Government policy and farmers' decision making in Thailand : the agricultural diversification programme in rice farming areas of the Chao Phraya River Basin, 1993-2000.

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Abstract

The crop diversification programme for the Chao Phraya river basin was formulated in response to the dual problem of irrigation water shortages and low prices of rice. Both problems were particularly acute in 1993, when the pilot phase of the programme began, to boost farmers' incomes and to lower demand for irrigation water in the most fertile agricultural area of the country. Combining the promotion of orchard cultivation as the main alternative to rice, and low-interest loans as an incentive for capital-poor farmers, the pilot project was expanded into a national agricultural restructuring programme in 1994.

The research study began with a structured survey among two broad groups of farmers in six provinces in 1994 and 1995, comparing those who had joined the project with others who had not. From 1996 to 1999, inspection trips and specific target group discussions were used to follow up on the original surveys, covering the changing external conditions – in particular, water resources available and rice prices, and the farmers' responses to such changes.

Design and performance of the diversification programme are discussed as a result of the interaction of a top-down government policy and farmers' own decision-making. Based on the initial adoption of the package offered by the government (fruit-tree saplings, guidance and low-interest loans), the farmers behaved very differently afterwards, learning from experience. Their decisions, for continuing with the diversification, or even reverting to growing rice, were made according to locally specific social, economic and environmental conditions. Endogenous factors of the farm household, such as land, labour and capital are manageable, but not exogenous factors, especially marketing and water supply. Specific combinations of these factors influenced farmers' decision making.

In conclusion, the agricultural restructuring approach must be adapted to locality-specific conditions, to enable decentralized and democratic decision-making. As this is in line with the current policy shifts towards decentralization and participation, the lessons learnt from this study would point out directions for a more democratic and better rural development process.

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List of Abbreviations

ADB	The Asian Development Bank
ALRO	Agricultural Land Reform Office
BAAC	The Bank of Agriculture and Agricultural Cooperatives
BMWA	Bangkok Metropolitan Water Authority
DOAE	Department of Agriculture
DOAE	Department of Agricultural Extension
DOF	Department of Fisheries
DLD	Department of Livestock Development
EGAT	Electricity Generating Authority of Thailand
FAO	Food and Agriculture Organization of the United Nations
LDD	Land Development Department
MOAC	Ministry of Agriculture and Co-operatives
NEDB	National Economic Development Board
NESDB	National Economic and Social Development Board
NRDC	National Rural Development Committee
NRDP	National Rural Development Programme
NSO	National Statistic Office
OAE	Office of Agricultural Economics
RFD	Royal Forestry Department
RID	Royal Irrigation Department
RPEP	Rural Poverty Eradication Programme
RRA	Rapid Rural Appraisal
PRA	Participatory Rural Appraisal
SMSs	Subject Matter Specialists
TAO	Tambol Administration Organization
T&V	Training and Visit System
UNDP	The United Nations Development Programme
UNCDF	The United Nations Capital Development Funds

Thai terms

tambol	sub-district

Measures

Area:

1 rai = 0.395 acres
1 rai = 0.16 hectares
2.5 rai = 1 acre
6.25 rai = 1 hectare

Currency (Baht / 1 $US)

Year	exchange rate (range)	exchange rate (average)
1996	25 – 26	25.34
1997	25 – 46	31.37
1998	36 –54	41.37
1999	36 – 40	37.84
2000	37 – 44	40.16

Statement of Copyright

Acknowledgements

The idea for the study originated from a smaller research which was conducted in the framework of the joint research programme of the Asian Institute of Technology, the University of Dortmund (Germany), and the Department of Agricultural Extension of the Royal Thai Government. A number of important questions arising from the initial study became the point of departure for undertaking this study as Ph.D. thesis at the University of Durham. The author wishes to acknowledge the financial assistance provided at the first stage by the joint university programme at Dortmund and Bangkok. She also wishes to thank her immediate supervisor, Dr. Jonathan Rigg, who opened the opportunity for this study at the University of Durham.

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Conducting this research was only possible due to the help of the various institutions at the national, provincial and local levels. Field-survey support was extended by the Department of Agricultural Extension (DOAE), the Bank of Agriculture and Agricultural Co-operatives (BAAC), the Royal Irrigation Department (RID) and other agencies. Special thanks are conveyed to the Farm Management Unit of the DOAE led by Mr. Vidhaya Atipananta and the extension officials at the provincial and local levels of the Agricultural Extension Office in the provinces of Lopburi, Angthong, Ayuthaya, Supanburi, Phitsanulok and Kampaengphet who gave strong support during several rounds of field work. Without their help, the field visits would never have been successful. It is hoped that the contribution of this study can be used as a reference for the work of the DOAE in further agricultural restructuring work.

Chapter I The Research Problem and the Objectives of the Study

The plan for this dissertation arose from a small research study dealing with the preparations for and the early experiences with the rice diversification policy which had begun in 1992 – 1993. This introductory chapter presents the background of the study and the diversification policy that lies at its core; it then sets out the objectives, the selection of areas for empirical fact finding, and provides an overview of the organization of the study.

1.1 Background

This study examines the intersection between government policy and farmers' actions. Specifically, it investigates the implication of the Thai government's rice diversification policy in the Chao Phraya river basin and how farmers responded to that policy and the initiatives that underpinned it.

This study covers a relatively long period of time, from the beginning of the agricultural diversification programme of the Thai Government in 1993 through to 2000. While the time frame is longer than originally intended, the seven years covered by the present study represent an interesting range of experiences with agricultural development policy in response to changing external development factors.

It is important to note that the two basic factors driving the Thai government's diversification policy changed not very long after it had been launched. The low rice price, one of the most serious problems facing farmers in the early 1990s, when the Thai Government formulated the diversification policy, disappeared in the mid-1990s, as the world market price for rice increased in an unprecedented way. Similarly, the severe national water shortages experienced in the initial project period (1992-1993) were alleviated a few years later, when rainfall volumes exceeded the long-term average figures. However, at present (early 2000), the rice price is depressed again, and rainfall in 1998 was much less than in previous years. Thus in these two respects the main external factors to which the policy had been responding, oscillated over time, and the farmers' response also changed as their decisions are influenced by both external factors and internal ones (i.e., the very diversification policy itself).

Due to the relatively long observation period, the case studies discussed in this study illustrate the unexpected changes that occurred after the diversification project was first initiated in response to the serious problems of the low price of rice and the shortage of water supply for rice cultivation. Diversification options out of rice as the main crop continue to be major challenges since rice is still one of the most important cash crops in the country.

The project assumed that farmers would diversify out of rice mainly because of the credit support offered to capital-poor farmers. However, the problem situation changed soon after the project was launched when the rice price increased rapidly and the water supply situation also eased permitting farmers to grow a second rice crop. In short, rice became a profitable option again.

The long-term sustainability of the diversification policy also depends on other influences such as availability and constraints of farm resources, opportunity for off-farm work in the context of industrial development in the region, and the dynamic changes in the national economic structure, from agriculture to industry. As the study covers an observation period of more than six years, it was possible to discuss the effectiveness of the diversification policy in an overall development context. All of the main factors have been carefully analyzed, based on empirical evidence from the project implementation in six provinces, and turned into "lessons learned", or recommendations for further agricultural development projects. It is thus hoped that the study does not remain an academic piece of research but that its results will be of some interest to policy makers in the Thai Government.

1.2 Critical Dimensions of Agricultural Development in Thailand

"There is rice in the field and fish in the water", the famous statement ascribed to King Ramkamhaeng (13th century) was a valid description of the agricultural abundance so characteristic of long periods of Thai history. This was based on the beneficial combination of rainfall, soils, temperatures and topography over large parts of the country. Such favourable conditions made Thailand an agrarian land where the economic structure was dominated by the agriculture sector until only twenty or thirty years ago.

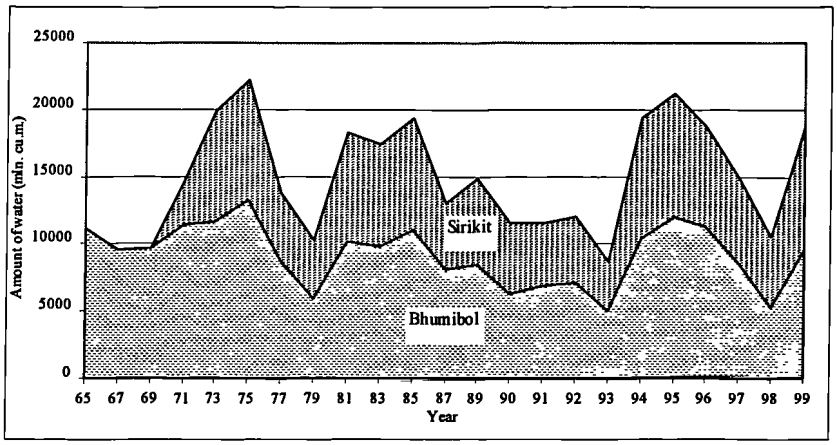
The history of Thailand shows a number of significant changes in agricultural development which were certainly not just induced by market signals, but also by deliberate policies. One example is the royal decree which established commercial rice mills in the middle of the 19th century that were then run by the Chinese immigrants invited to settle by the king. Another related example is the rice export premium which was a major factor influencing national rice growing and trading conditions until the mid-1980s. It is also worth mentioning that before the end of the 19th century, when King Rama V established the modern structure of government, there had been only four main branches (proto-ministries, so to speak) of the national administration, including "Na" (= rice field), the predecessor of the Ministry of Agriculture. (The other three were "Wieng", "Wang", and "Klang", in charge of city affairs [interior and defence], palace, and financial matters).

For a long time, up to the 1960s, agriculture provided both the highest share of GDP and national export earnings. In the course of national development, the contribution of the agriculture sector to GDP began to decrease, but was still about 50% in 1951, while it was a mere 12% in 1995 and 10.5% at present. The industrial sector had the smallest sectoral share in 1951 but it has developed rapidly to surpass agriculture in 1978, while the service sector increased more gradually to its current dominating position. The labour force employed in these two sectors (industry and services) has increased gradually too, but together have still not reached the size of the agricultural labour force. The discrepancy of GDP share and share of labour force in agriculture indicates an unbalanced condition with enormous gaps between the industrial-urban and the agricultural-rural sectors, as well as the strong external influences on any agricultural development policy. There is also the important point that these sectoral divisions disguise the multi-occupational nature (i.e: agriculture + industry) of the lives of many "farmers". As a consequence of the ongoing structural change in the national economy, the competition for resource utilization, i.e. land, water and human resources, is manifest and increasing. Especially for the agriculture sector, this results in increasing scarcity and higher costs of these basic resources.

1.3 Major Problems in Thailand's Rice Growing Areas

The impact of the competition for natural resources can be shown by the case of water allocation for agriculture in the early 1990s when there was a serious shortage of water. For the first time in 1993-1994, reservoir water for agriculture had to be limited in an unprecedented way. The two large Bhumipol and Sirikit dams that had been supplying irrigation water to the central plain since the 1960s and 1970s, reached exceptionally low levels (Figure 1.1), because of two factors: periodically experienced low rainfall intensity for three years, and, at the same time, the demand for electricity generation and water supply for the metropolitan region which had been growing tremendously due to the expansion of industrial development and settlement. For more than 25 years, most of the dam water had been traditionally used for agriculture, which encouraged farmers to plant a second rice crop during the dry season as a strategy to push Thai rice onto the world market. Now, however, agriculture was being squeezed by competing demands from other sectors. This forced the Royal Irrigation Department (RID) to reverse its 40-year policy of water use for agriculture. What took precedence over that of the farmers' demands was the need to service primarily urban-industrial interests, like the Electricity Generating Authority of Thailand (EGAT) and the Bangkok Metropolitan Water Authority (BMWA). This was coupled with an attempt at pushing salt water intrusion down to the Chao Phraya River mouth in order to save the orchard agriculture around BKK, but more so, to protect the metropolitan drinking water supply.

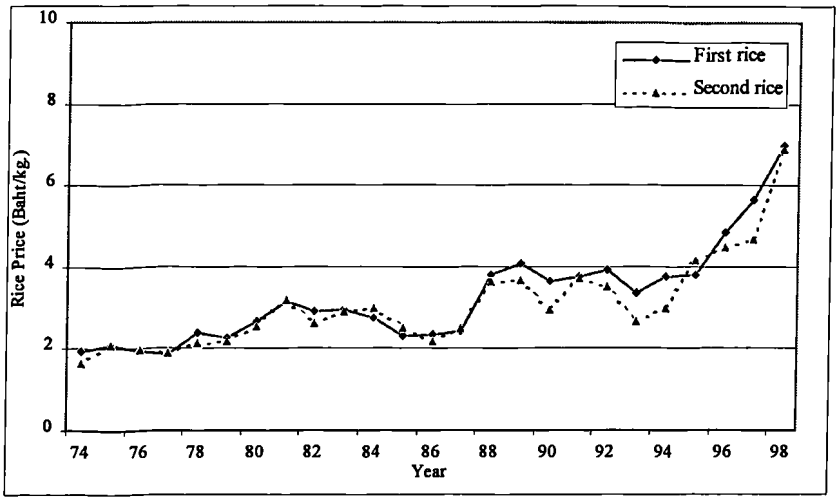
Figure 1.1 Availability of water in the Bhumipol and Sirikit reservoirs



Source : RID

The Chao Phraya River Basin has long been the rice bowl of Thailand, but its continuing existence as such is linked to the farmers' ability to make a living, which largely depends on the rice price. However, as Thailand is an open economy, the rice price fluctuates according to the world market price. The farmers never know the price situation in the coming season. Over the past 25 years, rice prices have fluctuated between 2 and 7 Baht per kg (Figure 1.2), and such fluctuations significantly affect farmers' income and the regional economy. In the early 1990s, when the rice price was only 2.5-2.6 Baht per kg, the farmers could hardly exist, as the farm-gate price barely covered their input costs.

Figure 1.2 Farm-gate rice price of first and second rice (1974 – 1998)



Source: OAE, from various statistical agricultural year books.

1.4 Policy Formulation Responding to Major Problems

Appropriate agriculture policy has to deal simultaneously with a number of major problems, namely shortage of water for agriculture, reduced amount of rainfall and its poor distribution, declining land resources and high competition in the world market trade. Thus a policy for "Agriculture Restructuring for the Chao Phraya River Basin" was set up in 1993, in the framework of a "Restructuring Agricultural Production Work Plan" which was formulated as the most important policy thrust in line with the 7th National Plan (1992 – 1996). Following the principal guideline of utilizing potential national resources and meeting market demand, the operational plan for this area emphasizes the promotion of crop diversification in order to mitigate the risk of low rice prices and to achieve the goal of consuming less water for cultivation.

The main strategy implied in crop diversification in the Chao Phraya Basin is twofold:

(i) as a minor strategy component, to substitute the second rice crop with other crops, and

(ii) as the major strategy thrust, to permanently replace rice cultivation with other forms of land use, notably fruit trees, but also animal husbandry or aquaculture.

The main objective is a double one, to avoid the risk of low prices of rice as the dominant crop, together with adjusting agricultural land uses to address the critical shortage of water resources and as a result, improve farmers' livelihoods.

In this context, reference must be made to recent studies (such as Team Consulting Engineers, 1993) which conclude that Thailand is about to face a "water resources frontier", with critical competition between agriculture, industries and urban domestic consumption. In fact, Thailand is only one of several developing countries in the wet tropics where the water frontier is reached, because of the increasing demand from urban-industrial uses in conjunction with agricultural use of the seemingly abundant water resources.

The minor strategy component of substituting for the second rice crop in the dry season does not change the land use pattern permanently. Rice is still cultivated in the wet season while other crops are grown in the dry season. In comparison, the major strategy thrust is to permanently replace rice cultivation with other forms of land use. The emphasis of this study is on this second component of the diversification policy, because it is more complex and requires much more far-reaching decisions by the farmers than the first component.

It was the first time that the Thai Government allocated a large budget in the form of credit support to farmers who wanted to diversify. Despite the incentive of a low interest rate, taking the credit still involved considerable risk on the farmers' part. This is especially true for small-scale farmers who have limited farm resources of land, labour and capital. These farmers will not accept the alternatives if they can not see the market opportunities. They will also consider whether their farm resources of land, labour and capital are suitable for any diversification. A number of these factors and their possible combinations determine whether a small farm is able to effectively participate in the proposed diversification.

1.5 Rationale

The rationale for undertaking this study originally was to describe the diversification project as an example of the decentralization policy of the Thai Government (Siriluck and Kammeier, 2000). Decentralization had been very prominent during the 7th National Plan (1992-1996), and is even more emphasized in the present 8th Plan (1997-2001). The agricultural diversification policy thus has to be seen in the changing framework of policy planning and implementation at the various levels, especially at the provincial and local levels. The focus is on agricultural planning procedures and experiences, as one of the centrally important forms of government intervention at the local and regional levels. It must be borne in mind, however, that the effects of public sector policies are strongly interrelated with the farmers' own decisions which would be made primarily in response to market signals.

The research aims at a systematic empirical study in order to understand the various factors that are involved in the implementation of the agricultural restructuring policy, and the farmers' actual decisions. The focus of the study is on the rice growing areas of the Chao Phraya River Basin, but the principal framework of the analysis, as well as the conclusions and policy implications derived from this study, may also be extended to other areas where agricultural restructuring takes place, such as those with current restructuring programmes focussing on cassava.

In 1994, there had also been policies on diversification out of other important cash crops such as coffee and pepper, along with similar policies for rice and cassava growing areas, but only a year after implementation, the world market prices for these two former crops (coffee and pepper) recovered in such a way that only few farmers adopted diversification measures. So the diversification policies of the Thai Government are essentially those for the rice growing areas (irrigated and rainfed), and, with far less emphasis and impact, for upland, dry land areas (rainfed cassava areas).

1.6 Objectives of the Study

The overriding objective of the study is to determine the opportunities and constraints of government-induced agricultural restructuring in a decentralized regional planning context. The related specific objectives are:

1. To describe and assess the framework of policy planning and implementation at the various levels, especially at the provincial and local levels, following the decentralization framework of the 7th and 8th National Plans. The focus is on agricultural planning procedures and experiences, as one of the centrally important forms of government intervention at the local and regional levels.

2. To investigate the agricultural diversification programme and the related planning and implementation practice in the central plain. This includes attention to differences in programme implementation in selected provinces.

3. In turning empirical evidence into "lessons learnt", the study then aims at generalizing them into recommendations for further development of the agricultural restructuring programme, to support realistic national policy making.

The six provinces selected represent distinctly different agro-ecological conditions, but more so, different conditions as far as exogenous factors are concerned, such as off-farm employment opportunities. The six provinces studied are reasonably representative of the conditions in the "rice bowl" of Thailand, i.e. the central plain and the lower north. While the emphasis of the study is on the conditions in rice growing areas, evidence of a more general pattern of factors of agricultural change and the response by agricultural extension has emerged as a major outcome of the study. Thus a relatively detailed section on agricultural extension approaches was added (in Chapter III), because the insights gained from the study are left to be relevant in terms of formulating a better framework for locality-specific agricultural extension services as well as general policy making in a decentralized context.

1.7 The Broad Study Area: The Chao Phraya Basin

The Chao Phraya River Basin is created by a combination of the Ping, Wang, Yom and Nan river basins, tributaries of the Chao Phraya, which originate in the North of Thailand. They meet in Nakorn Sawan and flow, now as the Chao Phraya River, to the Gulf of Thailand. Therefore the natural region of the basin covers the lower part of the northern region and the central parts of the central region of Thailand. The Chao Phraya Basin is a relatively wealthy and historically very

important part of the country. The central plain has been classified as one of the world's most fertile rice-growing areas (Judd, 1989) and it is also called the "rice bowl of Thailand". Rice has been cultivated here for a very long period, as a subsistence crop in the early stage and also for export at the later stage when, from the middle of the 19th century, foreign trade demand and irrigation facilities became the driving forces of Thailand's rice economy [1].

The Chao Phraya River Basin is defined as a natural macro-region with significant variations of natural and economic conditions within the constituent provinces of this area which would be too large to serve as a single target area for research. A number of smaller, micro-regions are distinguished on the basis of agro-economic criteria or simply by administrative division (province, district and sub-district or tambol). Thus the connection with the administrative responsibility at province/district/tambol levels becomes visible, in view of the significant variations of natural and economic conditions, within the same macro-region.

1.8 Selection of Study Areas in Six Provinces

Originally, the diversification programme was supposed to cover all 22 provinces of the river basin (Figure 1.3), beginning in 1993, but due to budget limitations during the first year (just 29 million Baht was made available in 1993), the government started a pilot project in four provinces only: Lopburi, Angthong, Supanburi and Ayuthaya. This selection was based on the high accessibility (from the national agricultural planning headquarters) rather than these provinces' representativeness of the different agro-ecological zones.

With a budget of over 65,000 million Baht for three years of operations (1994 – 1996) available a year later (1994), the crop diversification out of rice in the Chao Praya River Basin was integrated into the main work plan of the programme which was called *Restructuring Agricultural Production*, aiming to diversify out of the four major cash crops of rice, cassava, pepper and coffee which had been facing serious problems of price. This budget represents one third of the total operating budget of the Ministry of Agriculture and Cooperatives in these three years (OAE, 1999a, p. 305).

Within this framework, crop diversification out of rice was not limited to the irrigated areas, but also covered rice cultivation in rainfed areas. However, the focus of this study is limited to irrigated areas, because only such areas would meet the double objective of saving water resources and providing better farm incomes; and besides, they were the main target areas of the rice

[1] Exports of rice from Siam and considerable other exports, have been noted from the 1500s (Reid, 1988).

diversification policy in the Chao Praya River Basin. So it was only for such areas that any longer-term study of the policy could be maintained.

Some parts of the empirical research presented here were undertaken in the first four provinces of the pilot project, but two more provinces were added so as to cover the wider framework of the entire river basin. The selection of the six provinces, and within them several districts, was based on the existing irrigation zoning criteria that are used by the RID. The type and quality of irrigation systems in this classification system are as follows (Figure 1.4)

1. Gravity irrigation zone without land consolidation, in the upper Chao Phraya area (which falls into the Lower Northern Region of the country), covering the provinces of Tak, Uttaradit, Utaithani, and Kampaengpeth.
2. Gravity irrigation zone with various degrees of land consolidation, in the upper and middle Chao Phraya area, covering Pitsanulok, Pichit, Nakornsawan, Chainat, Singburi, Lopburi, Saraburi, Angthong and Supanburi. However, within this large zone, two sub- zones must be distinguished according to the degree of land consolidation (intensive and extensive systems). The so defined sub-zones 2.1 and 2.2 may exist within the same changwat. (Note that zones 2.1 and 2.2 are not differentiated in Figure 1.4).
3. Conservation irrigation zone in the lower Chao Phraya basin covering Ayuthaya, Nonthaburi, Nakornnayok and Patumthani. This zone is in the downstream area, with an abundance of rain water and river water from the upstream areas throughout the rainy season. The term "conservation irrigation" is used to refer to a system where the water is stored in the canals and, during the dry season, utilized by pumping into the fields.

Since the four provinces of the pilot project were situated in the gravity irrigation zone of the middle Chao Phraya River Basin (Lopburi, Angthong, Supanburi provinces) and the conservation irrigation zone of the lower basin (Ayuthaya), the two provinces of Kampaengphet and Pitsanulok were selected in addition. The former was selected to represent conditions in the gravity irrigation zone without land consolidation in the Lower Northern Region of the country while the latter represents the gravity irrigation zone with land consolidation in the upper Chao Phraya area. In this way, all three principal irrigation zones of the RID are included in the empirical study.

Figure 1.3: The Chao Phraya river basin

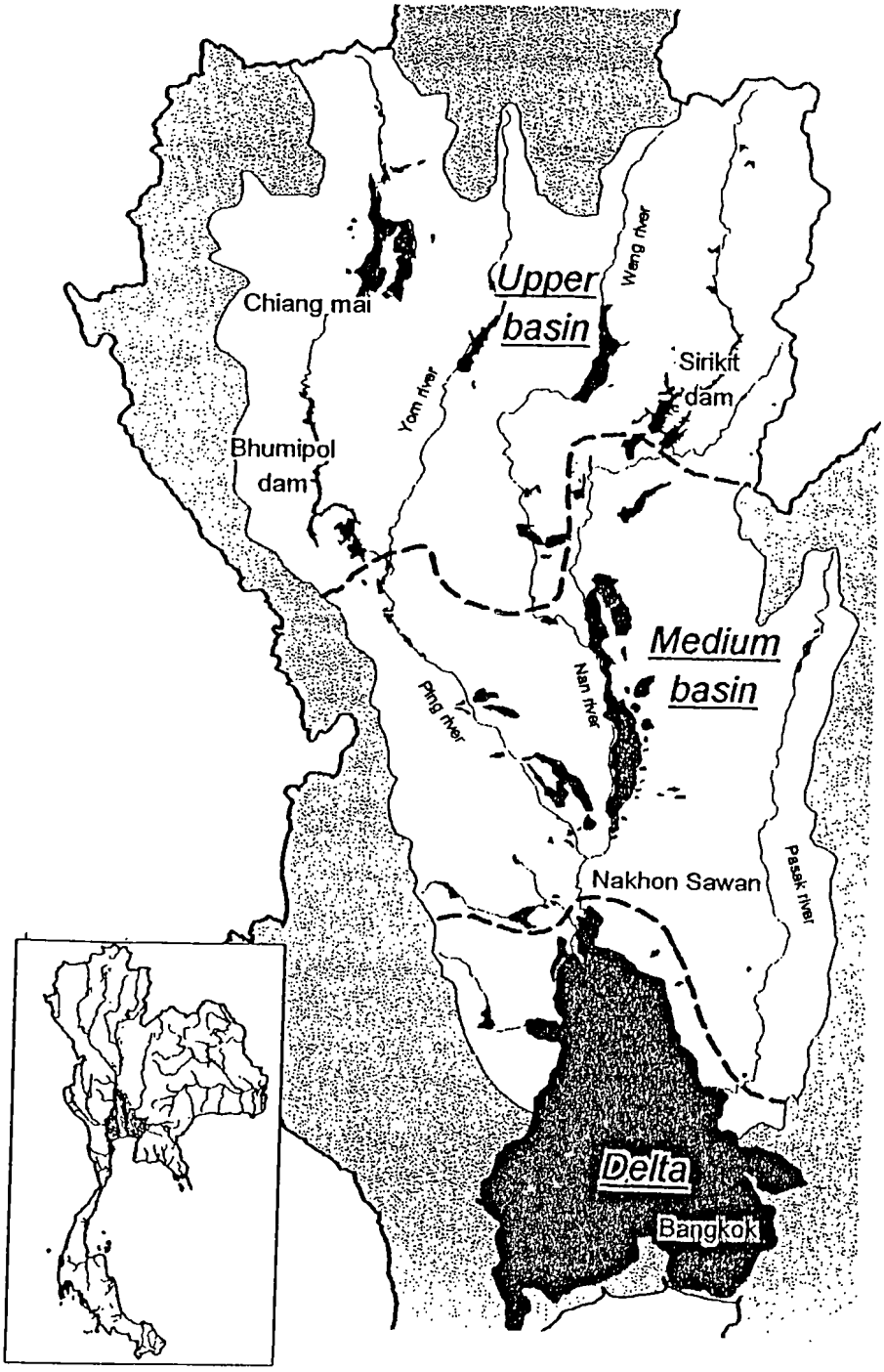
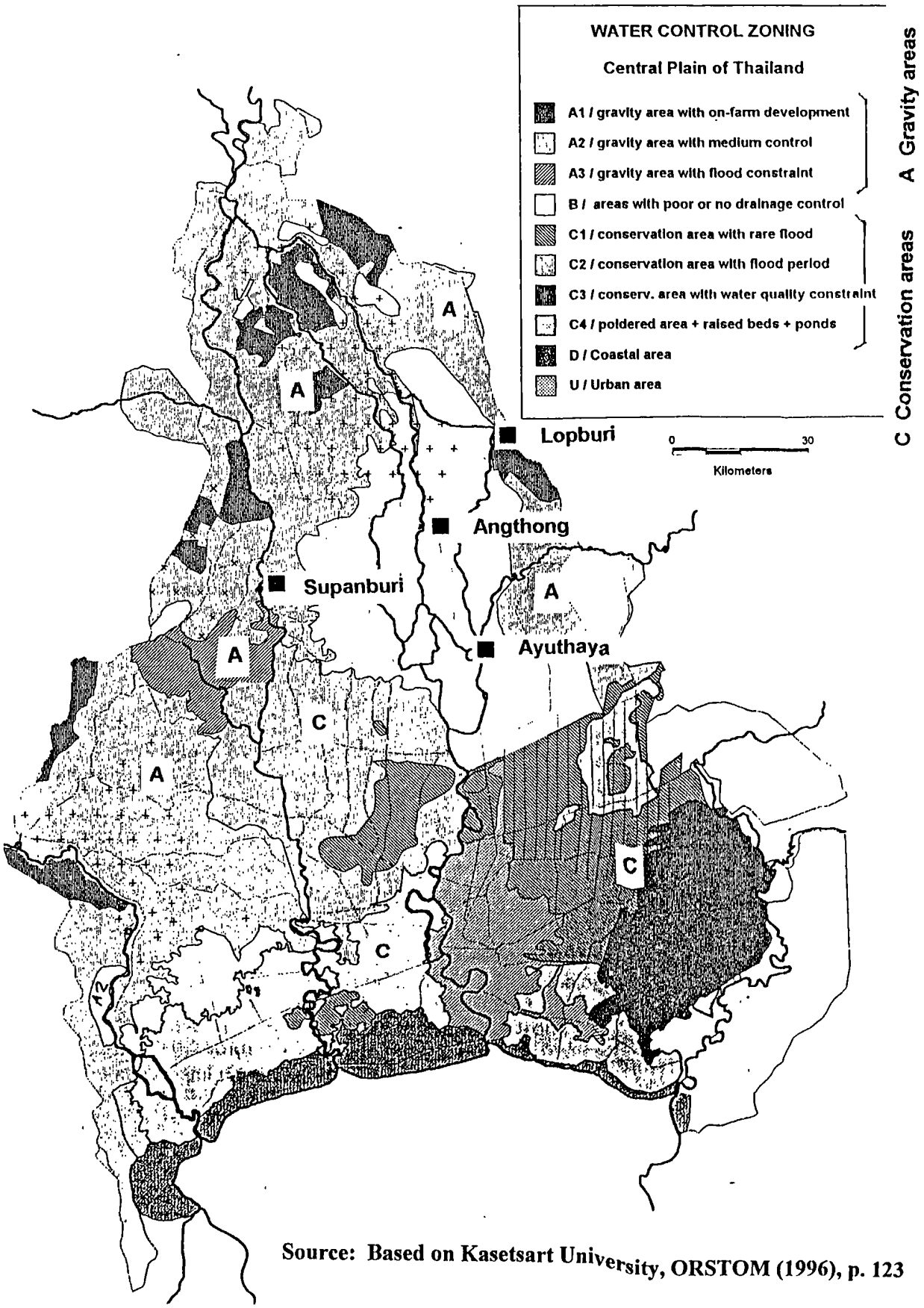


Figure 1.4: Irrigation systems in the Chao Phraya plain



Source: Based on Kasetsart University, ORSTOM (1996), p. 123

In each of the provinces, essentially two groups of farmers were selected for in-depth interviews - those who had joined the government-supported diversification scheme, and those who had not. Among the latter group there were many farmers who had already ventured into diversification themselves. The details of the sampling procedure are explained in Chapter IV.

Some provinces were deliberately not included although they are part of the Chao Phraya Basin. They are:

- Bangkok, Nonthaburi and Samutprakarn because they are primarily influenced by the high rates of industrialization and urban development, even though all of them still have extensive irrigated rice growing areas;

- Samutsakorn, Nakornnayok, Nakornpathom and Chachoengsao, because they are partly influenced by the adjacent Maeklong River Basin and Bangpakong River Basin, respectively, apart from their being heavily urbanized as well.

1.9 Organization of the Study

The study is organized into nine chapters that have been grouped into three major sections – Part A: Conceptual framework and research methodology; Part B: Fact finding and empirical study in six provinces, including the qualitative and quantitative analysis of the information from the empirical surveys; and, finally, Part C, drawing out the main conclusions and policy implications.

This section presents a summary of the research approach and the main conclusions for orientation.

1.9.1 Part A: Conceptual Framework and Research Methodology (Chapters I-IV)

Chapters I and II: The introductory chapter provides the background of the study, its rationale and policy context, and an introduction to the study areas. After this chapter, a broad review of the Thai economy is presented in Chapter II. It highlights the main features of the macro economy, since the immediate post war period, with a focus on change over the two decades until the burst of the "economic bubble" in 1997. While the discussion embraces the mutually dependent development of the three sectors of agriculture, industries and services, the emphasis is on the agriculture sector which has rapidly declined in importance during the accelerated development and transformation processes of the last two decades.

Chapter III: "Concepts of Agricultural Development and Their Reflection in Thailand's Agriculture Policy since 1961" is the descriptive heading of this chapter which is arranged into three major parts:

1. Agricultural development and national plans, beginning with a brief description of the national plans, together with a more detailed discussion of policies and plans for agricultural development. There is also a discussion of decentralization from the 4th until the 8th plan, in parallel with the stages of agricultural development.
2. Agricultural extension approaches in Thailand beginning with direct transfer of technology, and then proceeding to the training and visit (T&V) model, the farming system approach and finally, the farmer-centred approach in line with the people-centred approach of the current 8th plan. The turning point to a genuinely participatory approach is pinpointed in the framwork of the farming system approach embraced in the early 1990s which, in turn, is in line with the decentralization of administration in the 6th and 7th plans. The current trend, towards sustainable agriculture and increasing levels of participation, mirrors developments in a world context.
3. An outline description of the diversification project including details of planning and implementation at the national, provincial and local levels. This illustrates how policy formulation has responded to the serious problems faced by farmers. The chapter also outlines the package designed for diversification, target areas set up and budget allocation from the top and information transmission for action plans at the provincial level, and implementation at the local level.

Chapter IV: The methodology for empirical research follows immediately after the project description. It was important to conduct interview surveys although this is one of the most time-consuming research methods. The semi-structured interviews were carried out at the farm level in the carefully selected study areas in the six provinces in two years (1994 and 1995). It was only in this way that the farmers' experiences and views could be adequately studied and assessed. Moreover, visiting and interviewing the same groups of farmers twice was useful for understanding the complex, diverse, and changing conditions under which they had to make decisions for (or against) diversification. Other forms of survey and appraisal were also applied at the appropriate stage, such as "Rapid Rural Appraisal" (RRA) and "Participatory Rapid Appraisal" (PRA), for group discussion with the focus groups in the follow-up visits.

1.9.2 Part B: Empirical Study, Quantitative and Qualitative Analysis (Chapters V-VII)

Chapter V: The assessment of the existing situation in the study areas is based on the data derived from the structured surveys in the localities, with two groups of farmers, in the project and non-project categories. The findings show that farmers in the study areas are relatively

better off than the average of the farmers in the region. The income composition includes a wide range of percentages derived from on-farm and off-farm sources. Farmers in the four provinces in the central plain have more opportunities for off-farm work in nearby industries than those in the two provinces of the lower north. Despite these off-farm work opportunities, however, the income from on-farm sources is still higher in most cases.

Although the package designed for diversification was in the form of orchards as a substitute for rice, the main land use pattern in the study areas is still dominated by rice. In view of the intensive care and heavy investment in the first few years for orchard cultivation, only a small plot can be diverted in each farm. Hence the paddy area of the project farmers was only 7 per cent less than that of the non-project farmers. This small discrepancy, however, led to a considerable difference in variable cost and gross margin between the project and non-project groups of farmers, primarily because of the heavy investment for land conversion, without any return from the newly created orchard in the first few years.

Variations also occurred in other contexts as well, for example, due to differences in tenancy rates between the two project and non-project groups in some provinces. The variation, however, is not limited to the project and non-project groups. There are also place-specfic variations, as not every province has the same opportunity for off-farm work due to different degrees of industrial development in the region concerned. Similarly, there are differences in the on-farm situation where farmers in the conservation irrigation zone receive better water supply than in the gravity irrigation zone.

The many variations among farmers are caused by exogenous natural factors like climate and topography, or man-made ones, such as agricultural land reform, irrigation systems, and industrial development. The exogenous factors also cause the same problems for all farmers in the two groups (project compared with non-project). It was found that most of farmers have the same two serious problems, namely unstable and low price for their major crop of rice, and shortage of irrigation water for rice cultivation in the dry season. As these problems are beyond the control of farmers, they ask for support from the government.

Chapter VI: The effects of the first two years of implementing the diversification policy on farmers' livelihood were studied in depth and presented in Chapter VI, with an emphasis on qualitative factors derived from a number of detailed case studies. These include cases of farmers who diversified by themselves, in comparison with those who were supported by the project. Expectedly, the motives for diversifying are similar to the objectives of the project. All respondents stated that the unstable and low price of rice with expected higher income is the main reason for diversifying. Better income distribution and no need to search for off-farm work

were also noted by some of the respondents. Whole-farm analysis was undertaken in order to compare the traditional and alternative systems. This was not based on economic analysis criteria only, but also on farm resource utilization over time. Results show that returns from diversification in the first few years were lower than from rice alone. The break-even point is from year 4 onwards.

Chapter VII: Findings from Chapters V and VI indicate that although some farmers require credit support for diversification, some had already diversified without external capital support. However, there was also a group of farmers who were not interested in diversifying despite the availability of capital support. This led to questions about how farmers made such decisions. For this purpose, the raw data were reshuffled into three farmers' groups, (i) farmers who had already diversified on their own, (ii) farmers who diversified with the help of project support and (iii) non-diversifying farmers. In Chapter VII, these sets of data were run through statistical tests searching for the most significant factors influencing decision-making. Results show that different decisions were made according to the specific social, economic and environmental conditions facing these farmers. Endogenous factors such as the farm resources of land, labour and capital are manageable, but not exogenous factors, especially marketing and water supply. Combinations of these factors influenced farmers' decision-making.

1.9.3 Part C: Conclusions and Policy Implications (Chapters VIII-IX)

Chapter VIII: Based on the discussion in Chapter VII, the study proceeds to provide a broad account of the period after the completion of the pilot project. Chapter VIII first provides summaries of the three official evaluation reports that are now available on the programme. The second part of the chapter presents the essential lessons learnt from the evaluation of the first two years of project implementation, and from the follow-up focus group surveys in 1997-1999. Then the differences between the three official evaluation reports in comparison to the research study are illustrated in the third part.

Chapter IX, finally, presents recommendations, in the light of the discussion of critical points, mentioned above. These are not limited to the diversification programme only, but also include the wider context of future policy development in frame of decentralized agricultural development.

1.9.4 Organization of the Annexes

The study contains a considerable variety of statistical materials, questionnaires, maps, and texts that have been placed in three Annexes. Annex I contains supplementary materials such as tables and charts that are further numbered by chapter. Annex II includes the questionnaires that were used for the structured field surveys. Annex III includes the processed data from the surveys. The following Table 1.1 provides an overview on the structure of the Annexes.

Table 1.1: Organization of Annex Materials in Relation to the Main Body of Text

Chapter (short title)	**Annex I: Supplementary materials** such as tables and maps (numbered by chapter)	**Annex II: Questionnaires** used for the structured interview surveys	**Annex III: Tabulated processed data** from the structured interview surveys
I: Introduction	--	--	--
II: Thailand Development	--	--	--
III: Agricultural Development	I.3.1 Comparative income table (based on Rigg, 1997) I.3.2 Typology of participation I.3.3 Agencies involved in agricultural restructuring	--	--
IV: Research Design	--	II.4.1 Project group (1993/94 for central plain, 1994/95 for the north) II.4.2 Non-project group (1993/94 for central plain, 1994/95 for the north) II.4.3 Project group (year 2 survey, central plain, 1994/95) II.4.4 Non-project group (year 2 survey, central plain, 1994/95)	--
V: Empirical Findings	I.5.1.1 The 26 sub-projects, Greater Chao Phraya irrigation project I.5.1.2 The 12 major irrigation projects in the entire country Tables I.5.2.1 – 3 Cultivated area, dry season Tables I.5.2.4 – 6 Land use, six provinces, two crop years Tables I.5.2.6 – 42 Farm income and total household income I.5.3 Geological land forms, central plain	--	III.A: 1993/94 – Two groups, 4 provinces (central plain) III.B: 1994/95 – 2 groups, 4 provinces (central plain) III.C: 2 groups, 2 provinces (lower north)
VI: Farmers' Livelihood	I.6.1 The Problem of low rice prices	--	The tables in Annex III are also related to the analysis presented in Chapters VI and VII
VII: Decision-Making Factors	I.7.1 Statistical tests: Innovators vs. non-innovators	--	--
VIII: Agricultural Restructuring in Perspective	--	--	--
IX: Conclusions and Policy Directions	--	--	--

Chapter II The Economy of Thailand in Transition

This chapter is an overview of macro-economic development in Thailand, with a focus on the last 20 years. This chapter thus presents a background of the socio-economic transition of the country from traditional-agrarian conditions to its current stage as an early industrializing economy. The agriculture sector continues to be an important component of the economy, but over the last fifty years, and more so over the last 15-20 years, almost everything in Thailand has changed beyond recognition. Agriculture too has undergone fundamental changes – in terms of overall economic position, social structure, ecology, and technology.

This chapter begins with three sections (2.1 – 2.3) that reflect the long-term changes in economic structure, the largely externally driven industrial growth, and the growth of the service sector. After that, there is a separate section (2.4) on the "boom-and-bust" scenario of the 1990s, because it has so greatly influenced the performance of the agricultural diversification policy. Finally, drawing in the overall changes of the economy, the development of the agricultural sector is outlined in more detail. This chapter as a whole, and especially its last section (2.5), thus provides the background for the discussion in the following chapter (Chapter III), which is focused on agricultural development, planning, and extension services.

The title of this chapter alludes to that of a book published not long before the economic crisis of 1997, *The Thai Economy in Transition* (edited by Peter G. Warr, 1993). The book is remarkable in a sense that it compiles many different aspects of Thailand's socio-economic and political development over the past 100 years, with an emphasis on the more recent past. The book thus presents an excellent overview of the long-term changes in the economy and the political setting in the country. While the country did not change very much, or even stagnated, for about 80 years, until the 1950s (or even the 1960s), the rapid changes of the last thirty years have taken Thailand into a stage of transition. It remains to be seen whether this transition is towards a "newly industrializing country" ("NIC", a catchphrase of the early 1990s), or, as contemporary analysts would define it now, an agro-based industrializing and service economy with strong international linkages.

2.1 Long-term Economic Changes

Reflecting on the overall economic, social, and political changes in Thailand over the last 100 or 150 years inevitably leads to a fundamental question as to the reasons for the rapid transformation of the country during the last 50 years, and more specifically perhaps during the last 20 years. Evidently the changes over the recent past have been much more profound, and

their pace more rapid, than the changes that occurred in the hundred years before. Nonetheless, some important underlying factors have been present for a long time, such as, the modern administrative system, a very high literacy rate due to compulsory education since 1910, and, for the last thirty years, an increasingly dense transport and communications network. The political changes have been tremendous, from absolute monarchy through military dictatorships towards democratic rule under a constitutional monarchy. Milestone dates in the political transformation would be 1867-1905 (the reign of King Chulalongkorn), 1932 (the "revolution" which abolished the absolute monarchy and established a modern parliamentary form of monarchy), and 1974 (the end of the era of military dictatorship). However, the pace of transformation during the first 100 years (until about 1960, the beginning of modern national planning) would have been much slower than that of the forty years since then.

For a long time, Thailand was viewed – in conventional economic terms – as one of the poorest countries in the world, with a century of virtually zero growth of output per head of population. According to a long-term study of agricultural development, the annual growth rate of GDP per capita during the 80 year period from 1870 to 1950 was estimated to be not more than 0.2 percent (Sompop, 1989), as shown in Figure 2.1. This implies an almost zero-growth in agricultural production which was associated with very slow population growth over the same period. However, population growth began to pick up from about 1940 onwards, reached unprecedented annual growth rates of over 3 percent during the 1960-1970 decade, and has come down to just over one percent in 1999. So there is a similar picture of slow change over a long period of time, followed by a dramatic growth period, leading into the current transition from agriculture and rural-based to an industrial-services-urban based economy. The rapid changes in both economic and demographic growth can only be explained by long-term and macro-economic factors such as the relatively high standards of education and public health, strong international trade connections since the late 19th century, and in the shorter term, the economic impact of the American presence during the Vietnam war, of the 1960s and 1970s.

From the immediate post-war period, the Thai economy developed very fast. The transformation began from a status of an economy dominated by subsistence agriculture (which had not changed significantly for decades), followed by a fast expansion of the agriculture sector for export and, during the sixties and seventies, an import substitution strategy for industrial goods. The transformation of the Thai economy during this time was associated with increasing trade linkages into the world economy. After a brief crisis caused by the first and second oil price shocks of 1973/1974, Thailand liberalised the economy and was successful in pursuing an export oriented strategy during the late 1980s. The liberalisation however went further still, opening the economy up to foreign capital, and especially during the early 1990s. At this stage, the country was already referred to as the "fifth tiger" among the rapidly

expanding economies of Asia (e.g., in Muscat, 1994), before the economic crisis in the region in 1997 dampened any over-optimistic forecasts. Even the World Bank had described Thailand as a model for economic development only four years before the burst of the "bubble economy" (Buch-Hansen, 1999).

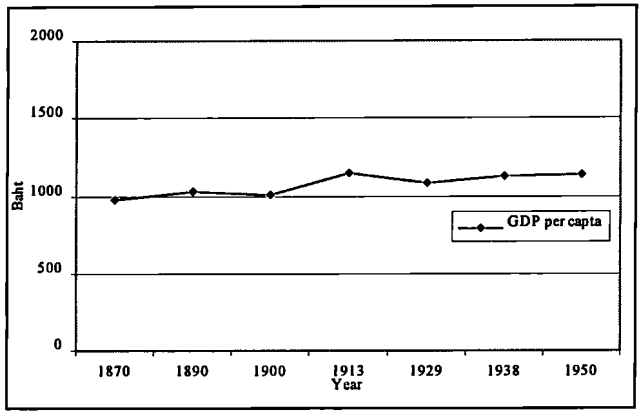
2.1.1 Structural Change in the Economy

Changes in GNP per capita since the 1950s until the 1990s are presented in Figures 2.2 – 2.4. The difference of the GNP per capita at market prices between 1957 and 1995 is very large, at 34.5 fold. These figures show that the GNP per capita was increasing gradually in the early 1960s, speeded up during the mid 1970s to 1989, and faster still until 1997. Annual growth rate of income during the first period was only 4.4% at current market price, and 2.8% at constant 1962 prices, while it was 8% at current market price, and 5.3% at constant 1988 prices, during last period. This reflects – and can be explained by – the economic growth of each sub-sector (see below).

The dynamic change of economic structure since 1951 is illustrated in Figure 2.5, which shows that agriculture was the leading sector during 1950s through the 1970s, but it was over taken by industry in the 1980s. With the slowdown of agriculture and the simultaneous growth of industries, Thailand reached a crossroads in terms of industrialization in the late 1980s.

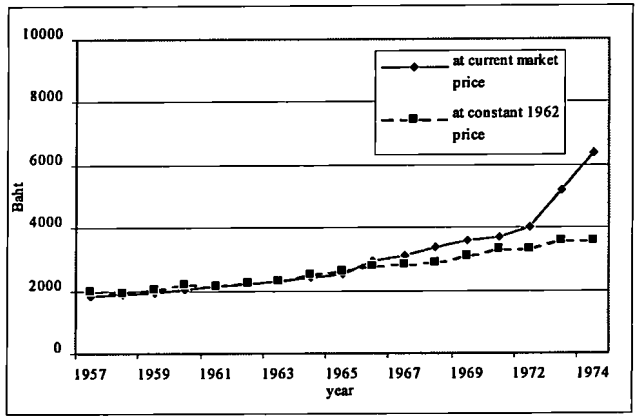
The share of agriculture to GDP gradually declined from 50% in 1951 to about 20% in 1980, while the share of industry rose to 25% in the same year. By 1995, the contribution of the industrial sector to GDP had risen to 28% in 1995 (1951 it was just 12%), while the service sector had risen to 60% from 38%, the same period. The agriculture sector which used to dominate in the past is now contributing the smallest share of national income, 10.5% in 1999.

Figure 2.1 Gross domestic product per capita, 1870 to 1950 (at constant 1950 prices)



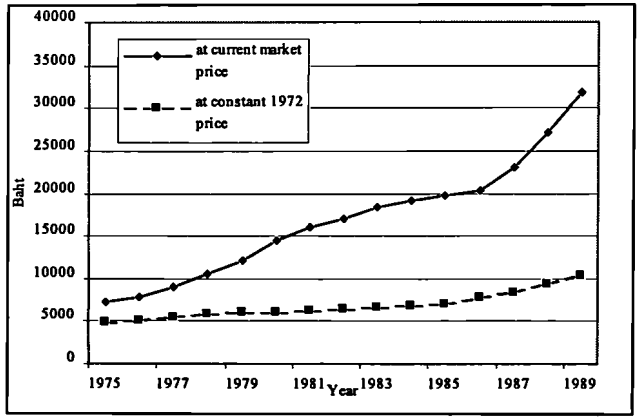
Source: Warr, Peter G., 1993 page 52

Figure 2.2 Gross national product per capita, 1957 to 1974



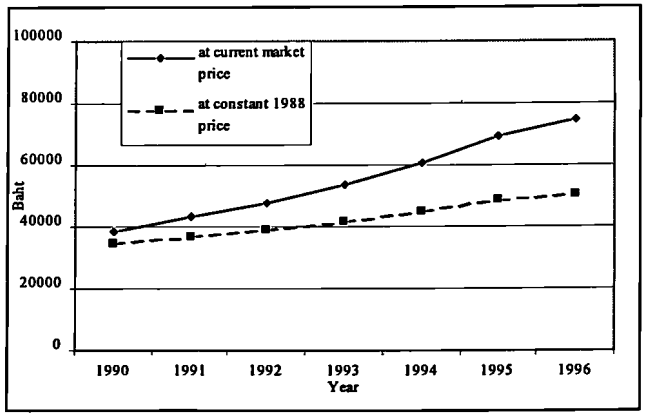
Source: National Statistics Office, various statistical yearbooks

Figure 2.3 Gross national product per capita, 1975 to 1989



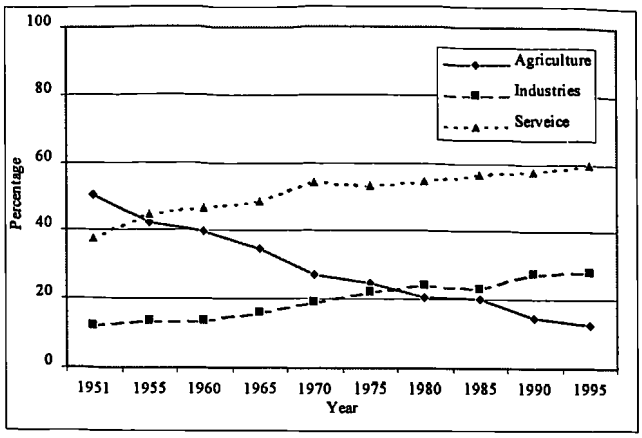
Source: National Statistics Office, various statistical yearbooks

Figure 2.4 Gross national product per capita, 1990 to 1996



Source: National Statistics Office, various statistical yearbooks

Figure 2.5 Change of GDP by sector at current prices, 1951 - 1995



Source : EUI, 1984, Warr, 1993 and NSO, 1999

2.1.2 Agriculture-based Early Industrial Growth

The rapid growth of the Thai economy during the 1950s to 1960s was led by agricultural growth responding to world demand for commodities such as maize, sugar cane, kenaf and rubber. Extensive agriculture was supported and promoted by government policy on road infrastructure, which pushed transport services into previously inaccessible rural areas, thus opening up large areas for cultivation which had previously been under forest cover. This made the foreign exchange earnings from primary exports expand rapidly and stimulated the growing demand for consumer and capital goods for urban expansion. However the demand for imports grew faster than export earnings, and turned Thailand's balance of trade into deficit in most years from 1952 onwards. However, the deficit of this period was offset by the inflow of foreign exchange from US grant aid and loans and other capital inflows during the 1960s (Pasuk and Samart, 1993).

The Thai economy was relatively strong during 1970 to 1978 because of high rises in the world price of farm products during the 1970s, and Thailand had large reserves of land for agriculture to cope with world market demand. The average annual growth rate of the economy for 1970 – 72 was 4.2 percent while it rose to 6.5 percent per year during 1973 – 75. This was mainly because of buoyant exports of principal agricultural products such as rice, rubber, maize, tapioca products and sugar. Their share of total export value was more than half (about 54%, Phattakhun, 1991). This enabled the Thai economy to quickly adjust to the oil price shock in 1973 – 74 and to exceed its previous growth rate and achieve more than 9 percent expansion per year during 1976 – 1978.

The economy slowed again following the oil prices rises of 1979 – 1980. Unlike the first oil shock, world prices of farm products during this time were unfavourable, resulting in an average growth rate for 1979 – 81 of only 5.3 percent. This also contributed to (a) high current account deficit of 7.1 percent for 1970 – 81, and (b) high inflation rate of 9.7 percent and high inter-bank lending rate of 15.2 percent over this period.

Worldwide recessions and high interest rates caused by the second oil crisis since the early 1980s slowed down growth rates in Thailand. This caused agricultural growth to slow further, as well as raising problems for other sectors. The trade deficit continued to widen, and the debt service ratio, which traditionally had been insignificant, began to rise alarmingly. The slump in commodity prices continued and, in addition, there were slowing trends in world demand for manufactured goods.

With slow economic growth rates and high real interest rates, the government launched structural adjustment programmes, aimed at improving the efficiency of the domestic economy, in 1982. Some of the programmes, (e.g. tax structure improvement, limitation of the growth of personnel cost of the government, and imposing a ceiling for annual public borrowing from abroad), resulted in the reduction in the growth of government expenditures. However, expenditures still exceeded revenues even though the growth rates of government revenues and expenditures for 1982 – 84 were slow compared to the 1970 – 1978 period (Chaipat, 1993: p. 207).

The Bank of Thailand also devalued the Baht by 14.8 percent against the US dollar in late 1984 as the latter had been appreciating against major currencies since 1983. This, coupled with other domestic structure adjustments launched by the government in 1982 – 84, apparently restored Thailand's competitiveness in the world market and provided a solid foundation for an impressive recovery from the middle of 1986 (Chaipat, 1993: p. 207).

Before reviewing the "boom-and-bust" period of the Thai economy during the 1990s, it is necessary to understand the main developments in the industrial and service sectors over a longer period of time.

2.2 Development of the Industrial Sector

As the country's economy was led by agriculture, the principal manufacturing activities in the 1950s were based on agricultural products such as rice milling, saw milling, sugar and rubber processing, and boat building, as well as the production of certain basic consumer goods. This mainly served the need of export trade associated with the Korean War in the early 1950s. Food,

beverages and tobacco were important agro-based industries accounting for 60 per cent of manufacturing value added in 1960 (EIU, 1984: p. 26 and Somsak, 1993: p. 120).

2.2.1 Shift from Agricultural Products to Manufactured Goods

There have been significant changes in the structure of production. By the early 1970s, most of the growth in manufacturing was still based on production for the domestic market, including a significant amount of import substitution in consumer goods. From 1980 there was a shift from food and agricultural commodity processing towards garments, metal and minerals processing, and machinery and transport equipment manufacturing. Various manufacturing industries have since become more export-oriented and some 20 percent of manufacturing output was being exported at that time (EIU, 1984: p. 26 and Somsak, 1993: p. 120).

Since 1985, the value of manufactured exports has exceeded that of agricultural products, and textile products (including garments) have emerged as the most important foreign exchange earners in the export market. They have replaced rice which had been the most significant export earner since Thailand first significantly entered into foreign trade in the mid-nineteenth century. Since 1986, the value of garment exports alone has surpassed that of rice (Somsak, 1993: p. 118).

2.2.2 Expansion of Industries

Expansion of the manufacturing sector as a whole has been rapid during the post-war period, contributing importantly to overall GDP growth. The expansion moreover, has been fairly consistent, with some slight acceleration over the period as a whole. In real terms, average annual growth was at the rate of 7.2 percent during the 1950s, 10.6 percent during the 1960s, and 11.5 percent during the 1970s (EUI, 1984: p. 26). However it slowed substantially in the 1980s. During the period of 1980 – 1985, the average growth rate was only 4.6 percent per year. In 1985 particularly, the manufacturing sector recorded a negative growth rate of – 0.6 percent. But industries serving the domestic market were generally experiencing low growth, export industries grew rapidly. Manufacturing can be attributed to continued export expansion and increased domestic demand resulting from the economic recovery since 1986 (EUI, 1984 and Somsak, 1993: pp. 121 – 122).

Recovery of the economy at this time was not just because of the declining oil price. It was in combination with other factors at this time, such as the more flexible Thai exchange rate after the devaluation of the Thai currency (and changing the system to tie up with a basket of currencies instead of the US dollars in 1984), reduction of international interest rates, recovery

of export commodities, increasing foreign investment inflow, and other developments. For example, the Eastern Seaboard Project (EDB) was launched in 1981 to maximize benefits from the natural gas found in the Gulf of Thailand. The big investments connected with this project comprised of an integrated petrochemical complex, soda ash plant, fertilizer plant and steel complex including infrastructure facilities such as a deep sea port (Pasuk and Baker, 1998: pp. 87 – 89).

The EDB was viewed as Thailand's version of Korea's heavy and chemical industries project. This was the first surge of public investment since the 1940s. There was high speculation in land together with development of housing, hotels, commercial centres and other infrastructure in the zone. This combined with the expansion of investment by the private sector especially by petrochemical firms which then boosted manufacturing and service industries (Pasuk and Baker, 1998: pp. 87 – 89).

2.2.3 Growth of Industrial Exports

From 1985 to 1990, total exports from Thailand multiplied three times; exports from Thailand to Japan multiplied four times; and exports of manufactured goods almost five times. The economic boom of the early 1990s was driven by foreign and local investment. Domestically invested and joint venture firms led the labour-intensive export-oriented manufacturing sector. Total textiles and garments exports from Thailand multiplied eleven times over the 1980s and became the single largest export sector in the 1990s. By 1990, the industry employed almost a million people. Exports extended to jewelry, shoes, toys, plastic products, furniture, canned and processed foods, leather, rubber goods, and artificial flowers (Pasuk and Baker, 1998).

Many of these industries developed an export potential from a mix of cheap labour and locally available raw materials. But once they had developed their export expertise, they kept on expanding by processing imported raw materials too, such as in the case of furniture made from rubber wood and gem cutting and jewelry making. (Pasuk and Baker, 1998).

While garments and other classic cheap-labour industries were the first products to boom, the surge of foreign investment shifted the emphasis to medium-tech industries, particularly electrical appliances, electronics, and auto parts. Joint ventures which had been set up to supply Thailand's domestic market, geared up to produce these goods for export. By the 1990s, Thailand produced TVs with 70% local content and a high degree of international competitiveness. Electronics and other medium-tech goods overtook textiles and other labour-intensive goods as Thailand's largest export sector. Their growth rate during 1991 to 1995 was about 27% a year (Pasuk and Baker, 1998).

At this time, the manufacture of computer parts also increased very rapidly. The export value was small in the mid-1980s, but it was more than double the value of rice exports by the mid-1990s (Table 2.1). In fact semiconductor production was first established in Thailand in the late 1970s, and from that date increased in volume rapidly. This was the result of investment by large multi-nationals such as Minebea, Seagate and IBM during the mid-1980s to early 1990s. These companies used Thailand as a base for producing computer parts and integrated circuits (Pasuk and Baker, 1995 and 1998), and quickly began to compete with Mexico as a new base for computer manufacturing for the lucrative North American market.

Table 2.1 Structure of exports, 1981 – 1993 (billion Baht)

Items / Year	1981	1985	1988	1990	1993
Agriculture	73.0	73.4	104.5	100.0	110.7
Labour-intensive manufactures	22.6	41.5	118.7	185.1	257.2
Medium-high technology manufactures	7.9	13.7	61.7	130.3	281.4
Total manufactures	54.7	95.6	265.6	440.4	752.6
Total exports	153.0	193.4	403.6	589.8	935.9
Manufactures as percentage of total exports	35.8	49.4	65.8	74.7	80.8

Source: Pasuk and Baker, 1995: p. 160

2.3 Development of the Service Sector

Although the manufacturing sector rapidly expanded especially during the 1980s and 1990s, the service sector (i.e. the tertiary sector plus public utilities, defence and public administration, ownership of dwellings, construction and other services) grew almost equally in terms of contribution to GDP and employment. Its contribution to GDP in 1951 was second after the agriculture sector (about 38%), grew gradually to contribute half of GDP in the 1970s, and became the largest sector in 1995 (about 60%). Most of this rise came from the sub-sector of "other services" which includes: education, health, recreation and entertainment, hotels, restaurants, personal services, domestic services, business services, non-profit institutions and repair work. This rise in terms of value–added contribution to GDP was relatively modest, but in terms of contribution to employment and foreign exchange earnings, services played a significant role (Pasuk and Samart, 1993).

The government attitude regarding the service sector changed significantly from the early 1970s onwards. This sector was promoted actively after little attention in the first two national plans (1961 – 66 and 1967 – 71). The tourism sector was stressed as one of the major sources of

potential foreign exchange earnings in the Third, Fourth and Fifth Plans (1972 through to 1986, Pasuk and Samart, 1993).

2.3.1 Promotion of Tourism and Overseas Workers

The second oil shock in the early 1980s led not only to the slowing down of agricultural growth, but also in world demand for manufactured goods. This caused Thailand's GDP growth rate decline while the rate of unemployment and underemployment rose together with an increasing debt burden and widening trade deficit (which had begun since the 1960s). Since this threatened political and economic stability, policy–makers turned to the service sector to act as a major source of foreign exchange earning and employment creation. It had become a major policy platform by the mid 1980s (International Labour Office, ARTEP 1984). The two strategies of promoting tourism and sending migrants to work overseas in order to increase foreign exchange earnings had become major component policies by that time.

Since this sector was promoted vigorously as a major source of foreign exchange and a provider of employment in the Sixth Plan (1987 – 1991), labour exports were expanded to new countries besides the Middle East. This plan also advocated measures to promote Thai construction firms overseas, and firms for business services such as marketing, management, public relations, quality control, packing, freight and insurance, and information services relating to marketing (Pasuk and Samart, 1993).

2.3.2 Impact of Service Development on the Rural Economy

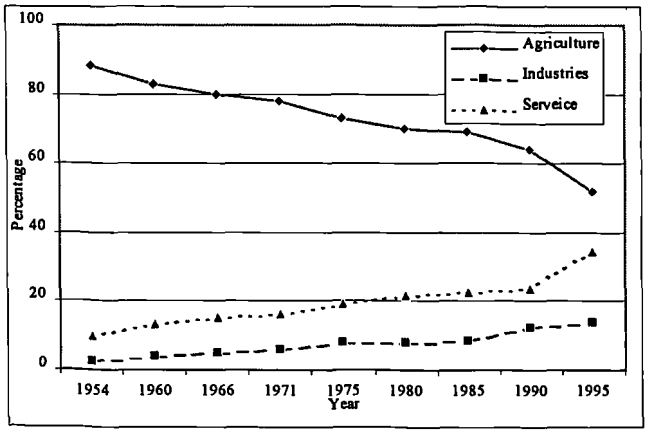
The income earned from tourism and the remittances of migrant workers overseas are the most important contributions of the service sector to foreign exchange earnings. This became very important as a means of bridging the trade deficit. Although the net income from tourism was negative before 1970, it increased rapidly thereafter. It could more than cover the total trade deficits because of lower oil prices in some years such as 1986 and 1987.

The contribution of workers' remittances at the start in the 1960s had been much less than that of tourism, but increased in importance from virtually zero in the early 1960s to over 17 percent of the trade deficit in most years since 1980 – 1981. This data on remittances, however, was underestimates the true flow of the funds because it is extracted from commercial banks only, and thus does not include remittances through other channels.

For a long time, the service sector has been able to absorb rural migrants either permanently or seasonally. As stated by Pasuk (1982), "available evidence indicates further that the service

sector is an important employer of rural migrant workers who face economic problems in their locality." This is also evidenced by other studies, such as Apichat et al (1995) and Parnwell (1993). Apichat at el (1995) state that the dry season population in the capital was 9% more than the wet season population. This implied an in-flow of one million seasonal migrants to Bangkok. Parnwell (1993) reported that 45% of migrants in Bangkok were from the Northeast, and 89% from rural areas. This is also implied in the statistics illustrated in Figure 2.6. The labour force of the service sector grew from about 10% of the total in 1951 (second to the agriculture sector) to 20% and 35% in 1975 and 1995, respectively. It should be noted that its growth rate was particularly rapid during 1985 – 1995 (about 50% over 10 year period), much faster than the rate between 1975 – 1985 (about 20% during that period).

Figure 2.6 Labour force by sector, 1954 – 1995



Source : EUI, 1984, Warr, 1993 and NSO, 1999

Pasuk and Samart (1993) explain that among the villagers of the Northeast and the North, temporary migration by young men and women in the off-farm season is now a regular event and a means of earning extra income for the family. A major contributing factor is the contraction of average farm sizes because of increasing population and because virgin land is no longer available at low cost. Small rice farmers in the Northeast (even with 20 rai of rice land) can no longer afford to rely on traditional paddy crops to sustain their families. Temporary migration to work for cash in urban areas is the most viable way out of this situation. Indeed, in the case of external migrant workers to the Middle East and other Asian countries, migrants from the Northeast also dominated the flow. The expansion of the service sector has provided a safety valve for absorbing underemployed and unemployed labour from rural areas.

2.4 The "Boom and Bust" of the 1990s

The "boom and bust" scenario (this phrase being used in the title of a bestselling book by Pasuk and Baker, 1998) is presented as a separate section. The downturn in the economy since July 1997 has profoundly influenced Thai society at large, and the re-orientation period of the economy is not yet over. As could be expected, the downturn of the economy has had a strong impact on the performance of the agricultural diversification policy. The fact that the time taken for this research has been longer than originally planned has unexpectedly provided the advantage of studying the effects of a radically different economic scenario (since 1997) on the farmers in the six study provinces.

Thai exports and the growth of the Thai economy were boosted by the recovery of the world economy since 1985. An economic boom did not occur only in Thailand during this period, but also in other countries in the region, including Indonesia, Malaysia, southern China, Vietnam and the Philippines (Pasuk and Baker, 1998). The main features of economic growth and change in the 1980s were foreign investments in industries, growing investment capability, a transformation of the economic structure, but with it also increasing inequality. The social dimension of economic growth in Southeast Asia has been analyzed and described by Rigg (1997, p: 91), who pointed out the rural-urban inequalities as distinct from regional inequalities.

2.4.1 Factors

Factors contributing to the economic crisis which culminated in the burst of the bubble economy in July 1997, had been building up over a number of years, since the early 1990s. They include the tremendous inflow of investment capital from Japan, Korea and Taiwan; the speculative investment of domestic and foreign capital; and the transformation of the economy, with rising inequalities.

- **Foreign investment**

Beginning in the late 1980s, many firms from Japan and the Tiger economies of Korea, Taiwan, Hong Kong and Singapore were looking for low-cost sites in Asia, because labour costs in their own countries had risen too high. In fact, many Japanese firms had first moved into the early industrializing Tigers economies after the first oil shock. But later, the Tigers were facing rising currencies and rising cost, in the same way as Japan had done ten or fifteen years before. Therefore, firms from these countries looked particularly to Malaysia, Indonesia and Thailand and a flow of export-oriented growth consequently spread into the region. Thailand was

particularly in favour because of the combination of relative political stability and a comparatively cheap and docile labour force. This made the flow of foreign investment into Thailand multiply ten times between 1985 and 1990. The total inflow of the last three years of the decade was greater than the total foreign investment in Thailand over the preceding thirty years before (Pasuk and Baker, 1998).

- **Local investment**

Although foreign investment was increased rapidly, the upsurge in local investment was even larger. Foreign investment accounted for only one-eighth of the increase in investment between 1985 and 1990. Thousands of local entrepreneurs cooperated with foreign firms to exploit the opportunities in exported-oriented industrialization. They seized opportunities in the rising home market. Some leveraged their expertise into other rising markets in China and in the Southeast Asian region and beyond (for example, Thai investment capital for production of motorcycles in China, or TV sets in Bangladesh).

- **Transformation in economic structure**

The key characteristics of the Thai economy changed in a very short period. In 1980, three-fifths of exports originated from agriculture, but by 1995, over four-fifths came form manufacturing. Over the same period, the urban population and the average per capita income both doubled. In these fifteen years from 1980 to 1995, the economy's main export emphasis moved from crops, to services, to labour-intensive manufacturing, and to medium-tech manufacturing. The GDP growth rate during this time was over 10 percent for a decade. *The Economist* projected that Thailand would become the world's eighth largest economy by 2020 (Pasuk and Baker, 1998).

- **Rising inequalities**

The benefits of the boom years were rather unequally distributed, both spatially and across the social strata. Being the major source of GDP growth, the factories were clustered in the Bangkok region, including the rapidly growing Eastern Seaboard area. The concentration of the industrial sector made businessmen rich and powerful and widened the gap between the rich and the poor, between Bangkok and the provinces, and between urban and rural areas. The counterpoint of urban triumph has been rural decline. Within little more than a decade, agriculture has been transformed from the country's main economic engine to a minor part (contributing just 10.5% to GDP in 1999). "The city population is swollen with in-migrants. The

land frontier has been closed. The urban economy stakes claims to the land, water and forests on which the countryside lives. The agrarian economy stagnates through neglect" (Pasuk and Baker, 1998).

2.4.2 The Bursting of the Bubble Economy

The big and sudden transformation of the economy was unexpected and came as a shock to almost the entire population. The real growth from 1986 – 1992 based on the growth of export industries promoted by domestic entrepreneurs and direct investments from East Asia stimulated high speculation from international merchant banks and investors. The financial markets were opened up in 1992 to welcome foreign investors. As a result, the inflows from 1993 on were so much larger than anything experienced before. Politicians and technocrats were mesmerized by the "bubble" and implicated in profit-taking. The local financial industry took in the foreign financial inflows and provided local firms with loans which seemed cheap, because – as it turned out in 1997 – the value of real property was not assessed carefully and grossly overrated. The people just threw money in the game instead of trading and investing cautiously. Yap and Sakchai (2000) have analyzed the origins of the financial crisis in the context of the speculative property values, the overheated construction boom and an inflated housing market in Bangkok, using the descriptive heading of "Once only the sky was the limit...".

The inflows of speculative capital threw the economy off balance. The government failed to control the inflows (for example, by stricter supervision of the speculative condominium developments in Bangkok) and failed to direct them towards productive uses. Local entrepreneurs, already under pressure from multinational competitors in export production, were deflected towards service industries, heavy industry projects, and overseas adventures. Too much was borrowed short and lent long. Too much was squandered on condos and housing. Some was plunged into over-ambitious and over-protected schemes. Some was sunk in asset pyramids built by the inflows themselves. All in all, Thailand's speculative bubble was the principal component of the economic crisis which dates from July 1997.

- **Decline of foreign industrial investment**

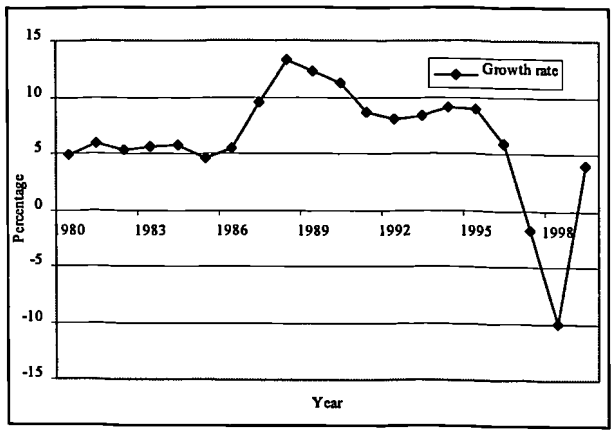
The other contributory factor to the crisis was the slow down in the growth rate in Thailand and the region which dates from the early 1990s. International factors also played a major role, just as they did in Thailand's boom. These comprised the economic recession in Japan and the strengthening of the EU and NAFTA, which pulled investments and exports gradually down.

The trend was reinforced by cheaper export platforms offered by China, India and Indochina (Pasuk, and Baker 1998).

Finally, export growth slumped from over 20 percent to zero in 1996, and the stock market lost two-thirds of its value within one year (1996/1997). All these factors made the economy shrink at frightening speed in 1997. The currency was battered by speculators into a sharp depreciation until the Baht's value had halved. The GDP growth rate fell from 9% in 1994 and 1995 to 5.9% in 1996, before hitting negative growth in 1997 (-1.8%) and 1998 (–10%), when the full effects of the crisis were reflected in the statistics (Figure 2.7).

The value of foreign debt in 1997 was higher than total GDP. The burst ripped out to the region and the world in late 1997 prompting even bigger IMF bailouts in Indonesia and Korea, and market panics in the Philippines and Malaysia. The crisis was both Thai and global.

Figure 2.7 GDP Growth rate of the Thai economy during 1980 – 1999



Sources: Warr, 1993, and NESDB (values for 1994-1999)

- **Impact of the bursting of the "bubble economy" on farmers**

Unlike the benefits of the boom which were rather unequally distributed, the impact of the burst was indiscriminate. Urban income and employment have shrunk. Millions of people were estimated to have lost their jobs, although this was less acute among farmers. The rural shock-absorber still works to some extent because the agricultural sector is so large and because the bonds of family and community remain. But the shock-absorber now works less than in the past. Agriculture has been systematically neglected. The farmers who feed the others have remained poor. Most rural families now rely heavily on the supplementary income from the non agricultural sector, including remittances. Family and community ties had been weakened by migration.

2.5 Development of the Agriculture Sector

Agriculture has long been an important sector of the national economic structure in Thailand. Dating back to Ayuthaya period (1350 – 1767), farmers were mainly self-sufficient, cultivating rice primarily for their needs and sugar cane was produced as a home industry. Internal trade at that time was limited by the restricted use of money. Although rice cultivating areas expanded significantly at the beginning of the Bangkok period, rice, mixed garden crops (vegetables and fruits) and sugar cane were grown primarily for local consumption. Thus government revenue around 1820 (King Rama III's reign) had no direct contribution from agriculture products (e.g. rice or sugar cane). It was mainly from forest products, primarily from the mountains in the north and partial contributions from tax on land used for farming (Takaya, 1987, Table 2.2).

Table 2.2 Government revenue (around 1820)

Source	Baht	%
Agricultural land	298,000	13.4
Forest products	775,000	34.8
Natural products	64,000	2.9
Others	1,089,000	48.9
Total	2,226,000	100.0

Note: The original source of this table does not offer any explanation for this large percentage of "other" revenues.

Source : Takaya, 1987

2.5.1 Importance of Agriculture for the National Economy

Agriculture gained an important economic role in the period just before King Rama IV's reign (approaching the mid 19th century). Rice was emerging as an export earner while sugar production shifted from being a home industry as small sugar factories and sugar cane plantations emerged (Phitsanes, 1977). By the year 1840, garden crops (vegetables and fruit) and sugar cane production had became a major source of government revenue in the agriculture sector (consisting of land tax and export monopoly) (Table 2.3). About 95% of total cultivated land was estimated as under rice cultivation in 1851 (Takaya, 1987).

Table 2.3 Government revenue (around 1840)

Source	Baht	%
1. Agricultural (total) (land tax and export monopoly)	9,305,000	62.2
• Rice	2,100,000	
• Gardens & plantation	6,045,000	
• Pepper	400,000	
• Others	760,000	
2. Forest products	800,000	5.3
3. Others	4,859,000	32.5
Total	14,964,000	100.0

Source : Takaya, 1987

2.5.2 Export Orientation in Agriculture

The change of rice cultivation from small-scale subsistence farming into plantation-type and export-oriented monoculture was in close relation with several key factors:-

- the free trade policy: the Bowring Treaty between Thailand and Britain (1855), which was quickly followed by similar treaties with the other western countries
- the drop in the world price of sugarcane together with greater demand for rice at that time
- the opening up of rice lands especially in the Chao Phraya Delta resulting from the King's canal excavation policy and
- the emergence of independent farmers following the abolition of corvee peasants.

This made rice the single most important crop in Thai agriculture, and the top ranking export item (Table 2.4). Rice lands were greatly expanded and many rice mills were developed at this time in response to the attractive market price. This is reflected in the fact that about 500, 000 rai had been cleared for cultivation in 1900, increasing to 1.5 million rai a few years later. However the boom ceased in 1930 due to the world depression (Takaya, 1987).

Table 2.4 Export value from Bangkok (1887)

Items	Value (Pounds)	%
Rice	1,918,783	73.8
Pepper	95,731	3.7
Others	584,387	22.5
Total	2,598,901	100

Source: Takaya, 1987, quoting statistics of the Foreign Office of Great Britain, 1887.

2.5.3 Growth of Agriculture in the Post-war Period

The annual growth rate of the agricultural sector has fluctuated during the post-war period. Nevertheless, Staatz and Eicher (1990) state that the growth rate of 4 –5 % for the agriculture sector as a whole is extraordinarily rapid. It expanded annually from 2% during the 1950s, 5.4% in the 1960s through the mid 1970s, while it slowed down to a rate of 4% from about 1975 to 1990. After that, it declined to only 2.5% in the period 1991 to 1996 (although the Thai government had planned to maintain its rate at 3.4%).

Within the agricultural sector, the crop subsector has been the core. Its share was about three-quarters of total agricultural value-added while the livestock subsector shared about half of the remainder during this period. While the share of crops and livestock subsectors was constant during this period, fisheries expanded rapidly, rising from less than 4 per cent in the early 1960s to 11 per cent in 1980, 14 per cent in 1990 and 20 per cent in 1995 due to the development of inland and coastal aquaculture. In contrast the share of forestry has steadily declined since 1960 (Ammar et al, 1993 and Pasuk and Baker, 1995).

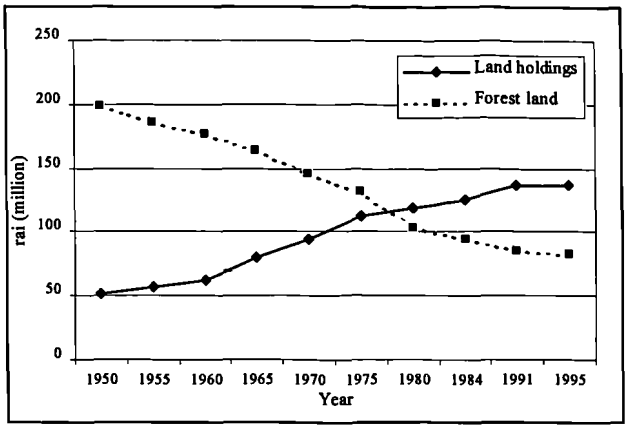
2.5.4 Expansion of Cash Crops vs Decline of Forest Cover

The declining forest cover, coincided with the expansion of cash crops responding to various factors, but especially world demand. As shown in Figure 2.8 and Table 2.5, forest land declined by 25% in the first twenty years of the post war period (1950 – 1970) and by a further 60% in the twenty years after that (1970 – 1991). This can be explained largely by the enormous expansion of agricultural land holdings. However, there is a considerable discrepancy in the sums of these two categories (land use and forest land) over time (Table 2.6). Although there is no remark regarding this discrepancy in Pasuk and Baker (1995), the explanation can be linked to OAE statistics that have been summarized in Table 2.6. The OAE figures show a relatively large area of "unclassified" land which differs from year to year.

Unclassified land is defined as the balance of the land area resulting from total land minus forest land and agricultural land holdings. This broad category includes very different components such as degraded forest reserves, swamp land, urban areas (sanitary districts and municipalities), railroads, highways, real estate, public areas and others. Given the fact that land in urban areas and under large-scale infrastructure does not account for more than a few per cent of total national land, the main "unclassified" land use explaining the discrepancy in the sums of agricultural land holding and forest land over time would be the degraded forest areas. This in itself can mean several different things, such as legally defined forest land which had actually been cultivated long before the Forest Reserve Law of 1963; degraded forest due to illegal

logging, followed by agricultural squatters growing cassava or maize as "pioneer crops"; and formerly forested land which is now in the process of being transformed into agricultural land.

Figure 2.8 Forest cover and land holdings, 1950-1995



Source: Pasuk and Baker, 1995 and OAE, 1999a

The expansion of agricultural land which has been replacing the forest is a characteristic of the "Frontier Model" outlined by Staatz and Eicher (1990), who pointed out that agricultural production in Thailand grew mainly because of the expansion of the area cultivated, and not because of increases in land productivity.

As mentioned above, the expansion of agriculture was stimulated by various factors. There was the strong factor of price signals (such as the world market demand for cassava) and the suitability of such crops to the poor soils and dry areas which are not suitable for paddy. These factors acted in conjunction with innovations in agricultural technology, efficiency of marketing and distribution systems which were facilitated by infrastructure development, especially road networks (EIU, 1984).

Table 2.5 Agricultural land holdings and forest land, 1950 – 1991 (million rai)

Land utilization	1950	1955	1960	1965	1970	1975	1980	1984	1988	1991
Agricultural land holdings	51.7	56.4	62.5	79.8	94.0	112.2	119.0	125.3	147.8	136.5
• Paddy	33.8	36.0	38.8	41.5	58.6	71.3	73.6	73.9	74.2	69.3
• Tree crops	4.8	5.2	5.8	9.6	9.1	10.4	11.1	12.1	19.6	20.1
• Other crops [a]	4.6	4.8	6.9	12.4	14.1	20.3	26.1	30.5	36.6	37.9
• Others [b]	8.5	10.5	11.0	16.3	12.3	10.1	8.1	8.8	17.5	9.2
Forest land	198.2	185.8	176.2	163.9	145.4	130.8	103.4	94.4	89.9	85.4
Sum	249.9	242.2	238.7	243.7	239.4	243.0	222.4	219.7	237.7	221.9

Source: Pasuk & Chris Baker, 1995, p. 53.

[a] Includes upland, field, orchard, and garden crops and
[b] Includes house sites, pasture, and idle land.

Table 2.6 Land utilization and type of land holding in Thailand, 1978 – 1995 (million rai)

Land utilization	1978	1980	1984	1988	1991	1995
Total land	320.7	320.7	320.7	320.7	320.7	320.7
• Agricultural land holding	116.4	119.0	125.3	131.8	133.0	132.5
• Housing areas	2.6	2.5	2.8	3.3	3.5	3.5
• Paddy	73.3	73.6	73.9	70.8	69.3	68.2
• Field crops	23.8	25.8	30.0	33.2	33.5	32.0
• Fruit tree & tree crops	10.4	11.1	12.1	17.8	20.3	22.3
• Vegetables & flowers	0.35	0.31	0.41	0.75	0.86	0.96
• Grass land	0.35	0.52	0.75	0.77	0.74	0.76
• Idle land	2.9	3.1	3.6	3.8	3.6	3.2
• Others	2.7	2.1	1.7	1.4	1.4	1.4
• Unclassified land	94.7	98.3	100.7	99.0	102.2	106.1
Forest land	109.5	103.4	94.7	89.9	85.4	82.2

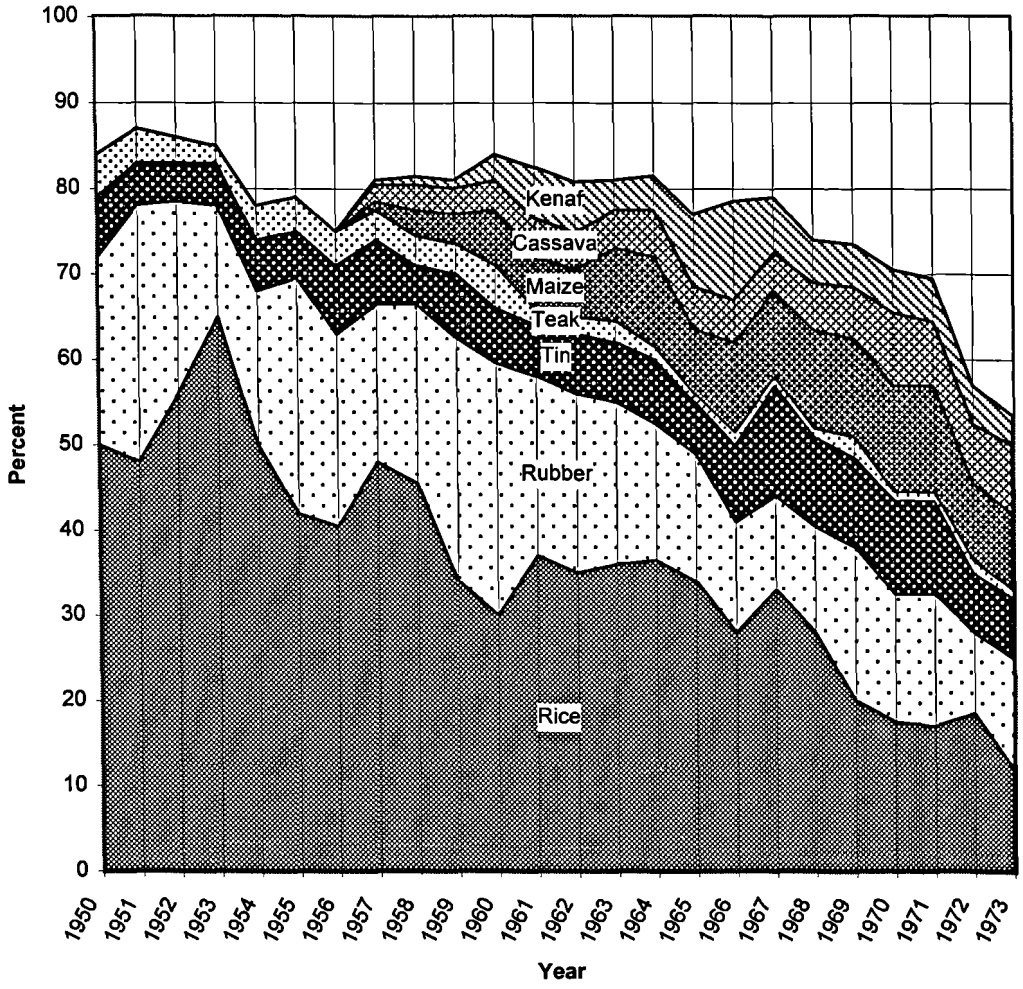
Source: OAE, 1987 and 1999a

2.5.5 Influence of Market Conditions on Cash Crops

The main alternative crops to rice in the 1950s and 1960s were in the categories of both new and revival. Maize, cassava and kenaf were new to the country at that time while the production of cotton, coconuts, sugar cane, fruit and vegetables have been revived. In fact some crops were developed earlier. Sugar cane was produced as a home industry from the Ayuthaya period and shifted to small sugar industries during the 1820s. It became a source of government revenue from 1840 (as shown in Table 2.2 above). Rubber became an important crop from the 1920s onwards. However teak, which had been the major primary commodity for export since the 19th century was curbed by the forest conservation policies introduced from the 1960s (ORSTOM, 1996). A total ban on hardwood logging was actually imposed as late as 1991.

Thailand's main export crops reflect the changing conditions on the world market as well as the response of the producers, i.e. the farmers and plantation owners. Figure 2.9 (based on Demaine, 1976) shows the contributions of key crops to total export volume over a period of nearly 25 years after World War II, which was one of the most important periods of growth and change in the agricultural sector of the country. Such changes are reflected in the figure: In 1950, four traditional primary products (rice, rubber, tin and teak) represented about 85% of the country's export value. In 1972, much greater volumes of the same set of four products contributed only about 33% to the much greater export value. Rice alone increased from 1.5 to 2.1 million tons during that time, but its share of export values decreased from 50 to only 12%. Teak export volumes decreased, not only its contribution to export value. The figure also shows the three most important "new" crops that expanded from the 1950s, maize, cassava and kenaf; they soon contributed 27% of total export value, but decreased to about 20% in 1973, although the production volumes (and the area planted) would have further increased. Figure 2.9 thus shows a succession of crops that are important in terms of export, while at the same time, the figure illustrates the relative loss in importance of the primary sector as a whole.

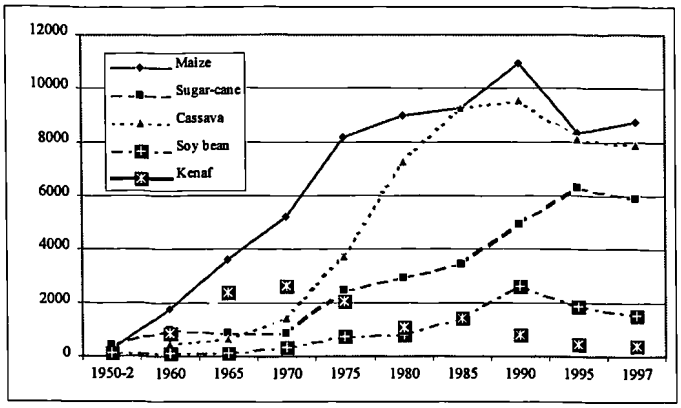
Figure 2.9: Contribution (in percent) to export value, 1950-1973: Four traditional products (rice, rubber, teak, tin) and three "new" crops (maize, cassava, kenaf)



Source:
This presentation is a composite recreated from two figures in Demaine (1976), Figure II-2 and II-6
Note: No data available for the three "new" crops until 1957. Values assumed to be close to zero.

The situation of the agricultural sector in Thailand is closely tied to world markets. The rise and fall in relative importance of individual crops has changed depending on market conditions. For example, from the 1970s onwards, the importance of kenaf has declined and the land has been used increasingly for cassava which has been growing in response to the demand in Europe as animal feed. The planting of cassava expanded at an exponential rate from 1970 through the mid 1980s (Figure 2.10) and its export value overtook rice for a short time. Similarly, pineapple cultivation spread rapidly on the upland areas, and Thailand became the world's second largest export of canned pineapple in 1977 (Pasuk & Baker, 1995). Other crops such as coffee, soybean, sugar cane, palm oil, fruit trees, vegetables and so on have recently gained importance, by taking advantage of world demand.

Figure 2.10 Cultivated areas of major cash crops, 1950–1997



Source: Pasuk & Baker, 1995 and OAE, 1999a

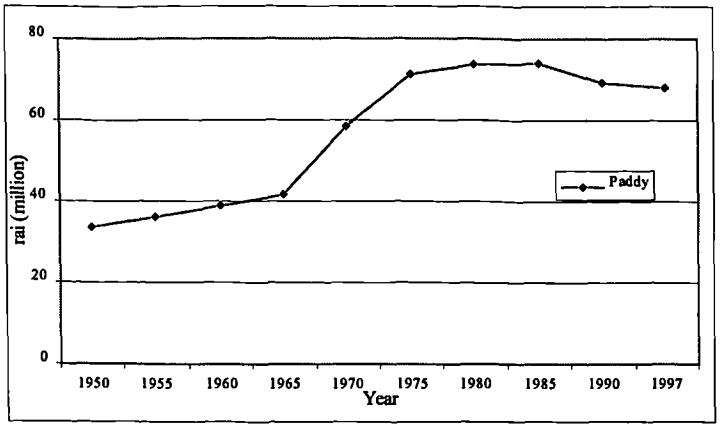
2.5.6 Effects of the Green Revolution on Rice Exports

As a result of IRRI's (International Rice Research Institute) and CIMMYT's (International Centre for Maize and Wheat Improvement) success in developing high-yielding dwarf varieties of rice and wheat, which were rapidly adopted in many areas in the Third World during the 1960s (Staatz and Eicher,1990), the Corn and Sorghum Research Centre of Thailand (in Nakorn Ratchasima Province) developed new varieties of maize, which is a cross-hybrid between a Thai and a Guatemalan strain. The most popular hybrid is the series of "Suwan" varieties. Well suited to moist, undulating land together with minimal labour requirements which can be handled by small scale farmers, maize proved to be a perfect crop for the upland frontier. The cultivated area of maize grew from 250,000 rai in 1950 to 4 million rai in 1965 and accelerated to reach 9 million rai in 1980 (Figure 2.10).

Clearing upland areas was mostly in relation to the expansion of upland crops which are suitable for this environment. In contrast to the large expansion of upland crops, especially maize during

1950 to 1965, the increase in rice areas was modest. The area had been increasing by about 23% during these fifteen years (or about 1.5% per annum; from 34 to 42 million rai). However, supported by the set up of research facilities under the IRRI umbrella, the cross-hybrid high-yield varieties of rice between Thai and IRRI strains (Koh Khor varieties) were developed, along with the required high-input technology. They were tested and adapted to Thai conditions since the mid-1960s and started to be disseminated in the late 1960s. The combination of new rice technology along with an expansion of irrigation facilities (details in section 5.1.2 - 5; Chapter V), especially in the central plain and lower north, permitted the expansion of double cropping of rice. As a result, cultivated areas of paddy were expanded considerably between 1965 and 1975 and reached their peak in the late 1970s (Figure 2.11). Increasing of rice cultivation however was in terms of both areas and production. Rice yield during 1950 to 1965 was about 197 – 243 kg/rai only, while it increased to 328 and 334 kg/rai in 1985 and 1990, respectively (Pasuk and Baker, 1995, p. 40 and OAE, 1999a). Pasuk and Baker (1995) also state that between 1960 and 1980, double cropping in the central region grew from almost nothing to 1.75 million rai. By 1980-90, some 3.5 million rai were under double cropping in the central region, equivalent to 22 per cent of the region's total cropped area under paddy. The total area under double cropping for the whole country was 5.2 million rai or (only) 8 per cent of the total paddy area.

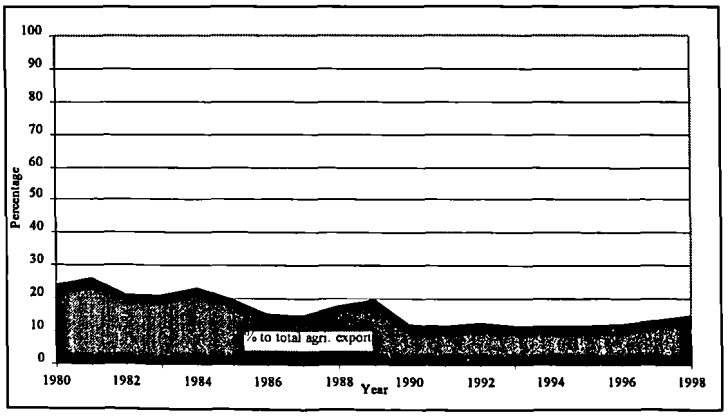
Figure 2.11 Areas under paddy cultivation, 1950 – 1997



Source: Pasuk & Baker, 1995 and OAE, 1999a

With these developments, rice reasserted itself as the number one crop with the highest farm value as well as export value throughout the 1980s. Rice export from Thailand represented 36% of total rice exports in the world in 1984. The peak export volume of the most recent period was in 1989 (Figure 2.12). Rice export contributed about 20% of total agricultural exports in the country. A significant portion of this was contributed by the highest productivity areas of the central plains region (Kasetsart University, ORSTOM, 1996).

Figure 2.12 Percentage of rice export to total agricultural export, 1960 – 1998



Source: Phattakhun, 1991 and OAE, 1999a

- **Decline of agro commodities in the 1980s**

After years of expanding income from exports, Thai agriculture was hit by the dynamics of the world market. Real export prices of rice fell by 36%, maize by 29%, rubber by 50% and sugar by 50% in the 1980s. The dependence on the EU market for cassava products hurt a great number of Thai farmers, especially in the Northeast region. They were also affected by the undercutting in maize and kenaf prices by other producers. Stiff competition from other rice producers such as USA, China and the fast development of low grade rice for export in Vietnam was also a price-depressing factor (Bello et al., 1998). The sharp drop of the price of rice in the late 1980s reduced the marginal return on rice production. Price fluctuations versus higher production costs of rice adversely affected farmers, especially those in the central plain where production costs of rice are higher than in other parts of the country.

2.5.7 Shift to Higher-Value Added Commodities

With traditional export crops under pressure, Thai technocrats and agribusiness interests began to move into the production of higher-value added agricultural commodities. These included shrimps, cut flowers, fresh vegetables, processed food, and broiler chickens. In all these types of higher-value agricultural products, Thailand was one of the pioneering countries, beginning in the early 1990s (Bello et al., 1998).

This trend appears to be continuing, although the support policies do not seem to be very coherent. The new *National Spatial Development Framework* which is being promoted by the National Economic and Social Development Board (NESDB) strongly emphasizes the opportunities for specialized agricultural production and "people prosperity" instead of "place prosperity" (NESDB, 1997b, especially pp. 103 – 156 and pp. 174 – 175).

"Build on local comparative advantage: Be realistic" is the key recommendation for further regional development with a strong agricultural base (Utis and Webster, 1999: p. 130). This was written as a commentary on the National Spatial Development Framework. These two authors, who are based at the NESDB, are in a good position to assess the development perspectives for the rural regions of "Outer Thailand", i.e. outside the urbanizing development corridors. That review of the specific potential of the private sector in balanced regional development provides twelve points on policy implications. They include:

- focus on medium-sized enterprises,
- support industrial clusters complementing the agricultural sector,
- promote subregional knowledge and service centres, and
- support rural land consolidation and farming system changes.

2.5.8 At the Crossroads to Industrialization: Competition for Water Resources

At the crossroads to industrialization, there were several developments in the late 1980s and early 1990s that affected agricultural development. As mentioned earlier in this chapter, industrialization had been expanding rapidly during this period and the boom was not matched by growth in the agricultural economy. This made the gap between incomes from urban factory work and incomes from agriculture increase further. Young men and women in rural areas, particularly from the Northeast, were encouraged to seek opportunities as workers in factories in Bangkok and its periphery. More workers migrated to Bangkok and settled permanently rather than engaging in seasonal migration. As noted by Akin Rabibhadana, "In a large number of villages in the Northeast, only old people and their daughters, and children are left in the villages. The entire middle generation has gone to work in Bangkok" (Bello et al., 1998: p. 161)

The boom was not only absorbing labour from the agriculture sector, it also encouraged the conversion of more and more prime agricultural land into land for either real estate development or speculation. In the late 1980s, widespread speculation was limited to areas within easy reach of urban centres, but later it spread deeper in to the hinterland. This kind of conversion meant the displacement of tenant farmers and agricultural workers. This also created difficulties for small-scale farmers in terms of buying land to expand their holdings and cultivation. With the spread of land speculation, small-scale farmers were in competition with capital-rich national and even international land buyers. There was a similar effect on agro-industrial enterprises, which were forced by high land price to relocate from agricultural areas closer to Bangkok to the upper central region and close to Nakorn Ratchasima in the lower Northeast region (Bello et al., 1998: p. 161).

The influence of industrialization on the agriculture sector was not restricted only to the farm resources of labour and land, but also had an impact on natural resources and especially water. It can be said that agriculture has now reached the "water ceiling", two decades after reaching the land frontier. This was reflected in the water shortages of the early 1990s when the availability of water in the two large dams, Bhumipol and Sirikit, supplying the central plain, dropped alarmingly (see Figure 1.1) as water demand in agriculture, industry, and in Bangkok rose. As described in section 1.3, this force the Royal Irrigation Department (RID) to change its priorities for allocating water for agriculture and other purposes. As a result, the Department of Agriculture launched its new diversification policy in 1993, encouraging farmers in the central plain to diversify by growing other crops which consumed less water than rice while giving higher incomes and meeting the low rice price policy implemented by the government.

2.6 Concluding Remarks

The structural changes in Thailand that have taken place over the past 100 – 150 years have been profound in their impact on transforming the economy and the society at large. Especially the last 20 – 30 years have transformed Thailand from an agriculture-based to an industry and services based economic system. Although agriculture has been transformed from a largely subsistence system to a predominantly market-production system, it still is by far the largest sector as far as the labour force is concerned, but its overall contribution to the national economy has decreased dramatically. This raises serious questions about agricultural productivity and the dependency of poor farmers on off-farm work for their livelihoods.

Chapter III Concepts of Agricultural Development and Their Reflection in Thailand's Agricultural Policies, 1961 - 2000

After reviewing the changing macro-economic situation in Chapter II, the focus in this chapter is narrowed down to national policy formulation and planning, with an emphasis on agricultural development planning in the framework of national development. The chapter open with a brief review of changes in planning direction and style since the First National Plan (which began in 1961) through to the current Eighth Plan (1997-2001).

As agricultural extension is one of the major policy instruments used to stimulate agricultural development, the agricultural extension system and changes in approach over time, are also analysed in this chapter. In addition, the crop diversification project in rice-farming areas in the Chao Praya River Basin is introduced at the end of this chapter. The project arose from the policy frame of agriculture development implemented by the Department of Agriculture Extension (DOAE) as part of its responsibility to improve farmers' living conditions.

Hence the three major subject areas discussed in the six sections of this chapter consist of:

(1) Agricultural development and planning, in line with the eight national development plans in Thailand since 1961, with an emphasis on the more recent changes in planning approach and style (sections 3.1 and 3.2).
(2) Agricultural extension as one of the most important policy instruments to promote agricultural development, with an emphasis on the changing approaches to farmers' participation (sections 3.3, 3.4 and 3.5).
(3) Finally, and as a much shorter section, there is an overview of the planning and implementation of the crop diversification project, an important element of the DOAE's programme (section 3.6).

The style of presentation in this chapter is a mix of (a) discussing concepts, based on a review of the essential literature on agricultural development and especially agricultural extension, and (b) a descriptive assessment of the development of agricultural planning in Thailand over the last 40 years. So this chapter prepares the conceptual ground for the empirical study of the diversification project and its reception by the farmers in six selected provinces.

3.1 Agricultural Development Planning

3.1.1 Importance of the Agricultural Sector

Although the review in the previous chapter has shown that agriculture development seems to be less significant for the country's macroeconomic performance now, the agriculture sector still employs the majority of the Thai people. As shown in Figure 2.6 (in Chapter II), by 1995, still about a half of the labour force was employed in agriculture. It must be stated though that this statistic hides the fact that a very significant portion of the incomes of agricultural households is from non-agricultural sources. Recent statistics show (Table 3.1) that the proportion of these sources to total household income varies from region to region. Comparing net farm cash income (not including home consumption of rice, vegetables, fruit and fish), the proportion of income from non-agricultural sources is as high as 80% of total household income in the North-Eastern region while it is nearly two thirds for the country as a whole. This is similar to the situation of other countries in Southeast Asia presented by Rigg (1997: pp. 155 - 183). He states that income from non-agricultural sources has been increasing over time in this region.

Table 3.1 Farm cash income and farm expense per farm by type and region, crop year 1995/96

items	Region				Average whole kingdom
	North-Eastern	Northern	Central Plain	Southern	
Cash farm income	31,191	57,655	124,384	104,202	61,818
Cash farm expense	19,386	31,561	68,812	37,099	32,006
Net farm cash income	11,808	26,094	55,572	67,103	29,812
(as % to total household income)	18.83%	40.30%	45.81%	53.50%	36.86%
Non farm cash income	50,891	38,662	65,737	58,324	51,059
(as % to total household income)	81.17%	59.70%	54.19%	46.50%	63.14%
Farm household net cash income	62,696	64,756	121,309	125,427	80,870
as % to total household income)	100.00%	100.00%	100.00%	100.00%	100.00%
Farm household cash expense	44,480	50,278	87,892	95,732	59,722
Cash saving	18,216	14,478	33,417	29,695	21,148

Source: OAE, 1999a.

Despite its declining contribution to total farm income, the agricultural sector still plays an important role in economic development by, for example, increasing the supply of food for domestic consumption, releasing labour for industrial employment, providing scope for

investments in agro-processing, and earning national foreign exchange. It also constitutes a very significant market. Even though the purchasing power of the individual farmer may be low, collectively farmers constitute a large population of producers, investors and consumers. Therefore, the potential for raising agricultural incomes must not be underestimated or neglected (Demaine, 1992 and DOAE, 1992).

3.1.2 Responsible Agencies

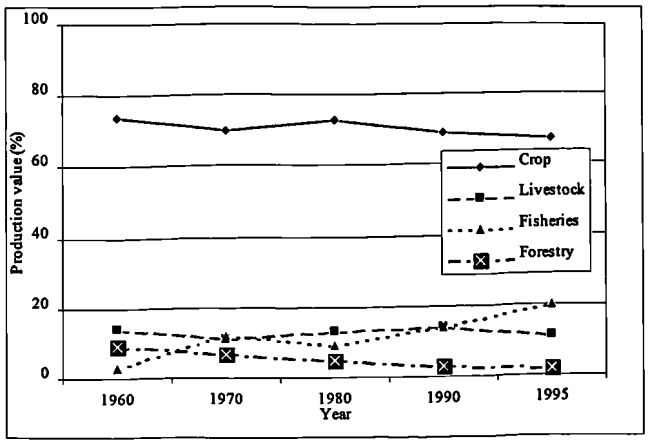
Responsibilities for agricultural development are shared by many organizations. Although the major responsibility is taken by the Ministry of Agriculture and Cooperatives, other departments in other ministries, such as the Department of Community Development, the Accelerated Rural Development Office, the Department of Non-Formal Education, and the National Security Command, and some of the private sector players have all taken part in some specific aspects that could be mutually supportive of the ultimate goal of a strong agriculture sector.

Within the Ministry of Agriculture and Cooperatives, there are various departments having responsibilities in specific areas such as:

1. Crop	:	Department of Agricultural Extension (DOAE)
2. Crop	:	Department of Agriculture (DOA)
3. Livestock	:	Department of Livestock Development (DLD)
4. Fisheries	:	Department of Fisheries (DOF)
5. Forest	:	Royal Forestry Department (RFD)
6. Soil	:	Land Development Department (LDD)
7. Water	:	Royal Irrigation Department (RID)

Research and development for livestock, fisheries, forestry, soil and water are carried out in the same department, but not for crops. Extension is implemented by the Department of Agricultural Extension (DOAE), while most research is carried out by the Department of Agriculture (DOA). This is due to the fact that cropping is the biggest branch of the agricultural sector. Approximately 70 – 75 percent of the total value of the agricultural sector is derived from crops (Figure 3.1). The percentage of farmers engaged in this sector is about 75 percent as well (Charoen, 1991 and DOAE, 1997a).

Figure 3.1 Share of agricultural production by sub-sector



Source: Charoen, 1991 and DOAE, 1997a

3.1.3 Agricultural Planning and the National Plans I-VII

The key feature of agricultural extension, dealing with people rather than with their soil, crops or animals, is reflected by the goal of the DOAE which is set as "increasing farm products with high quality and sufficient quantity to meet the market demand and to have a better standard of living in rural areas both economically and socially" (Charoen, 1991). This emphasis on dealing with the farmers distinguishes the agricultural extension services from other agricultural initiatives as carried out by the other agencies in the Ministry of Agriculture and Cooperatives. At the same time, the emphasis of this study is on how farmers have responded to the agricultural diversification policy. Therefore, the review of agricultural development planning examined in this study is limited to the formulation and implementation of plans by the DOAE, due to its direct responsibility for people in rural areas. The relationship of rural development to the wider development context as framed in the national development policies is summarised by Demaine (1992) who described the links as follows:

> "Since the framework of national development policies of a country has to be closely related to the prevailing socio-economic conditions, then the country has to pay particular attention to the needs and aspirations of those rural populations that constitute sizeable majorities. Therefore rural development policies with a focus on agricultural development have to emphasize on areas with high population densities, limited land resources, and a large percentage of farm households under the poverty line".

The DOAE is the only department in the Ministry of Agriculture and Cooperatives which has extension officers providing services down to the village level, covering the entire country (Thitirong, 1994). Thus the extension service is a key agency when it comes to examining how the policies and plans are implemented, and whether they are effective to the majority of the people or not.

Due to the close relationship of the agricultural sector to socio-economic conditions of the rural people and the national economy, agricultural development policy always follows the framework and guidelines of national planning. To examine this relationship, the first seven national plans of Thailand are briefly reviewed, covering a time period of 36 years, from 1961 to 1997.

- **The First and Second National Plans (1961 – 1966 and 1967 – 1971)**

Agricultural development planning during the first two national plans was focused on improving agricultural productivity in order to serve the goals of growth orientation and stabilization of the national economy. Initatives arising from the implementation of the first two national plans provided general support functions for agriculture development during this period. These were based on basic infrastructure development such as large-scale dams for irrigation systems and electricity generation, roads, schools and hospitals. The plans also included support for development of research, agricultural extension and experiments. The private sector was encouraged to play an increasing role in expanding commercial agriculture.

- **The Third and Fourth National Plans (1972 – 1981)**

A feature of the Third and Fourth plans compared to previous ones was the emphasis on social development as well as regional and provincial-level planning. More programmes were provided in the rural areas within the Third Plan. They were classified according to their sectoral basis; i.e. agricultural development, population control, education and public health. Within the Fourth Plan, local development planning was augmented by the important dimension of the "bottom-up" concept of planning to complement the already established "top-down" process. The former concept focused on rural areas with the objectives of (a) meeting the basic needs in the predominantly rainfed areas that had been ignored in the past, (b) providing adequate rural infrastructure and related productive inputs so that the people can help themselves and (c) enhancing further the capacity of local self-government to become more responsive and viable tools for integrated development in the rural areas (NESDB, 1977).

This was the first time that the government authorized every province, apart from the Bangkok Metropolitan Authority (which already had a tradition of planning for itself), to formulate five-year provincial plans, based on careful analyses of existing socio-economic conditions and problems identified according to basic needs of the people. It was also the first attempt by the government to allocate a decentralized budget to each Tambol Council all over the country (the "Tambol Development Fund" of the Kukrit Pramoj government, 1975).

Because the majority of the poor live in rural areas, food prices are a major determinant of the real income of the rural as well as the urban poor. Since the low productivity of agriculture was seen as a major cause of poverty, the change towards provincial-level planning should imply a much greater role for agriculture in development programmes. In practice, however, agricultural development plans during this period had given emphasis to speeding up agricultural production, improvement in the quality of agricultural products for export, and diversification. A wide range of commodities were promoted besides rice, maize, cassava and rubber. Since this resulted in great encroachment into the forest areas, the agricultural land reform programme was also established during this period. However, this development did not help to change the structure of income distribution. The Ministry of Agriculture and Cooperatives realized that income derived from the agricultural sector was much lower than that of other sectors (DOAE, 1992).

- **The Fifth National Plan (1982-1986)**

Development under the Fifth Plan emphasized the need for raising the standard of life of the rural population in poverty-stricken areas rather than increasing national product and income. Revised rural development policies and new approaches to solving rural problems were adopted at the national level, involving four "principal ministries". This new approach was designed to solve the problem of unequal distribution of development benefits resulting from the conventional method of rural development followed in the preceding plans. The ultimate goal of this approach was to help poor farmers so that they can eventually help themselves and their community (NESDB, 1982).

Under this plan, special emphasis was given to identifying major causes of poverty and more effective measures to cope with problems. More public resources were allocated to the poverty stricken areas so that poor people could better benefit from the development programmes. Three major rural development programmes were designed by the NESDB within this scope, pertaining to village food production, agricultural seed research, village extension worker training and village land improvement projects. Furthermore, 32 intensive rural development projects were initiated under the integrated administration of the principal ministries, namely, the Ministry of Agricultural and Cooperatives, Ministry of the Interior, Education and Ministry of Public Health. These projects were implemented in 12,562 villages in 288 districts of 38 provinces.

Following one of the three major programmes designed by NESDB, agricultural development within this national plan period gave importance to increasing production efficiency since the expansion of planted areas had already reached the land frontier (DOAE, 1992).

- **The Sixth National Plan (1987 – 1991)**

The strategies, targets and guidelines for development of the Sixth National Plan had been continued from the Fifth Plan, with necessary modifications in accordance with changing conditions. Rural development policies were therefore been geared toward the uplifting of overall national development by expanding the economy, developing society, improving the qualifications of the people, and distributing wealth and prosperity to the rural areas.

The approach of the rural development programme under this plan had two outstanding characteristics. Firstly, it concentrated on extending the national rural development programme throughout the country using the actual problems confronted by the rural population as criteria in determining target areas. Such criteria ranged from basic problems like poverty, poor health and ignorance to problems in production and marketing, which have strong impacts on income and employment generation. By using these criteria, the villages throughout the country were classified into three levels (backward, middle-level and progressive areas). Development efforts and resources of the government sector were concentrated on the backward and the middle-level areas only while the private sector was encouraged to play a leading role in the progressive areas. The second characteristic of this plan period was to encourage the private sector to participate in solving the problems of the people and their communities in order to reduce the government's role and activities wherever people were able to manage on their own (NESDB, 1987).

Within this framework, four specific development guidelines were formulated with a focus on creating opportunities for increasing production which would alleviate problems related to rural livelihood and occupation. They were

a) to develop the basic infrastructure for rural production and marketing;

b) to increase the efficiency and capacities of the public sector in solving rural problems;

c) to improve the system for administration of rural development in order to integrate and systematize the efforts of each agency; and

d) to strengthen the participation of the private sector and of people's organizations in rural development.

Following these guidelines, agricultural development focused on restructuring of agricultural production, increasing production efficiency, and promoting the application and transfer of technologies appropriate to specific areas. The differences of this agricultural development plan from the previous plans were aspects such as promotion of the cooperation of the private and public sector for agricultural development, improving the utilization and conservation of natural resources, as well as improving the administrative system of agricultural development. To achieve the last of these three objectives, more authority was given to the provincial agricultural offices. Different strategies were introduced in accordance with specific area situations. Spatial approaches were used for area analysis at this time. Although the government considered that the outcome was relatively successful, disparities in poverty and income between agricultural and non agricultural sectors remained significant problems (DOAE, 1992).

- **The Seventh National Plan (1992 - 1996)**

The emphasis during this period was placed on promoting a unified administrative system in rural development, entailing the decentralization of administrative authority and decision making to provincial agencies. The roles of provincial offices in initiating development programmes and projects were to be strengthened in response to the needs of local people and in line with government policies. A large proportion of budget was allocated to support the decentralization of administrative authority in rural development by setting up special funds for provinces to finance development projects in their territory. To support the policy promoting decentralization coupled with greater reliance on local-level participatory planning, people's organizations and the private sector were encouraged to participate in rural development programmes, in particular to improve the quality of life and security of income of the rural poor (NESDB, 1992).

The foci of the previous plan period continued during the Seventh Plan, i.e. restructuring of agricultural production, increasing production efficiency, promoting the application and transfer of technologies appropriate to specific areas, improving the utilization and conservation of natural resources and improving the administrative system of agricultural development. Following the national plan, restructuring of agricultural production was emphasized to be more in accordance with the potential of land resources and market demand. Hence local conditions such as land suitability, water resources and farmers' skills, were used as the main factors for adjusting agricultural systems towards commercially viable scales. This was linked with production, marketing, and factory-based agro-processing. Moreover, crop diversification was promoted to minimize risks caused by natural disasters and price fluctuations.

Intensive integrated farming consisting of crop, livestock, fisheries and forestry was promoted as a substitution for major cash crops which faced marketing problems. By this time, farmers were encouraged to make their own decisions through lessons learned from successful farmers. The government would provide services according to farmers' needs together with supporting farmers' capabilities. With the emphasis on development to meet local needs, the administrative systems were more decentralized in terms of planning and financing. Formulation of the plan for restructuring agricultural production at the provincial level was promoted so that it was oriented towards problem solving and farmers' needs. It was recommended, however, that plan formulation to be incorporated with the other agencies at the same level. (DOAE, 1992).

At this time, the Royal Thai Government was able to allocate a budget to alleviate the serious marketing problems of the major cash crops. Following the policy framework, restructuring agricultural production was designed "to adjust the structure of agricultural production of the cropping areas which face marketing problems such as rice, cassava, coffee and pepper to the other farm activities which give higher returns and are more suited to local conditions" (Chula Unisearch, 1996). Thus in practice this implied that farmers who wanted to diversify out of these four crops could ask for credit support to restructure their agricultural plans

A large budget, of over 65,000 million Baht, was allocated to support farmers' production plans in terms of credit with low interest rate during 1994 – 1996. This is the largest budget the government has ever provided to farmers in the form of credit. The programme continued in the period of 1997 – 1999 and with slight adjustments in 1999 - 2001, but not from the government budget. The Thai government asked the Bank of Agriculture and Agricultural Cooperatives to provide funds for the programme instead (Chula Unisearch, 1996, Thitirong, 1994 and OAE, 1997a).

3.1.4 Effects of the National Plans I-VII

The first seven national plans spanned a period of 36 years, during which the Thai economy and society was transformed. It is hardly possible to say whether the changes that occurred during those decades of transformation are actually the effects of the national plans, or the agricultural policies in particular. To some extent, however, government planning efforts led to intended effects, as well as a number of unwanted side effects. The following paragraphs outline these effects.

- **Strong economic growth**

With a strong emphasis on economic development in these three decades (1960s through to the mid 1990s), the Thai economy achieved high rate of economic growth (as shown in Figure 2.7 in Chapter II) with an expansion of about 7.8 percent per annum. The record shows that income per capita increased nearly 35 fold in this period (from 2,000 Baht in 1960 to 69,000 Baht in 1995, Figures 2.2 – 2.4 in Chapter II). Moreover, the poverty rate was only 13.7 percent in 1992, compared to the target of 20 percent for 1996 (NESDB, 1997). Until the end of 1996, the performance of the Thai economy was internationally recognized. Public investment in economic and social infrastructure (i.e. electricity, drinking water, the road network, schools, public health facilities) have contributed to better income, living conditions and quality of life of the Thai people.

- **Income disparities**

Despite the impressive rate of economic growth, most economic activities are concentrated in Bangkok and its periphery, the extended Bangkok Metropolitan Region, which includes the Eastern Seaboard area. The resulting income in the Bangkok Metropolitan area is much higher than in other regions. For example, Utis and Webster (1998) state that household incomes in rural areas of the poorest region, the Northeast are only 25% of these in Bangkok. A similar finding was also pointed out by Rigg (1997:p. 88), who estimated that the annual household income of the Bangkokian was the highest in the country and by 1995 was about 4 times higher than the income of the Northeasterner. Annex I.3.1 provides more details on income distribution for Thailand, in comparison with Indonesia, where the income distribution was slightly more equitable during 1980s. Although the discrepancy is smaller in urban areas, household incomes in the urban areas of this region are still only 69% of Bangkok's (Utis and Webster, 1998:p. 152).

When the comparison is made between the agricultural and non agricultural sectors, it is found that the income disparity between these two sectors has grown wider and wider since the implementation of the First National Plan in 1961 (Table 3.2). This has been caused by excessive emphasis on industrial development while neglecting agriculture and the deteriorating effects on natural resources due to improper use of the land (DOAE, 1997a).

Table 3.2 Comparison of incomes gained in the agricultural and non-agricultural sectors

Time period (by National Plan)	Proportion of income between agricultural and non-agricultural sectors
The Third Plan (1972-1976)	1:7.52
The Fourth Plan (1977-1981)	1:7.89
The Fifth Plan (1982-1986)	1:8.12
The Sixth Plan (1987-1991)	1:9.78
The Seventh Plan (1992-1996)	1:13.40

Source: DOAE, 1997a

As an illustration of the rising income inequalities, it was estimated that the gap between the rich and the poor during the four years from 1988 to 1992 was widening as follows: The total income of the top 20 percent of all households was increasing by 5 percent (from 54 to 59 percent) of GDP during this period, while the total income of the poorest 20 percent dropped by nearly 1 percent (from 4.6 to 3.9 percent) of GDP in the same period (NESDB, 1997a.).

Another illustration of income disparity and its change in the wake of the economic crisis of 1997 was reported recently (The Nation, 6 June 2000): In 1992, the top 20 percent of households earned 9.6 times more than the bottom 20 percent, but in 1998, the factor was still 8.4 times, i.e. only slightly lower than in 1992.

- **Negative impacts on social and environmental conditions**

In the course of preparing for the 8th Plan, NESDB described the negative side effects of rapid economic development as follows (summarized from NESDB, 1997a: pp 1-2) :

The development impact is not only on income disparity, but it also had a negative impact on people's behaviour as well as in the depletion of national resources and deteriorating environmental conditions. With the prevailing high competition for income and wealth, the people have embraced materialism. This made them increasingly lose the virtues of the past and resulted in lack of discipline, declining ethical and moral standard, greater self-interest and exploitation of others. These trends threaten the traditional values of Thai culture. Moreover, the social stresses caused by this competition have started to alter the patterns of sickness and mortality. In terms of depletion of natural resources and environment deterioration, problems are found in forest exploitation, soil erosion and poorer water quality in the rural areas while air and noise pollution are the major concerns in Bangkok and most other urban areas.

The negative impacts also have been recognized by many critics [1]. On the occasion of the joint national seminar where the completed Eighth Plan (1997 – 2001) was unveiled for the public debate in mid-March 1996, the prime minister at that time (Banharn Silpa-archa) stated that past experience of development had shown the economy-oriented agenda, which contributed to economic improvement to some extent. However it resulted in countless social ills that stood in the way of sustainable development (Thai Development Newsletter No.30, 1996).

3.1.5 The Eighth National Plan (1997 - 2001)

Since all these unwanted side effects of development have negative impacts on quality of life, they were addressed as serious issues in the Eighth National Plan. Trying to alleviate them, a long-term vision for Thai society, was set out in the Eighth Plan (Box 3.1), which would provide an enabling environment for the participation of all sectors in society in the formulation, programming and implementation of the national plan. The vision (which was relatively optimistic as it was formulated well before the economic crisis of 1997) also assumed public participation in the monitoring and evaluation of development efforts.

Box 3.1 Vision for Thai Society, associated with the Eighth Plan

This aims at enabling the country to be better prepared for sustainable development in the future and to become a fully developed country by the year 2020. It is envisaged that by that year the Thai economy will be the eighth largest in the world, with an average per capita income of not less than 300,000 Baht or about US$ 12,000 at 1993 constant prices. The proportion of people living below the poverty line will be reduced to less than five percent, resulting in a vastly improved quality of life for the majority of the Thai people.

Source: NESDB, 1997a

The plan also implies sustained development and a greater ability to respond to the needs of the majority of the people than has been the case in the past. The development concepts of this plan

[1] A number of critics and their arguments regarding negative impacts on social and environment conditions of the country were widely reported by the press. An article on the "Eighth Plan: National Plan endorsed but doubts linger", published in the Thai Development Newsletter No.30, (1996) featured the opinions of many people from various careers. They shared similar views about the development of the past seven plans, i.e. heavy emphasis on the economy, which contributed to economic improvements (at least before the crisis), but resulted in deteriorating social, natural and human resources. The critical observers, including the social critic Dr. Prawase Wasi and the Director of the Thailand development Research Institute (TDRI), Dr. Chalongpop Susangkarn, pointed out the need to empower the local communities to create their own social and economic development to suit their environments and to strive for sustainable development. However, many of these observers doubted how these can be written in the plan and put into practice when it comes to budget allocation. A related suggestion came from the former prime minister (Anand Panyarachun) who stressed the need to reduce the bloated bureaucracy and decentralize power to local governments as one of the steps to be taken to reform public administration.

shifted from a growth orientation to people-centred development. Economic development is viewed as a means to improve the well-being of the people rather than as the final objective of national development (i.e.: economic development is a means rather than an end).

Aiming at achieving the vision of an ideal Thai society, this is the first time that people from several occupations including the private sectors and NGOs from various regions were invited to participate in drafting the plan from its inception. This indicates a change in plan formulation, shifting from the former top-down approach initiated and directed by the public sector to wide the collaboration of other groups in the population.

- **The new strategies of the Eighth National Plan**

Since the majority of the people are expected to benefit from the national development plan, two new sets of key strategic approaches were initiated. They are (a) the establishment of good governance and (b) the reform of the development administration for effective translation of the plan into action. The former involves strengthening good relationships between the government and the people, through collaborative and participatory efforts of all parties in society, the provision of guarantees for freedom, human rights and equity, and the settlement of conflicts through peaceful means. (This definition would also include the concept of "civil society", which is, however, not explicitly mentioned in the Plan.) The latter requires a development system based on the area approach, the integration of functions and participation of all stakeholders, improvement of the efficiency of the public agencies at the central level, particularly in budget and personnel management, together with development of indicators that would be suitable for the monitoring and evaluation of holistic development. To be in line with these new approaches, the plan proposes a shift in the planning process from a compartmentalized to a more holistic approach right from the start rather than trying to integrate the separate sectors later (NESDB ,1997a).

- **Strengthening of community capacity**

With the particular emphasis on boosting the development potentials of the regions and rural areas in order to decrease social and economic disparities between the people in the metropolitan region and the rural areas, the development strategy of the Eighth Plan focuses on the reconciliation of urban and rural development through greatly increased people's participation, with the aim of making the development of urban and rural area mutually supportive. Communities are to be empowered to play a significant role in the development of

the economy, society, natural resources and environmental conservation, while economic activities and social services are to be more fairly distributed through the regions.

- **Bridging the gap between the rich and the poor**

Therefore, development concepts and guidelines for regions and rural areas need to be adjusted in order to promote greater self-reliance among local people and to give them equal rights and opportunities in social and economic development. This aims to narrow the gap between the rich and the poor, with the expectation that only 10 percent of the total population will be under the poverty line by the end of the Eighth Plan. In other words, employment opportunities have to be created for approximately eight million of the rural poor, to enable them to gain sufficient income and economic security. Then job creation should not be limited to the agricultural sector, but also include a wider range of non-agricultural employment options.

- **Need of maintaining a strong agricultural sector**

However, along with the importance of strengthening the production base in the long term, it is necessary to maintain the agricultural sector in a leading role in order to increase Thailand's potential as an agricultural commodity producer, feeding its own population and being a major exporter of agricultural products. The plan was prepared in response to changes in global markets which influenced changes in the country's production and trade structure. In particular the plan aimed to strengthen the linkages between the agricultural, manufacturing and service sectors.

Corresponding to the agricultural development plan, restructuring of agriculture production and agro-processing were highlighted as means of strengthening the production base in preparation for changes in world markets. This was further elaborated (NESDB, 1997a:pp. 109 – 110, DOAE, 1997a and OAE, 1997b) as follows:

- Adjusting the patterns of land use in the agricultural sector in order to diversify agricultural production, particularly focusing on rice cultivation, where other crops should be introduced. This will involve the provision of an adequate number of small and medium water resources in each area.
- Supporting agro industry and agro-processing by setting up agricultural zones for the production of raw materials to supply manufacturing industries. The location of the zones must be consistent with the true potential of local areas. Tax and financial

incentives in the form of soft loans should be granted for agro-processing plants located within the zones.

- **Promotion of sustainable agriculture**

To ensure that the demands of production and the need to conserve natural resources and environments are balanced, sustainable agriculture in the form of organic farming, integrated farm and agro-forestry were promoted as alternatives for restructuring. The plan targeted an expansion in sustainable agriculture to 25 million rai of land or about 20 percent of the total agricultural area (NESDB, 1997a.)

- **The changing role of government officials**

Restructuring however, is not only limited to the production system, it also covers the extension system. The government's role has to be changed from one where the extension officers give advice to their being coordinators for all parties concerned in order to support and facilitate the alternatives which are in accordance with farmers' needs, and areas and market potential. Farmers' capacities will be strengthened so that they are able to make their own decisions regarding farm plans. Government officials should be trained to understand the change of their roles from being mentors to facilitators. The private sector and NGOs will be encouraged to play a greater role in marketing, transfer of technology and management. This will be supported by the public sector (NESDB, 1997a, DOAE, 1997a and OAE, 1997b).

Under this plan certain policies continued from the previous plans, such as restructuring of agricultural production, increasing production efficiency, promotion of the application and transfer of technologies appropriate to specific areas, improving the utilization, and conservation of natural resources. Restructuring of agricultural production is set to achieve the expansion of crop diversification in response to the risks of marketing problems and natural disasters. Alternatives such as orchard, integrated farming, field crops and vegetables as substitutes for rice are recommended. These alternatives, however, have to be relevant to the local ecosystems.

- **Establishment of local institutions**

Although agricultural restructuring, especially with regard to administration, had started earlier, the implementation had not been clear. Therefore, the agricultural development plan during this period is aiming to be adjusted in accordance with the change in various aspects; i.e.

restructuring of the socio-economic structure, decentralization in decision making to all levels, and adjustment of the regulations to facilitate agricultural development. As a people-centre approach is the new paradigm for sustainable development under the Eighth Plan, farmers' institutions are encouraged to participate in formulating policies and guideline for agricultural development at both local and national levels. This will be incorporated with the local administration organizations (TAO) and the line agencies concerned.

3.2 Dynamic Change of National Policies since the Fourth Plan

National planning from 1961 to the present Eighth Plan has undergone significant changes, and the style of agricultural and rural development planning has equally changed considerably since the early beginnings in the 1960s. Such policy changes have regularly reflected influences from abroad, such as the emergence of strategic planning, but they have also made use of the "lessons learnt" from the experience of previous planning periods.

3.2.1 Policy Shifts from Economic to Social Aspects

With the implementation of successive national development plans over the last 40 years, it can be seen that the plans have been shifting gradually from physical development to social development. The emphasis in the first two plans was the development of major infrastructure projects which resulted in the remarkable economic growth rates of the 1960s (11.3 percent per year; DOAE, 1992).

Thailand began to shift towards social development from the period of the Third and Fourth National Plans (1972 – 1981). Besides implementing more social development programmes in rural areas during the Third Plan, the focus of decreasing income disparity between rural and urban sectors in the Fourth Plan is in line with the development goal of the "Growth with Equity" paradigm. This followed mainstream western development economics which began to give greater attention to employment and the distribution of real income in the early 1970s (Staatz and Eicher, 1990). The change in the name the former National Economic Development Board (NEDB) is indicative in this respect: It became the National Economic and Social Development Board (NESDB) in 1972.

3.2.2 Departure to Decentralized Planning

The concept of bottom-up planning which was introduced in the form of provincial five-year development plans during the Fourth National Plan did not go far during this period. In

describing the concept of *Karn Phatana* (development, Thai style), Demaine (1987) states that plans drawn up at the provincial level were very much an exercise on paper. He elaborated that efforts made under the Third and Fourth National Plans to deal with the problems of lagging areas continued in the traditional framework of "top-down" planning which had been inherited from the highly centralized monarchical system and which had little changed despite the advent of the constitutional monarchy in 1932. Under this system all decisions were made in Bangkok by the cabinet and the senior echelons of the civil service, with the provincial and district administrations playing a role only in the implementation of policies and projects passed down to them.

More experimental exercises in provincial planning took place during the Fifth National Plan (1982 – 1986) when the Thai Government began to focus much more specifically upon the problems of rural poverty. The "Rural Poverty Eradication Programme" (RPEP) thus became a major element in government development policy from 1981 onwards. This focuses on specific provinces and districts designated as poor on the basis of criteria drawn up by the National Economic and Social Development Board, the country's central planning agency. Within each district, local officials were expected to designate target villages, for implementing special programmes of the four main ministries with responsibilities for rural development. (Later on, the number of ministries participating in the national rural development system increased to six and eventually eight (Demaine, 1987).)

It is from this Rural Poverty Eradication Programme that the National Rural Development Programme (NRDP) has grown. Indeed, many of the projects under the NRDP are not new but inherited from the RPEP. However, the big differences are as follows:

- the administrative and planning framework in which the various projects are set is innovative;
- secondly, for the first time on a national basis the NRDP attempts to co-ordinate the work of the various government agencies involved in rural development in a single integrated framework;
- and thirdly, given the continuing focus on the problems of the poorer rural areas, there has been a consolidated attempt to build a national data base for properly identifying the problem areas (Demaine, 1987, p. 147).

3.2.3 Construction of a Single Integrated Framework for Rural Development

For the first time in Thailand, the NRDP constitutes a positive attempt to offer solutions to particular problems of particular areas through the involvement of the rural population and of

local officials in a process of decentralized planning and implementation. With a single integrated framework, the structure of the NRDP has been set up via hierarchy of committees ranging from the national down to the local scale. As a national level policy-making body, The National Rural Development Committee (NRDC) is chaired by the Prime Minister himself and comprises representatives of the main ministries. Below this, the NRDP has led to the creation of similar committees at provincial, district and tambol level. At each level, these committees are in charge of drawing up an annual development plan for their integrated and co-ordinated activities (Demaine, 1987).

- **No horizontal linkages but strongly vertical linkages**

One of the advantages of the decentralized framework of planning is that in theory co-ordination of the work of the line agencies involved in rural development becomes more practical. Unfortunately, in practice it has proved difficult to bring about such co-ordination. This is because the policy frameworks of each ministry are passed down from the national level to the provincial level individually (Demaine, 1987).

These frameworks however are in the form of a "menu", indicating the sorts of available projects decided by the policy and planning staffs of individual ministries with the budget allocation still being controlled in Bangkok. The provincial authorities of each ministry then selects the project list from the "menu" that seems to be appropriate to tackle the rural development problems in their provinces even though some are not suitable for the specific needs of their provinces. These frameworks are then compiled as provincial policy framework and passed down to the district level where the first choice of projects for the specific area is made. The requested projects are reviewed from the provincial policy framework to determine which of the projects listed are appropriate to the needs of the area. Certain projects may be eliminated from the list before this is passed down to the tambol level, the smallest unit of local administration which consists of groups of 10-15 villages on average (Demaine, 1987).

With this procedure, the tambol development committees just choose the relevant projects from the "menus" which are supplied by the participating ministries and amended by the district and provincial development committees. It is the job of the tambol development committees with the help of advisory groups to reconcile the needs of each community with the available projects. These are then listed and priorities set where there are several villages seeking projects of the same kind. The complete list is passed upwards through the administration hierarchy for reconsideration. After the passage of the provincial plans to the central ministerial level, the administrative system of the NRDP essentially follows the normal process within the Thai

bureaucracy. The departments examine the various proposals made by the provinces and consolidate these into a workplan for a year. The budget is then requested via individual ministries. After approval, the final operation plan is passed down from the ministries to the provincial authorities for implementation (Demaine, 1987).

- **Semi–decentralized planning**

Although the implementation shows that Thailand is on the way to decentralized planning, Demaine (1987) argues that it is not by means a fully decentralized system. Although there was a significant break with tradition in its attempt to try and give the local rural population a choice of the development projects to be implemented at local level and in its attempt to co-ordinate the activities of line agencies in a specific spatial framework including the tambol, district and, in particular, the provincial levels, the policy framework in terms of a fixed list of available projects and budget allocation was still being controlled from Bangkok. He states that the NRDP is a hybrid system of rural development planning, incorporating some elements of decentralized planning, but set within the project compilation of a centralized policy framework and continuing centralized control over the budget allocations. That means that the various projects are inconsistent with many of the real needs at the village level. Moreover, the procedure does not allow the district and provincial planners/officers to undertake any systematic planning exercise. Their main function is narrow in scope -- putting together or collecting the sectoral programmes/projects of line agencies into a compilation as so-called district and provincial plans.

Hence it appears that the line agencies' personnel still take decisions on the basis of a sectoral plan framework and on project priorities in isolation and that the provincial planning secretariat is ill-equipped to fulfil the role expected of it despite the existence of district and provincial development committees. It is difficult for the NRDP to create horizontal co-ordination at several levels of the bureaucracy where none has existed before. Because the typical Thai bureaucracy is organized in a highly vertical framework, individual ministries and departments have been carrying out their separate tasks with little relation to one another and indeed seeking to maximize their areas of responsibility with little attempt to co-ordinate. Within a vertical organizational environment, decisions are normally taken at the highest level (Demaine, 1987).

Thus this makes it difficult for lower-level officers to take on new responsibilities due to a fear of incurring the disapproval of their seniors. One can say that the continued commitment to their line agencies via the strong vertical linkages of the existing administrative system, rather than to

whatever decentralized planning authority is established on an areal basis, clearly affects the effectiveness of the decentralized planning framework (Demaine, 1987).

- **People's participation not facilitated by decentralization**

The emphasis on decentralized planning and administration of the rural development programme begun during the Fifth Plan has been continued during later development plans. Their implementation was expanded nationwide with modifications in accordance with the local situation. The number of ministries involved in the rural development system has increased, over time, to eight. Using actual problems confronted by the rural population as a criterion by classifying the poverty rank of each community, the Sixth Plan at least aimed to tackle backwardness in the regions which had hitherto benefited little from rapid economic growth.

The Seventh Plan (1992-1996) emphasized the promotion of a unified administration system, entailing the decentralization (or rather de-concentration) of administrative authority and decision making to provincial agencies. Along with this development, there are now (since the early 1990s) a number of horizontally integrated plans at the provincial level designed to respond to the needs of local people. They are:

1. *The strategic plan* which is a multi-sectoral and long-term plan (10-15 years), mainly formulated by the secretariat of the provincial office, aiming at all line agencies and state enterprises that are supposed to refer to the plan.
2. *The investment plan*, formulated by a consultant company hired by the provincial authority. This is a useful framework in bringing public and private sectors together in identifying opportunities and the public sector could support private sector investment through infrastructure development.
3. *The environmental plan*, also formulated by a consultant company hired by the provincial authority, guided by the 1992 Environment Act, which puts an emphasis on solid waste, wastewater, pollution and associated research and improvements.

Implementing these plans, however, has not been easy or smooth, as pointed out by the "Core Planning Team", comprised of senior planning officials for national resources and environmental management in Chanthaburi Province who analyzed the system in the context of an innovative Natural Resources and Environmental Management pilot project in this province (Demaine and Siriluck, 1996). The main points of the critical review were:

- There was still not enough integration among the units and line agencies in the province.
- Most of the plans lacked adequate spatial analysis, and failed to identify the different problems which needed priority attention in different areas.

- The depth of problem analysis under the plans was limited.

Similar to the encouragement of people's organizations and the participation of the private sector in rural development programme in the Seventh Plan, there is a strong emphasis on decentralized forms of planning and development in the Eighth Plan, in particular through strengthening local capacity especially at the grass roots level. Although the establishment of Tambol Councils (in the 1980s), and later on, their transformation into Tambol Administrative Organizations (after the 1994 Local Government Law) may help to strengthen the planning process at this level, the planning system has not changed much. Kammeier (1999) states that the main weakness of the planning process is that it is still too much dependent on the (deconcentrated) territorial civil service staff at the provincial level, as their main loyalty is mainly vertically oriented (towards their departments and ministries). Moreover, as long as the development budget has not been decentralized, attempt to shift from a compartmentalized to a more holistic approach will not work either. Undoubtedly there are examples of people's participation being facilitated by decentralization, but this has not been achieved on a broad front.

3.2.4 Functions of Agriculture Development Planning in Rural Development

The close relationship between National Plans and agricultural development plans has been obvious from the first two plans. Implementation of basic infrastructure development during this period in the form of large dams for irrigation, roads and so on had a significant impact on increasing agricultural productivity.

With the departure to decentralized planning in the Fifth Plan, agriculture development played an important role in a single integrated framework for rural development. As one of the major ministries responsible, the Ministry of Agriculture and Co-operatives produced numerous documents detailing the separate projects designed by the large number of individual departments and offices of this ministry. These projects were passed down the vertical links from the top to be implemented by the officers of the same departments at the local level.

A form of decentralized planning of agricultural development at the provincial level had begun to respond more directly to the problems and needs of farmers in the Sixth and Seventh Plans. In practice the planning process for agricultural development has not been fully decentralized, in the same way as the national plan. As stated earlier, the reasons for this continuing weakness in the system are the deeply ingrained patterns of the traditional Thai bureaucracy (Demaine,

1987), and the dependency on the – deconcentrated – territorial civil service staff at the provincial level (Kammeier, 1999).

In the framework of a people-centred approach in the Eighth Plan farmers' institutions are incorporated within the Tambol Administrative Organization. It is hoped that in this set-up the new strategy will allow farmers to express their needs and make their own decisions regarding farm plans, rather than picking projects from a menu. It is also hoped that the officers' role will change, towards supporting alternatives which are in accordance with farmers' needs, and area and market potential.

3.3 Concepts of Agricultural Extension and Their Application in Thailand

As one of the most important policy instruments used to stimulate agricultural development (van den Ban and Hawkins, 1996), agricultural extension has been in evidence in some form for a long time. Organized extension systems emerged at the beginning of the twentieth century as a central mechanism in the agricultural development process. Such development took place initially in the industrialized developed countries and later in developing countries. After the Second World War, many developing countries established extension systems with the financial assistance of the U.S.A. and the World Bank, following the model suggested by them. However, over the years, extension systems have been undergoing modifications in order to meet local needs and priorities. Such modifications can be seen in terms of extension approaches, organizational set-up, extension agent-to-farmer ratios, the ratio of field staff to subject matter specialists, concentration on women farmers, strengthening the research-extension linkages and demand for highly qualified extension agents to perform quality extension work (Jalil, 1994).

3.3.1 Agricultural Extension Systems in Asian countries

Nowadays, almost every country in the Asia and Pacific Region, has at least one formally organized agricultural extension system. In many, there are more than one. In these countries, the agricultural extension system has the same basic function or purpose, that is to provide "a service or a system, which assists farm people, through educational procedures, in improving farming methods and techniques, increasing production efficiency and income, bettering their levels of living, and lifting the social and educational standard of rural life" (Jalil, 1994)

Agricultural extension organizations, however, have been viewed differently by countries in this Region due to different needs and conditions. In most countries, the Ministry of Agriculture is responsible for the development of the country's agricultural extension system, its role being

played either by a full-fledged extension department or division, within the Ministry. An extension division or section is also found in departments or ministries of livestock, fisheries, forestry, irrigation, or rural development, where these sectors are not part of, and thus treated separately, from agriculture (Jalil, 1994).

Extension activities are also carried out in special projects of non-government and private organizations. Some of these organizations have a primary function, they require extension activities for their success, such as in the case of a rubber producers association, cotton development board, watershed management project, rural credit association or integrated rural/agricultural development projects (Jalil, 1994).

Beyond the line agencies of the government, agricultural extension activities are also carried out by banking/credit institutions, farm input suppliers, private voluntary organizations, religious groups, and private or public firms which purchase farmers' output. (Jalil, 1994)

3.3.2 Agricultural Extension Services in Thailand

Separate agricultural extension programmes in Thailand have been established for a long time within the various departments under the Ministry of Agriculture; i.e. the Rice Department (seed multiplication and research), Field Crops Department and Horticulture Department (vegetables and fruit trees). With the purpose of gathering all agricultural extension activities in one organization, the DOAE as the single extension agency was established as late as in 1967. The goal was – and remains to increase the output of farm products with high quality and sufficient quantity to meet market demand and to support a better standard of living in rural areas both economically and socially. To meet this objective, the Department is expected to disseminate technical know-how or modern agricultural knowledge to farmers more efficiently than any other institution. Simultaneously, the DOAE assists them in tackling their field problems to improve farm productivity and to upgrade the rural standard of living. The department has served over 30 years by means of coordinating with other agencies and farmers to transfer agricultural knowledge and appropriate technology from research institutes and other technology sources to farm families (Charoen, 1991).

3.4 Stages of Agricultural Extension

The DOAE, has adapted its extension methodology to new challenges. Its operating improvements can be separated into three main stages of development (Charoen, 1991 and Thitirong, 1994) as follows:

During *the first period* (1967 – 1975), with limited personnel and budgets, the extension activities were carried out without any systematic and distinct extension approach. Extension work was mainly carried out with farmers' institutions, including farmers and youth groups. The ratio of extension agents to farm families during this period was 1:4,000 (Thitirong, 1994).

Technology transfer at this stage was in the form of large demonstration plots, production contests, exhibitions and annual provincial contests. This approach was set in the framework of increasing and speeding up agricultural productivity as laid out in the Second and Third National Plans. However, as pointed out by Charoen (1991), it proved difficult for extension agents to transfer technical know-how, information and agricultural data to individual farmers thoroughly and efficiently with limited resources to hand.

The second period (1975 – 1977) followed government policy in agriculture set out in the Fourth Plan by emphasizing rice production for export and local consumption and raising the standard of living of farm families by promoting efficient land utilization. Irrigation-system development and expansion was also important objectives during this period. Thitirong (1994) states that by this time, an appropriate extension method of mass media through radio broadcasting and leaflet distribution via farmers and youth groups was implemented, aimed at transferring technical know-how to promote rice productivity especially in irrigated areas for export.

In *the third period* (1977 – 1990), the DOAE adopted the Training and Visit System (T & V system) as its extension approach and expanded it nationwide in 1982. Many more staff were recruited, especially agricultural extension officials at the district and tambol levels. The objectives were set as:

(a) To increase to an adequate level the number of extension personnel in proportion to the number of farmers at the tambol level.

(b) To improve the administrative system of the DOAE by dividing its functions into executive tasks and coordination tasks from department level down to tambol level.

(c) To improve extension system and methodology by emphasizing continuous training and a scheduled visiting system. Through these approaches, the field staffs would be able to perform their role with efficiency. Demonstration and test plots were made part of technology transfer to farmers.

(d) To improve the linkages between agricultural research and extension systems. This would enable extension agents involved to disseminate their knowledge and to pick up

problems from the farmers side. With the tambol-level agricultural extension officers (Kaset Tambol) now in place, this facilitated two-way communication.

(e) To provide sufficient facilities such as vehicles, audio-visual aids, housing and equipment as appropriate to encourage all field staff's performance.

(f) To establish a system for supervising and evaluating projects for measuring implementation outputs step by step.

3.4.1 Transfer of Technology

As described above, the extension approach in Thailand mainly takes the form of transferring agricultural knowledge and technology from the researchers via extension officers to farmers. The big difference of the third period (1977 – 1990s) from the first two periods (1967 – 1977) is the adoption of the T&V system. The T&V system is one of the most significant extension approaches adopted the last decades, and it has diffused rapidly in South and South East Asia supported by the investment of billions dollars by the World Bank since 1975. The T&V system has been shown to increase the effectiveness of agricultural extension in irrigated areas in a number of countries in the region. So T&V was adopted in Thailand along with the promotion of farm production, particularly in irrigated areas by mean of irrigation-system development. As mentioned earlier, the DOAE started to give extension support in irrigated areas including appropriate extension methods to this programme by the second period extension in 1975 while the T&V system was first adopted in 1977 and expanded nationwide in 1982 (van den Ban and Hawkins, 1996; Charoen, 1991, and Thitirong, 1994).

3.4.2 Advantages of the T&V Approach

The advantage of the T&V system is that it was the first time that the Department had extension officers working down at the local level. So, with its presence at tambol level, the ratio of extension officers to farm families was about 1:1,000, i.e. a great improvement over the ratio of 1:4,000 of the first and second period (Thitirong, 1994).

The extension system and methodology focused on the continuous training and scheduled visiting system to improve the linkage between agricultural research and extension systems. The T&V system, tries to achieve changes in production technologies used by the majority of farmers through assistance from well trained extension officers who have close links with agricultural research. Therefore the extension officers at the local level receive regular training from Subject-Matter Specialists (SMSs) who work at the Technical Division in the DOAE. The extension officers have to learn:

- to identify relevant production technology needed by farmers;
- diagnostic skills; and
- appropriate communication techniques.

The SMSs working at the national level take the research results from the Department of Agriculture (DOA) and academic institutes and examine them with suggestions for their applicability in the provinces before passing them on to the field SMSs. These field SMSs who work at the regional and provincial level then give training to the tambol extension officers. Since both DOA and DOAE are dealing with the crops, the research areas of the DOA lay the stress on seed multiplication, on-farm trials, multi-location trials, and demonstration plots, while the cooperation with the academic institutes is at the level of technical service and information dissemination. The regular training aims to enhance the tambol extension officers' technical skills (Thitirong, 1994).

However, as the ratio of officers to farm families is 1:1,000, it is physically impossible for extension officers to meet all their farmers regularly. Hence, smaller numbers of contact farmers are selected who are visited every two weeks on a fixed day. They then hope the modern technical know-how will be passed on to all farmers through regular communication with the smaller number of selected contact farmers (Charoen, 1991, Pretty, 1995, van den Ban and Hawkins, 1996).

3.4.3 Disadvantages of the Contact Farmers under the T&V Approach

As the contact farmers are usually selected on the basis of literacy, wealth, readiness to change and "progressiveness", this often sets them apart from the rest of the community. Therefore, the secondary transfer of technical messages, from contact farmers to community, has been much less successful than predicted and adoption rates are commonly very low among non contact farmers. A number of case studies carried out in various countries, (e.g. Somalia, Nepal, India and Pakistan), showed that T&V is now widely considered as ineffective (Antholllt, 1992). The nature of this ineffectiveness however can be classified into two categories :

- *Productivity:* no impact on agricultural productivity, especially in dry land (e.g. in India, West Bengal, Nepal, Indonesia and Pakistan)
- *Farmers:* (a) the contact farm model did not work. Its ratio to non-contact farmers was much lower than expected. Furthermore, there were unexpectedly successful non-contact farmers with much higher cereal yields than contact farmers (40 – 45% higher, in the case of Somalia). (b) Very little relation between contact and non contact farmers; the latter

preferred to consult a wide range of alternative information sources (e.g. in the cases of India and Bangladesh).

The unsatisfactory functioning of the contact farmers systems has also been pointed out by others, and the model is not recommended by the World Bank anymore (van den Ban and Hawkins, 1996). A World Bank Discussion paper stated :

> "The training and visit approach of agricultural extension is strong on procedures: regular and controllable visits of farmers, monthly sessions for staff, and periodic meetings between research and extension, for instance. However, this focus has sometimes meant that staff would strictly follow farm visit schedules, but with little to tell the farmers" (Zijp, 1994).

Another critical study noted that :

> "The T&V system, emphasizes visits on fixed days to a relatively small number of contact farmers per agent. While in theory T&V urges that these farmers represent a cross-section of their community, the methodology as such does not ensure a spread of attention. It probably over-represents active, commercially oriented farmers" (Moris, 1991).

Problems regarding inefficiency of contact farmers also occurred in Thailand. As pointed out by Charoen (1991), there was a gap between the officers and other non-contact farmers in case the contact farmers did not perform their duties. Charoen (1991) also raised the point that the disadvantage of the T&V system was also its centralized planning style, focusing on increasing productivities while ignoring farmers' livelihood. These matters seem to have been discussed worldwide in the last decade. For instance, a team from the University of Berlin working towards developing a participatory extension approach for Siavonga District in Zambia, Africa noted "the T&V approach is basically a top-down approach, including 'transfer of technology' philosophy from research via extension to the farmers. Its contact farmer model (two-steps flow of information) may also not be universally valid" (Nagel, et al., 1992). Similar arguments can be found in a number of publications such as Pretty (1995), Moris (1991), Ellis, (1995).

The difficulties of the T&V system noted by van den Ban and Hawkins (1996) in their World Bank study, are exactly the same as the disadvantage of the T&V system implemented in Thailand, as pointed out earlier. "In reality the tradition of a top-down extension approach is often continued in the T&V system and the service of solving farmers' field problems is not achieved" (van den Ban and Hawkins, 1996, p.261).

3.4.4 Top-Down Approaches and Modern Technology

The top down extension approach of the T&V system can be interpreted as taking the "modern technology know-how" to the farmers. It is simply transferring results from agricultural research

experiments that had been conducted under controlled conditions on research stations with heavy emphasis on increasing agricultural productivity to the farmers. These technologies are assumed to be universal and transferred to farmers without adaptation. It was widely believed by scientists during the green revolution period (from the 1960s onwards) that they would be able to transform agricultural systems without affecting (or taking notice of) social systems (Palmer, 1977 and Dahlberg, 1990). It was simply assumed that new technologies could be introduced independently from the social context.

Impact of modern agriculture has been remarkable. Pretty (1995) stated that about half of the rice, wheat and maize areas in Third World countries are planted to modern varieties, and fertilizer and pesticide consumption has grown rapidly. Some 2.3 - 2.6 billion people in the developing countries are supported by agricultural systems characterized by modern technologies associated with the green revolution: new, high-yielding cereal varieties which, when cultivated with modern fertilizers and pesticides, transformed many agricultural systems. These systems are, however normally applied to resource-rich situations where there are good soils and reliable water, and which are close to roads, markets and input supplies.

3.4.5 Spread of Innovations

With these characteristics, extension has long been grounded in the "diffusion" model of agricultural development, through which technologies are passed from research scientist via extension officer to farmers (Rogers, 1962). Many government extension officers are expected by their bosses to convince farmers that they should adopt "modern" agricultural practices. The small scale farmers are often assumed to be poor decision makers who require outside assistance. Farmers who choose not to adopt are often labelled by extensionist as 'laggards' with attitudinal barriers (Russel et al., 1989).

Research on diffusion or spread of innovations was booming in developing countries during the 1960s, because the ministries of agriculture believed that large numbers of farmers should use the results of scientific agriculture in order to prevent famine. Farmers' conservatism was offered, for many years, as the main reason for their failure to adopt new technologies. However, research has shown this view often to be incorrect. There are many limitations facing farmers regarding the adoption of these technologies (van den Ban and Hawkins, 1996).

3.4.6 Limitations of Innovation Adoption

Pretty (1995) states that most farmers reject a technology because it does not fit their needs or is too risky. They have differing conditions, needs, values and constraints to those of researchers. So they may not see those technologies are suitable and beneficial for their livelihood. At the same time, they may have limited resources to adopt and manage innovations. Therefore farmers have sometimes judged the best products of research to be inappropriate, and rejected them (Pretty, 1995). These points are similar to those of van den Ban's and Hawkins who state that there are many situations in which all farmers cannot be recommended to adopt an innovation because this decision depends on their resources and personal values [2] (van den Ban and Hawkins, 1996, p.97).

However, in irrigated areas most farmers have a relatively uniform agro-ecological and socio-economic situation. In this case, many technologies are used without adjusting them to the specific needs of each farmer. This was the situation in many Asian countries when the T & V system was introduced shortly after the High Yield Varieties became available (van den Ban and Hawkins, 1996).

This was similar in Thailand, when rice production for export and local consumption was promoted and investment channeled into irrigated areas by means of irrigation system development with the support of appropriate extension methods (Section 3.4). Expansion of wet rice cultivation over a large area (see Section 5.3.1) provides evidence of the conditions described by Hayward (1989) who states that a rather one-dimensional (or even authoritarian) approach can work well in situations where a new technology is available which will increase most farmers' income, while at the same time helping to achieve government agricultural policy goals, providing extension agents know the situation and the goals of their target group.

On the one hand, it seems to be appropriate to use this approach in irrigated areas, but on the other hand it is not applicable in rainfed areas which occupy about 80 percent of the total cultivated land in the country. According to Charoen (1991), the new technology is not applicable to farmers in remote areas. In addition, not all farmers in irrigated areas (which is only 20 percent of total cultivated land) were able to adopt HYVs because they could not afford to apply chemical fertilizer at the official recommended rate and did not have full access to the irrigation. In summing up, the T&V approach has been proven to be successful but only when all the farming conditions (irrigation, fertilizer, labour and capital) are conducive. So although

[2] For example, a change from subsistence farming to vegetable production.

agro-ecological conditions are *relatively* uniform, the farmers' socio-economic conditions can be quite different.

3.4.7 Inappropriateness of the Top-Down Approach and Serious Problems of Price

The transfer of modern technology through a highly centralized planning framework is not the only disadvantage facing the majority of Thai farmers who live in rainfed areas. One of the most serious problems is unstable and low price of farm products. This is accentuated because most of them are small farmers producing in small quantities. They know that the price is low after harvesting and gradually increases towards the end of season. But they can not hoard their output until that time. It is not only because of a lack of storage facilities, but also because they have no bargaining power with the buyers who are sometimes also input and credit suppliers (Thitirong, 1994). So the farmers have no savings of their own because they have to repay their loans as soon as possible.

This is consistent with the statement of van den Ban and Hawkins (1996), who pointed out that there are large variations in farming conditions, over relatively short distances in the rainfed areas. This difference then refers to the necessity of development for location-specific solutions for farmers' problems that extension officers should explore in collaboration with farmers and researchers. These location-specific solutions, however, also become necessary in many irrigated areas nowadays. This relates to the fact that crop yields can not increase when environmental problems endanger the sustainability of the farming system and uncertain market opportunities introduce an increasing element of risk.

3.5 Changing Planning Styles and New Approaches in Thailand

The turning point in agricultural planning and extension (from top-down to dialogue) came when the system began to be able to offer alternatives to farmers. This kind of approach requires intensive two-way communication between researchers and extension officers, and extension officers and farmers.

In general term, the system can be described as follows : Location-specific solutions are needed in rainfed areas due to the variations in farm size, land quality, availability of capital and labour, and family goals. These variations make the farmers different, including their decisions regarding the use of production technologies. Therefore, extension officers can not make appropriate decisions for all farmers. So a much more participatory approach is required rather than the authoritarian approach practised in the irrigated areas.

This is similar to the extension approach in Thailand. To cope with the problems of different local conditions, the agricultural development plan is adjusted following the guidelines contained in the agricultural development plan under the policy framework of the Sixth National Plan (1987 – 1991) embraces a much more bottom-up approach. The Cabinet assigned the DOAE to implement improvements in agriculture development programming at the provincial level in conjunction with development for small-scale farmers. Thus these two programmes were combined into the "Improved Agricultural Development Planning for Farmers" (Pote, 1991).

3.5.1 Experience with Decentralized Forms of Agricultural Planning in Thailand

The main objective of the agricultural development programme from the Sixth Plan has been to adjust the structure of the administration of the DOAE so as to facilitate a more decentralized form of planning for the regions. After receiving a policy and broad guideline from the Department, the provincial agricultural officers passed this down to the district level which functions as an operating unit while the policy and budget are controlled at the provincial level. At this lower, district level, the tambol extension officers who are the key people working with the farmers have to prepare a "Tambol Agricultural Development Guideline" for the farmers in their working areas. One of the most important parts of this guideline is the alternatives for farm improvements offered to farmers.

Guideline preparation was supported by training nationwide. In this way, the extension officers have to study the existing farming systems in the area, with regard to their agro-ecosystem, farming system classification, input-output flow, farm practices, problems, constraints and potential improvements. When there is a scope for enterprise diversification, extension officers have to consider the needs of farmers, market demand, development potential, policies and technology. This analysis is used as the input for extension officers who then lead the farmers to make decisions to improve or change their agricultural activities. This is not in the form of making decisions for them, but rather is a process of helping farmers make decisions by choosing from alternative solutions to their problems. Thus this enables the farmers to participate in the planning process together with the public and private sectors. The intention is that such an approach will also improve the production and marketing systems. The philosophy behind this approach is called "Providing Alternatives to the Farmers" (Pote, 1991).

This philosophy was used to set a specific operation guideline of the agricultural development plan under the policy framework of the Seventh National Plan (1992 – 1996). The plan states the philosophy as being : "Providing alternatives to farmers as their guidelines to draw up their

own agricultural plans suitable for local conditions and, then, setting up the operational plans or projects in order to secure the budget for the support in the implementation under the project for the support of the Farmers' Production Plan" (DOAE, 1992).

This approach has been applied nationwide since the early 1990s and continued until 1999. It was disseminated during the period of the Seventh National Plan and then for a further two years (1992 – 1999). The approach of offering alternatives to farmers is in line with the implementation of the restructuring of agricultural production which has a huge amount of credit support for farmers who want to diversify out of the four major cash crops (see Section 3.1.3). These strategies enable small farmers to achieve higher incomes because they have an opportunity to choose the most appropriate farm activities for themselves which are, at the same time, also suited to local conditions and market demand.

3.5.2 Farming Systems Research and Development Revisited

Shifting the emphasis requires a change in extension approach. The description above shows that the extension system in Thailand had advanced to a *"participatory theme"* (at least on paper and in theory) by the early 1990s, the time when "alternative systems" were introduced after a worldwide critique of the T&V system. This approach is totally different from the T&V model which is basically top-down, with its transfer of technology philosophy from research via extension to farmers. With the "providing alternatives" philosophy, extension officers no longer act more or less as the postman (as described by van den Ban and Hawkins (1996) for the T&V approach), conveying the message from the researchers to farmers without changing anything in these messages. The priority of determining farmers' circumstances in a farmer-oriented, system oriented, problem-solving approach, is characteristic of the ethos of "Farming System Research" (Box 3.2) which, in fact, was introduced as a pilot project in Thailand during the early 1980s and disseminated as part of extension approaches in the early 1990s.

Box 3.2 The farming systems approach

The Farming Systems model emerged in the mid-1970s and became prevalent in the 1980s, as a response in part to the failure of green revolution-type innovations to reach resource-poor farmers growing crops other than wetland rice or wheat (Ellis, 1995). The UNDP and FAO sponsored FSR in Thailand in 1980. The DOA implemented a "Integrated Rainfed Farming Research and Development" project led by "Farming Systems Research", with emphasis on improving the farming systems of the small rainfed farmers in the project areas. The project was expanded and incorporated with the DOAE and academic institutes later. After the results of the pilot activities were recognized, the approach was adopted by the DOAE and disseminated nationwide (Chudleigh, 1984 and Siriluck, 1984).

3.5.3 Changing the Roles of Farmers and Extension Officers

With the philosophy of allowing farmers to express their problems by themselves and clarify their real goals and opportunities, the extension agents leave farmers to make their own optimal decisions suited to their personal goals and conditions. This means a change in the roles of both farmers and extension officers. The farmers are no longer recipients of expert knowledge while the role of extension officers is changed from expert or teacher to be more of a facilitator (Pote, 1991 and Thitirong, 1994). The extension at this stage is not on agricultural technology as before, but rather on "a process of helping farmers make decisions by choosing from alternative solutions to their problems". This has the same meaning as "Beratung" (the British and German sense of advisory work) which implies that an expert can give advice on the best way to reach a goal, but leaves the recipient with the final responsibility for selecting the way forward (van den Ban and Hawkins, 1996).

This approach was scaled up to becoming nation-wide practice for the first time in the restructuring agricultural production workplan, which will be presented in the next five chapters. The analysis and discussion will be based on the empirical study of the agricultural diversification project in rice farming areas of the Chao Phraya River Basin, (as it is the pilot project of this workplan).

3.5.4 Current Trends (since 1999) in Agricultural Extension in Thailand

With in the new paradigm of a "people-centred" approach set out as the core of human resource development in the Eighth Plan, the agricultural development plan is expected to be formulated by farmers in response to their own needs. Since the plan is aimed at the tambol level, farmers' institutes incorporated with the local administration organizations and line agencies were supposed to play a major role in plan formulation. Although this was clearly stated in the Eighth Plan (1997 – 2001), it was never practised until mid 1999. Indeed, its late implementation was forced by the ADB who provided a loan for restructuring agriculture. Thus the agricultural extension planning system has been changed again since June 1999. Since this approach is newly introduced, there has not been much experience in implementation so far to draw on. Moreover, the incomplete guidelines and documents have confused agricultural extension officers at the local level, especially the tambol extension officer who is supposed to be a key player in this context. However, while detailed evidence and feedback is still to be gathered the development is worth reporting here because it shows the trend of agricultural development and extension in Thailand.

Problem analysis and needs assessment of farmers in the community are set as the key factors for plan formulation. The tambol agricultural extension officers have to organize meetings with the participation of farmers' institutes, which are normally in the form of farmers' representatives as well as members of the tambol administration organization. The needs are then identified in accordance with the development potential of the community as identified by villagers while the extension officers acts as facilitators, shaping the meeting's outcomes taking into account the respective agricultural context. The needs are prioritized at the tambol level by these people. These are submitted to the upper tiers (i.e. district, provincial and national levels) and technical and budgetary support requested.

Prioritization is done again at the district together with the plans from other tambols, and again at the provincial level together with plans from all the districts. They are then submitted to the national level. Prioritization at these two levels (district and provincial) however are done by agricultural extension officials.

The requests are sorted out and categorized at the national level. The Subject Matter Specialists (SMSs) are teamed up according to the requests from the lower tier and based on the members' expertise. Each team takes responsibility for one subject. They investigate the requests related to their subject nation wide. For example, an "Integrated Farm Team" will consider the request for the technical and budget support of integrated farming activities in the entire country and allocate technical and budget support to the areas accordingly, while the team on "rice", "maize", "durian" and so on will do the same thing. Every team is mobile so it is in a position to monitor implementation at the local level. The action plan is also prepared at this local level based on the budget received.

Two new institutes have been set up on an experimental or pilot basis, parallel with the farmers' institutes at the tambol level. They are:

(1) The Agricultural Technology Transfer Centre of the Tambol: in order to strengthen capacity of the farmers' institutes, the DOAE is promoting the "Soon Taitod Technology Karn Kaset Prajam Tambol" or "Agricultural Technology Transfer Centre of the Tambol", with the main purpose of being a centre for transferring agricultural knowledge in the local area. This will be integrated agricultural knowledge from every agencies concerned in the area, (i.e. livestock and fisheries), and not limited to one component. So far there is only one such centre in every province.

(2) Farmers' Field School: for specific problems and needs, which can not be solved by the farmers, the DOAE has begun to set up "Farmer's Field Schools" in some locations. The schools are supposed to train farmers' groups at farm level to work through a

complete cycle of a particular farming practice, for example, integrated pest management (IPM) on rice.

3.5.5 Changing Stages of Extension Services and Applying them in Thailand

The major policy in the early years of an agricultural extension organization often is to increase crop yields and animal production. However, after some time, more attention is paid to improving production efficiency, environment and institutions. Such a change in policies seems to be in response to the availability of resources, innovations and marketing mechanisms over time. These changes are similar to the characteristics of the four overlapping periods of steadily shifting emphases, characterized by Rhodes (1989) These are production, economic, ecological and institutional stages, as presented in Box 3.3.

Box. 3. 3 Four overlapping periods of shifting emphases of agricultural development in developing countries

Agricultural research and development has become increasingly diverse in recent years, with a growing number of disciplines engaged. Based on international comparative research, Robert Rhoades (1989) identified and described four stages as follows:

1. **Production stage** (roughly 1950-75) , in which the pioneer disciplines were breeding and genetics, and farmers were seen as recipients of technology.
2. **Economic stage** (roughly 1975-85), in which Farming Systems Research was pioneered by economists and agronomists, and farmers were seen as sources of information for technology design.
3. **Ecological stage** (roughly 85 – 95), in which anthropology, agro-ecology and geography are pioneers, and farmers contribute their indigenous knowledge, and are seen as victims and causes of unsustainable development.
4. **Institutional stage** (roughly 95 onwards), in which the pioneering disciplines are management specialists/scientists, training specialists and educators, in which farmers will be full collaborators in research and extension; and where alliances will be developed between different institutions.

Reflecting such changes in orientation, with a delay of some 10 years in the case of Thailand, the shifts in the orientation of the Thai agricultural research, extension and development may be interpreted as follows.

Production stage (roughly 1960 – 1980s)

The Thai farmers were seen as recipients of technology even before the establishment of the DOAE, when extension was carried out by the Rice and Horticulture Departments. Large-scale dissemination of technology continued at the time when the

T&V model was adopted, especially with the spread of the green revolution and intensified farming from about 1975 through the 1980s.

Economic stage (roughly late 1980s – 1990)

This stage began the introduction of the alternative systems which were adopted under the influence of Farming Systems Research from the mid 1980s. As described above, the alternatives offered to the farmers were however, designed by the extension officers, but based on the farmers' social, economic and environmental conditions.

Ecological stage (roughly 1990s, continuing)

Following the call for sustainable development, the policy for agricultural development started to include the term "sustainable agriculture" from the Sixth Plan (late 1980s). The promotion of sustainable agriculture is in the form of encouraging farmers to practice natural farming, organic farming, integrated farming and agro-forestry. And the Thai government expected the expansion of sustainable agriculture to reach 20% of total agricultural land in the country (i.e. approximately 25 million rai) by the end of the Eighth Plan (2000). This goal, however, is in conflict with the goal of maintaining a strong agriculture sector, maintaining Thailand's leading role as a food producer and major exporter of agriculture products which is also underlined in most national plans, including the Eighth Plan.

Despite this target, there has been very little real effort towards realizing and implementing sustainable agriculture. Apart from an absence of financial support and poorly defined concepts, it is difficult to shift farmers in a country of exported-oriented success like Thailand to sustainable farm practices. Farmers are closely linked to agribusiness companies providing seeds and other agricultural inputs, including credit. These linkages make many of them indebted to the companies, commercial banks and the BAAC. The use of agricultural inputs is still relatively modest for the majority of Thai farmers although they have increasingly to invest in intensive farming techniques due to the closing of the land frontier (Buch-Hansen, 2000).

With the conflicting goals of the government, reflected in the promotion of increased food production and "sustainable agriculture", it is not easy for the extension officers, especially those who work at the tambol level. They are confused by the conflicting goals. One of the tambol extension officers in Supanburi remarked that "sustainable agriculture" which is translated as "Kaset Yang Yuen", turned the officers into "Kaset

Yuen Ngong" (confused agricultural officers).! They used the word "Kaset" to mean "agriculture" in the first phrase, while in the latter it means "agricultural extension officer". Similarly they used the word "yuen" in two meanings. The former is mixed with "yang" which means sustainable or standstill, while the latter is mixed with "ngong", which means standing and confused.

Institutional stage (1999 onwards)

As the farmers' institutes are established to serve the people-centred approach, farmers' groups incorporated with the tambol administration organization are supposed to formulate agricultural development plans at the local level. These are to be based on farmers' problems and needs while technical and financial support can be requested from the DOAE. However, this approach is still at an early stage and not yet fully developed.

The four overlapping periods of agriculture development reflect changes over time in world agriculture and in scholarly and applied approaches to the interpretation and promotion of agriculture. In this case, the extension officers have to play a crucial role in increasing farmers' competence together with the new roles such as promoting sustainable agriculture. Therefore new skills are required in accordance with the change of working conditions.

Following up on the argument of the evolution of agricultural extension approaches, the next section is a synthesis of the change and development of extension approaches in Thailand being in line with the change in world agricultural development conditions. It shows that Thailand is adopting participatory methods and approaches in the context of agricultural development over time.

3.5.6 Moving Towards a Higher Degrees of Participation

With changes over time in the agricultural extension system, it is possible to compare the agricultural extension stages in Thailand to the international experience, in increasing degrees of farmers' participation in decision-making. After the earlier two stages of extension by (1) transfer of technology and (2) transfer of technology with the T&V model, the extension approaches have become increasingly participatory in the 1990s, in the form of (3) the "alternative system or approach", and (4) the "farmer-centred approach" [3]. As described above,

[3] The term "alternative system" was frequently used by Dr. Pote Chumsri in the context of the "Farming Systems Approach" (see Box 3.2) while the term "farmer centred" is translated from the Thai term "Soon

the approach allows farmers and the tambol extension officers to play a greater role in planning and implementation while the officers at the upper tiers play more of a supportive role. This seems to not only serve one of the objectives of the 8th Plan which is to change the role of government officers from advisers to facilitators, but is also consistent with the core of new planning processes contained in the Agenda 21 (made popular worldwide by the Earth Summit in Rio de Janeiro, 1992). The latter initiative embraces the full involvement of local people in developing and implementing strategies, including their contribution in design, information exchange and sharing in decision making (Pretty, 1995).

Although it is not easy to change the style of approach to extension in the short run, this is no reason to delay. The changes in the stages of the extension system in Thailand, from the earlier transfer of technology to the latest one, the "farmer centres", can be compared to the spectrum of seven levels of participation, constructed by Pretty (1995):-

1. Passive participation
2. Participation in information giving
3. Participation by consultation
4. Participation for material incentives
5. Functional participation
6. Interactive participation
7. Self-mobilization

Table 3.3 shows the similarities of the four stages of extension in Thailand with at least four of Pretty's seven levels.

Taitod Technology Karn Kaset Prajam Tambol" which has only been introduced by the DOAE in 1999 as a pilot project.

Table 3.3 Participation Level of the Extension System in Thailand

Type of extension	Time	Participation characteristics (using Pretty's typology of seven stages of participation)
Transfer of Technology	Until 1977	As modern technology is already defined from research results and being carried to farmers without farm trials, farmers are told what is going to happen and sometimes has already happened. That means technology belongs to external professionals and is announced without listening to people's response. This is characteristic of *"passive participation"*.
Transfer of Technology with the T&V model	1977 – 1990	With the resources of tambol extension officers, it became possible to conduct structured surveys nationwide. However farmers only answered the questions without any influence over proceedings while most of the findings were never to be shared or checked for accuracy. This is similar to *"participation in information giving"*.
Alternative approach	1990s	With this approach, extension officers listen to farmers. Both problems and solutions are defined in accordance to their needs and the local situation. This is in line with *"participation by consultation"*.
Extension style used in the agricultural restructuring programme	Since 1993	For the first time, the diversification pilot project (and later on, the restructuring programme) coupled low-interest credit with diversification. The extension approach used here includes elements of *participation for material incentives,* apart form the alternative approach that had been introduced before.
Farmer-centred approach	Since 1999	The establishment of farmers' institutions incorporated within the Tambol Administration Organization with the aim of encouraging farmers to carry out joint analysis which leads to action plans together with letting these groups have control over decisions and maintaining the agricultural practices in the form of "Farmers' Field Schools". This is the characteristic of *"interactive participation"*.

Source: Interpretative table designed by the author, linking the extension stages in Thailand with the seven participation stages described by Pretty (1995). Refer to Annex I.3.2.

3.6 The Diversification Project in Rice-Farming Areas of the Chao Phraya River Basin

At the end of this long conceptual chapter, the diversification project for rice-growing areas is introduced. This section serves as a link between the more general discussion on the changing national economy, agricultural development and extension approaches, and the study of the diversification policy and its adoption by the farmers (Chapters V – VII).

3.6.1 Project Formulation

As mentioned earlier (Section 3.1.3), crop diversification was strongly promoted in response to the risks caused by natural disasters and prices fluctuation. This was set within the framework of the work plan of restructuring of agricultural production, which was, itself in line with the policy framework of the 7th national Plan (1992 – 1996). It had the specific objective *"to adjust the structure of agricultural production of the cropping areas which face marketing problem*

such as rice, cassava, coffee and pepper to other farm activities which give higher returns and are suitable to local conditions". The Thai government had a policy to support this programme by means of credit support. That means farmers who want to diversify out of these four crops can ask for credit support. However there was no implementation at the early stage of the plan because the MOAC could not seek for the budget which can be used as credit support for this programme.

It was only in 1993, when the the two major problems of insufficiency of water resource allocation in the area and the low price of rice became acute, that the DOAE could found 29 million Baht to alleviate the critical situation.

Thus "Agriculture Restructuring for the Chao Phraya River Basin" was formulated following the principal guidelines of being in accordance with national resource potential and meeting market demand. Therefore, the operational plan for this area emphasized the promotion of crop diversification in order to mitigate the risks of the low rice price and, to consume less water for cultivation while simultaneously boosting income.

The operation guidelines of the agricultural development plan during this period (Section 3.5.1) promoted intensive farming in the form of integrated farming consisting of crop, livestock, fisheries and forestry, as substitutes for major cash crops which faced marketing problems. In line with this, the DOAE designed the package for diversification for farmers who wanted to diversify.

- **Design from the top, with the recognition of farm resource constraints**

The package was designed at the upper tier of a typical Thai bureaucracy which is organized in a highly vertical framework. The DOAE believed that orchard crops are appropriate for substitution for rice as they can be grown in the areas of the Chao Phraya River Basin, and meet market demand. This acknowledged the expansion of orchard cultivation in the country, including the central plain, recognising their higher return while consuming less water than rice.

But land has to be modified for conversion from rice to orchard. In particular land has to be raised due to the nature of orchard crops. The DOAE realized that the investment needed for land modification is significant and a major constraint for capital-poor farmers. So the DOAE decided to provide long term credit with a low interest rate (only 5 per cent per annum) to the farmers who joined the project and who asked for such credit support.

The difference is not in terms of patterns of land use, but also with regard to cropping cycles. Perennial orchard crops require about 3 – 4 years of vegetative growth before having a reproductive life of about 10 – 20 years. This is very different from an annual crop such as rice which has a growth cycle of only 3 – 4 months duration. Thus credit provision is of long duration of 15 years. During the first few years during which there is no yield from the orchard, vegetables are recommended as inter-cropping, between rows of orchard while fish are raised in ditches between the raised beds of the orchard. These are expected to provide supplementary income while the orchard matures.

With a budget of only 29 million Baht in 1993, the DOAE was not able to cover all of the 22 provinces of the Chao Praya River Basin. So the DOAE selected the four provinces of Angthong, Ayuthaya, Lopburi and Supanburi for the pilot project implemented in 1993. It was expected that lesson learned from these four provinces would be utilized for expansion to cover the entire 22 provinces a year later (1994).

Besides capital constraints, the DOAE also recognized the severe labour constraints of farmers. The DOAE estimated that about 3 – 5 rai per farm would be a proper size for diversification. This figure was used to calculate the farm budget for diversification by the SMSs at the DOAE and guided the calculation of the amount of credit necessary to support farmers in this project. Since the calculation showed that the total of 29 million Baht could cover the diversification of 2,000 rai, an indicative target of 500 rai was distributed to the four selected provinces equally.

This project was integrated into the main work plan of restructuring agricultural production a year later (1994), at the time that the Thai government allocated a large budget of over 65,000 million Baht to support the diversification out of the four cash crops of rice, cassava, coffee and pepper as mentioned above. With the larger areas involved covering both irrigated and rainfed areas across the whole country, more types of diversified enterprises were offered to farmers. These included alternatives like dairy, cattle, and non-fruit trees. However the implications for diversification out of the four cash crops of rice, cassava, coffee and pepper are the same as in the pilot project of the first year (1993) in the four provinces.

Following recommendations, the plan was implemented by five agencies (including the DOAE) under the decentralized planning and administration framework of the 7th Plan. In fact, the DOAE had intended to co-operate more closely with about twenty other agencies (Annex I.3.3), including the four most obvious ones. These are BAAC, Department of Livestock Development, Royal Forestry Department and RID. Although these four agencies are more cooperative than other agencies in the restructure agricultural production work plan of the four cash crops, they

still worked following their own agendas. The agency which is mainly responsible is the DOAE (Chula Unisearch, 1996). This is similar to diversification out of rice in the Chao Praya River Basin where the DOAE is an agency which carried out most of the implementation while the BAAC and RID were involved more than the others, due to the direct responsibility of credit and irrigated water delivery to farmers (see Box 3.4: BAAC and Box 3.5: RID).

Box 3.4 The Bank of Agriculture and Agricultural Cooperatives (BAAC)

The BAAC was established in 1966 with strong support from the Bank of Thailand, to promote the appropriate and efficient development of farm credit facilities. The bank started with only 5 branches serving 24 areas. With rapid growth, the bank now has branches in every province and sub-branches in every district, covering the entire country.

With its function of strengthening credit services and mobilizing loan funds for farmer use, the BAAC has field staff working as credit supervisors to appraise farm assets, assist in loan applications and provide training in credit use.

Being responsive to the low income position of farmers, short-term and medium term loans of the BAAC allow farmers who do not have sufficient fixed assets as collateral to form a group of 5 farmer members with join liability, while long term loans still require fixed assets with a value of not less than twice the loan value as collateral.

Despite a usual 13 per cent interest charge, special funds for credit promotion in some projects command only 9 per cent. Thus it is clear that the interest rate of 5 per cent under the crop diversification project under restructuring agricultural production work plan was a very special incentive to farmers.

Source: Ladda, 1984.

Box 3.5 The Royal Irrigation Department (RID)

Water resources are managed by several organizations, but mostly by the RID which is responsible for water delivery from storage dams. However when the water resource is also managed for electrical generation such as the case of the Chao Praya River Basin, EGAT becomes one of the leading agencies of water management.

While water management in the rainy season aims to control excess flows in the different waterways in order to control flood and avoid damage, water delivery in the dry season is more carefully managed. It has to be calculated based on the requirements of electricity generation, urban consumption, transportation, salt water protection and agriculture use. These shares however depend on the availability of water in the storage dams.

For agriculture, especially during the dry season, deliveries from dams are monitored by the regional offices before feeding to the main canals of all projects in the areas. While monitoring and regulation of the main canals are carried out at the project level, water management of secondary canals is under zone personnel who take care of an average of 12,500 rai each. And farmers manage water by themselves at the ditch level, at last.

Source: Kasetsart University, ORSTOM. 1996.

Planning procedure and implication of the projects are illustrated as follows:

- **Transmission of information via provincial level, from the top to the bottom**

After the budget and target areas of each province were identified by the department, the information was vertically transmitted to the provincial level. This means the provincial agricultural offices, the BAAC manager and the RID officers were all informed about the project, target areas and credit support by their own head offices.

At this level, it was the duty of the provincial agricultural offices to find the farmers to join the project in order to achieve the target areas. The form of diversification, credit available and target areas were discussed in a meeting with the district agricultural officers. After checking the potential areas for diversification with the agricultural district officers in each district, the rough extent of the target areas was distributed to districts accordingly. This information was also transmitted to the BAAC and the RID, so the former could prepare the credit and arrange for it to be transferred to the district branches while the latter would recognize the diversified areas.

3.6.2 Implementation at the Local Level

Based on the rough figure proposed to the provincial office, the district agricultural officers had to discuss the potential with the tambol extension officers who are the key people, working closely with farmers. These tambol extension officers were given the task of encouraging farmers to diversify. They together with the BAAC branch officers, held meetings with farmers, explaining the project objectives, outlining the benefits that farmers might receive and setting out the conditions for receiving the credit, repayment rates and so on.

- **Proposal of farm plan**

Those farmers who wanted to join the project, had to work on a farm plan together with the tambol extension officer(s). The farm plan primarily consisted of :-

- description of total land use area, farming activities, land holding status together with the amount of family labour
- proposed area for diversification and its location together with types of activities, (i.e. types of fruit trees, vegetables or fish required)
- estimated farm budget for diversification

Following the concept of the alternative system approach, it is a duty of tambol extension officers to assist farmers consider the size and location of diversified areas based on their land and labour resources. The officers should propose alternatives of types of fruit trees, vegetable seed and fish to farmers and let them choose.

These farm plans were compiled at the tambol level and submitted to the agricultural district officers. They were forwarded to the BAAC district branch. Investigation was done case by case. After screening disqualified farmers out, the rest were visited at their farms for in-depth investigation. Those who were considered as having suitable land to modify, enough labour for orchard work and were able to repay the loan, were approved.

- **Information flow to the upper tier**

All approved areas and farmers were compiled at the district level. Both agricultural district officers and the BAAC branch managers transmitted information via their own channels. The proposed diversified areas were submitted to agricultural provincial offices where adjustment to the target areas identified by the department took place. In case some districts could not reach their allocated target areas, the rest could be given to other districts where a number of farmers and proposed areas exceeded the allocation. The adjustment among the districts however was to be done in order to be fit with target areas, allocated from the department to the provinces. The final areas were then forwarded to the BAAC provincial branches to adjust the amount of credit accordingly.

All this information was compiled at the provincial level and transmitted to the central level. Credit request was on the BAAC line while agricultural provincial offices prepared budgets for input support submitted to the department.

- **Support of the lower tier**

After approval, the amount of credit and budgets for material inputs were allocated to the provincial level. Credit was distributed to the district level as requested while fruit tree stock and vegetable seed were purchased by the provincial officers and distributed to the various districts.

The information then flowed from the district level to farmers via the tambol extension and BAAC officers. The farmers were getting the contract on low interest rate (only 5% per annum, compared to 9% in the ordinary projects) with the BAAC. The credit was not provided at once

but on rebate system. Farmers received money according to work progress. They got the first amount after land modification and another amount after the fruit trees were planted. The organization of the project is illustrated in Figure 3.3.

3.6.3 Analysis of Planning and Implementation: High Degree of Centralized Planning

Although the administration system has been promoted to be more decentralized in terms of planning and financing, planning and implementation of the project as described above were in a typical bureaucratic manner. Decision making and budget control were still from the top along the line of the individual agency. The package of technology and credit supply was top-down designed and delivered as a rigid message from the central department down to the provincial and district levels, respectively. As the package was designed and set out in the form of a blueprint from the top, it was not easy to change and adapt. The tambol extension officers who were working at the grass roots level then acted more or less as postmen, and transferred the message they received to farmers. This is in contrast with plan formulation at the provincial level, which is designed to respond to the problems and needs of farmers as stated in the 7th Plan, because:-

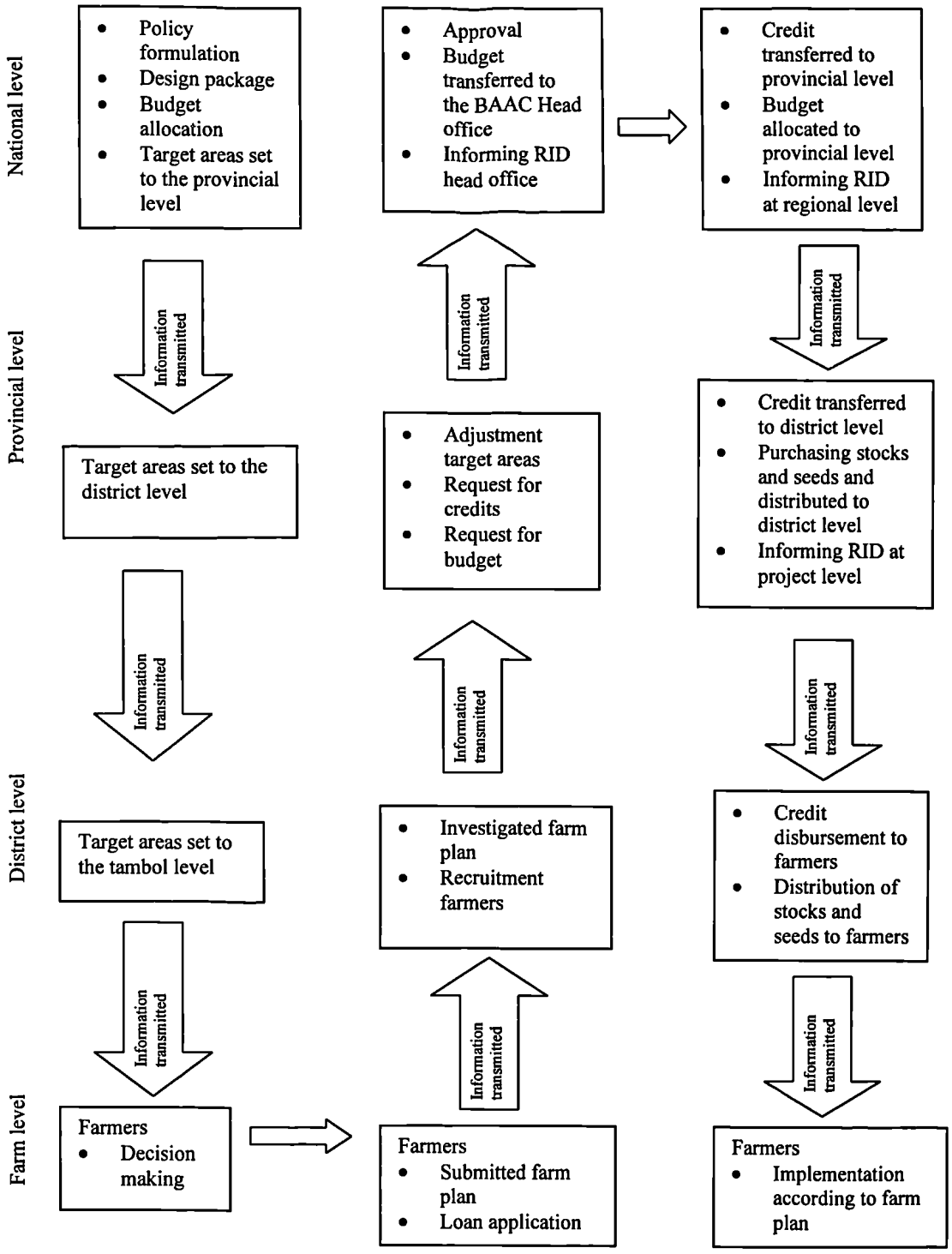
(i) the plan did not follow a bottom-up approach

(ii) farmers did not make their own decisions, they just adopted the package offered by the DOAE

Despite these contrasts, there are sometimes advantages of making decisions at the top because the Chao Phraya River Basin has been set up in order to serve the programme at the regional level under this operational guideline. "Region" in this case is defined as a natural macro-region, the river basin - within which a number of smaller, micro-regions are distinguished on the basis of administrative divisions (province, district and tambol). This can avoid duplication and sufficient attention can be given to serious problems of low rice price and insufficient water use which have pointed to as important in the long term.

However it is not possible to say what is advantageous or disadvantageous unless the situation is investigated in detail. This is the rationale for undertaking the research presented in the next five chapters.

Figure 3.2 The organization of the project



Chapter IV Methodology for Empirical Research

As outlined in Chapter I, the study is designed in such a way that the conceptual ideas of agricultural development are related to a complex empirical study in six provinces in Thailand over a period of five years. The intention is to turn the empirical findings, together with the conceptual framework (primarily outlined in Chapter III), into "lessons learnt". These lessons learnt will then be generalized into recommendations for further development of the agricultural restructuring programme, and to support realistic national policy making. Therefore, the focus of the empirical study is on the variations of implementing the national diversification programme at the various levels, especially at the provincial and local levels. The most important implications for future policy modification would be derived from the study of how the policy has affected the farmers, who are the main target group of the project.

The farmers in the project area are spread over a large area of the Chao Phraya Basin which, in total, comprises 22 provinces, encompassing a range of different farming environments. The justification for the six provinces selected for the empirical study are detailed in Chapter 1, section 1.8. They encompass differences in agro-ecological conditions, resources, and economic conditions. These factors set the context and help to explain why farmers make different decisions with regard to the enterprises they embrace, and especially towards the adoption of the recommendations for crop diversification out of rice offered by the agricultural extension officers.

Policy makers should understand these complex and diverse situations, as well as the differences in the response of farmers to the diversification programme offered. It is only with this feedback, that effective policies and extension programmes can be designed. The most appropriate approach for studying the impacts of project implementation should be that of a comparison between two groups of farmers. The two groups are (1) those who adopted the crop diversification package offered and implemented by the local extension office, and (2) the "control group" of farmers in the same area who did not join the diversification programme.

The main means of data collection for the comparative study of the two groups of farmers was a structured formal survey. This was required because the results of the surveys had to be subjected to a number of statistical tests in order to be able to serve, later on, as the basis for policy modification. While the structured formal survey was designed to collect quantitative information by the use of questionnaires, informal surveys were utilized to prepare the formal surveys and, later on, for verification of the survey results. The informal fact finding was in the

form of reconnaissance and follow up surveys, using RRA and PRA techniques, respectively (RRA: Rapid Rural Appraisal; PRA: Participatory Rural Appraisal).

This chapter presents how the methodology was developed first and then, later on, adapted and expanded to serve the objectives of a policy study. Figure 4.1 is a flow diagram illustrating the methodological steps taken.

4.1 Preparation Stage

This stage includes collecting both secondary and primary data. The latter was in the form of informal surveys with application of RRA techniques.

4.1.1 Reviewing Secondary Data

Background information relating to the objectives and study areas was collected and reviewed. There are numerous relevant published and unpublished materials including project documents of the DOAE, the agreement for the project between the DOAE and BAAC, progress and interim reports of the project both at the national and provincial levels, guidelines for alternatives offered to farmers, the agricultural development plan within the framework of the 7^{th} national plan. This information was assembled and screened, and serving as preparatory material for designing the empirical study. It was also incorporated into the discussion in Chapter III.

One of the decisions that had to be made at the beginning of the research was to select the provinces for study. Initially, during the first year of the diversification project, there was not much choice, because the project began in only four provinces. Later on, however, when the project covered all the 22 provinces in the river basin, an additional set of study areas had to be added, using appropriate criteria. (The selection process is described below in section 4.2.)

4.1.2 Interviewing Key Informants at the National and Provincial Levels

First of all, key informants knowledgeable in the relevant subject areas were interviewed. These included agricultural extension officials at the national, provincial and local levels including some farmers. Dr. Pote Chumsri, the director of the Agro-Business Promotion Division of the DOAE who played a leading role in initiating the project was proud to say that it was the first project to be established in response to the real problems that farmers faced. In particular, the new extension methodology of recruitment of farmers in the project followed the concept of providing alternatives, rather than transferring technology to farmers.

The chief agricultural officers of the first four selected provinces (Lopburi, Angthong, Ayuthaya and Supanburi) highly appreciated and warmly welcomed the project. For them, the diversification project did not only solve the immediate problems of lack of resources for investment by farmers, but also provided some free material inputs such as seed and saplings in addition to low interest rates for credit, all of which are traditionally requested by farmers.

4.1.3 Joining a Large Meeting of Extension Officers and Farmers at the District Level

Direct observation was made when the extension officers at the district level called the farmers who were interested in the project for a first information meeting. Such a meeting was organized in Wisetchaicharn District of Angthong Province in mid 1993. It showed that most of the attendants (over 150 farmers) were interested in the prospects offered by the pilot project. Attending this large meeting was of great relevance to the researcher because it confirmed the validity of using the diversification policy as a research subject. The meeting also prepared the ground for asking the right kind of questions in the reconnaissance survey, and developing preliminary ideas for local-level surveys.

4.1.4 Reconnaissance Surveys at the Farm Level

Since the procedure for recruiting farmers into the project (see details in Chapter III, section 3.6.2) during the first year (1993) was completed by the middle of the year, a reconnaissance survey was carried out in the four selected provinces in March 1994. This aimed to quickly obtain basic information of farmers' circumstances, i.e., family size, labour force, land holdings and ownership, land use, farming activities, sources of income from both on-farm and off-farm sources, water use for agriculture, and constraints, problems, needs and suggestions for development.

As part of reconnaissance survey, few farmers (4 – 5 persons) from each province were informally interviewed. A simple list of questions was used for interviewing in a mostly open-ended format. Farmers were free to talk, and there was no fixed sequence of questions. Information was noted down and consolidated later.

The interviewees were mixed. Some of them had diversified with project support while some had diversified even earlier by themselves with no project support. The interview also included some farmers who had not diversified. Farm practices and activities regarding diversification were recorded in detail, from both project support and non project support groups. It was found that one in the latter group was tambol extension officer in Angthong province. He converted

his 10 rai of paddy land to orchard with vegetables as supplementary crop in 1989, 4 years before the project was launched. He tapped the technology of successful farmers in Chachoengsao province, which is also in the central plain and not far from Angthong. Attracted by his success in diversification, a number of farmers in the same tambol followed him and asked for support from the project.

4.1.5 Questionnaire Design and Pre-Tested

All preparatory information was compiled and questionnaires were drawn up accordingly. Most of the questions were set in the time frame of crop year 1993/94 (counted from May 1993 to April 1994, starting with the rainy season), the same year when the project was launched. Based on the comparative study purpose, questionnaires were designed for use with the separate project and non-project groups in each of the selected areas. So questions in some parts of questionnaire such as those relating to demographic data and off-farm work were the same for both groups while some other parts were different, especially concerning on-farm activities. Hence the set of questions for the project group had more specific details about diversification than the questions for the control group. Different questions were also put in the section on attitudes to diversification. The organization of the questionnaire is described as follows.

- **Demographic data**

Questions began with simple issues. Most of the questions in this part required specific answers such as name of head of household, duration of stay in the area, number of family members, together with age, education level and occupation of each member.

- **Land use, holdings and ownership**

As in the previous part, specific answers were required in this second section of the questionnaire. These covered total cultivated area (in rai) with number of plots, type of land use, size, ownership and accessibility to irrigated water. Information was collected for each plot. It was found from the reconnaissance surveys that many farmers have fragmented land and the type of land use and ownership status vary from plot to plot. For example, it is common for farmers to have more than one plot of land, and some are owned while others are rented. A similar level to type of land use; one is usually paddy while others are occupied by orchards, vegetables or fish ponds, especially among the diversified farmers. With the adoption a year earlier of the project group, these variables were questioned for two crop years, i.e. for 1993/94 and the year before, in order to assess change over the period.

- **Costs and returns of cash crops**

Following the record of land use, information about costs and returns of those crops were gathered separately, plot by plot. Again, as a finding from the reconnaissance surveys, the farmers found it easier to recall the information by plot rather than by type of crop. Since the three major types of crop in the areas are rice, orchard and vegetables, sets of questions were prepared accordingly. It is common to find rice is the major crop for both groups while the other two crops are found more in the project group due to diversification. However, the questions on these crops were applicable to the other group too, because some non-project farmers had orchards and vegetable crops as well.

Costs and returns of rice are simpler than for vegetables and orchards. While rice is grown as a mono-crop many farmers grew mixed types of orchard crops in a single plot, and the same applied to vegetables. Therefore, costs and returns of mixed orchard and mixed vegetables were recorded instead of by individual type.

Input costs was recorded mostly in the form of variable costs, mainly comprised of material inputs (i.e., seed, fertilizer, pesticide ... etc.), and power input which included both hired labour and machinery. Questions were put following the sequence of farm activities, starting from planting to harvesting. For example, the material input cost of seed was questioned before fertilizer and pesticide cost. Cash paid for hired labour began with soil preparation, planting, spraying and so on, until harvesting and transportation for sale. Family labour was omitted in this case. It is not easy for farmers to recall from memory the number of man-days spent on farm activities. The author's experience of formal structured surveys performed for a number of international projects both in Thailand and other countries in the region (Laos and Vietnam) showed that farmers were characteristically confused and it was easy to make mistakes when they were asked about this topic. This led to an uncomfortable atmosphere and farmers were not willing to co-operate anymore. So instead of discussing this subject in any further detail with the respondents, the following assumptions were made: Family labour can be managed and efficiently utilized for both on-farm and off-farm work, depending on demand and supply factors. The farmers can hire additional labour or machinery whenever it is necessary like a harvesting machine to harvest rice or for some activities where they are not skillful enough, like spraying pesticide.

With the recognition that most people do not like others being nosy about their income, return from each plot was not asked directly. Instead, the questions were about total production, unit

price, amount sold, payments for rent, stocks kept and consumption. From this information, net return by activity was calculated.

- **Cost and return of livestock and fish**

Since livestock and fish are not a major enterprises in these areas, rough estimations of cost and return of each type of livestock were asked. Specific questions were put in a simple form following the logical sequence of activities, i.e. asking for inventory stock, number sold and bought during a year, cost and price received, input cost for feed, vaccine and other costs.

- **Marketing systems**

The marketing situation and systems of each enterprise was asked immediately following the questions on inputs and outputs. Questions were set in tabulated form. For each crop sold questions were concerning market channels, location sold, time sold and problems occurred.

- **Water resources for agriculture**

Despite irrigation, sufficient water is not always available at times. Therefore, farmers were asked to prioritize water resources in both wet and dry seasons. Emphasis was on water sufficiency in the dry season together with reasons for insufficiency and solutions that might solve this problem. So a closed yes/no question was put to ask about water sufficiency before leading into open-ended questions regarding solutions. This part also included questions on reduction of second rice areas in the past. Identification of time, size and reason for reduction were asked.

- **Credit**

It was also found out from the reconnaissance survey that most small-scale farmers have to borrow money for farm investment. Therefore, questions were put in tabulated form, asking about size of loan, source of loan, purpose and interest rate. This is besides the credit offered to farmers in the project group linked to the diversification project.

- **Non-farm employment**

In recognition of the importance of this source of income which significantly contributes to the family livelihood, every single member of the household who was involved in non-farm employment was asked about type of work, timing, location and amount of income. Questions in this part were often open-ended in form and linked with the demography part of questionnaire where each family member identified their occupations.

- **Attitudes to diversification**

Questions regarding this issue were set differently for the two groups. For the project group, of course, reasons for joining the project was asked together with credit received for diversification and its investment. Although it was too early to judge the results, farmers were asked about their expectations from diversification, and their satisfaction about the support provided. Questions were also put concerning failure to diversify in the past and reasons for not doing so in those cases where it had been considered. Further to this, two more questions were asked on possible future decisions, i.e. (a) whether the farmers would go for more diversification if conditions for that were favourable, and which types of enterprise they would go for; and (b) whether they would go back to growing rice if the rice price increased significantly (for example, more than 4,000 Baht per ton).

Despite not joining the project, the non-project group of farmers were questioned about their opinions regarding the project. So questions were asked whether they wanted to join the project or not, and why.

- **Diversification before the project was launched**

Some farmers in both groups had already diversified before the project was launched, so questions were put regarding the year of diversification, areas, activities diversified and sources of capital for investment. All these were precise questions and it was relatively easy to obtain specific answers. As the reasons for diversification were the most curious things to know, these questions were put in open-ended form.

- **Problems in agriculture**

As a sensitive issue, which sometimes led to a long conversation and complaints, this part was put last. Questions were set in open-ended form, asking about various problems and their solutions.

- **Pre-test**

Although all questions were drawn up using simple language, aiming to be easy to understand by the respondents in the context of the interview, a pre-test was carried out with a few farmers in the study areas selected. This aimed to test for accuracy within the real situation. Some wordings had to be changed after the pilot survey showed that it was not easy for farmers to understand. Also the sequence was slightly adjusted in order to maintain a good flow. After this adjustment, the questionnaires were finalized (as shown in Annex II. 1 – 2), and final preparations for the structured survey were made.

4.2 Organization of Structured Interview Surveys

It happened that a senior officer of the Farm Management Unit at the national level of the DOAE was also interested in this study, and so he provided support in terms of the necessary coordination of the field work. This connection with DOAE began from the preparatory phase and continued until the follow up stage of the study.

4.2.1 Preparation of the Sampling Frame

The DOAE reached their target in terms of area easily during the first year of operation. Allocation of credit was somewhat less than the target figure. Table 4.1 shows details regarding target areas, broken down by province, and credit support.

The sample size of the survey was set in line with the principle of scientific sampling. For example, Norman et al. (1995) emphasizes the importance of understanding the appropriate sample size, which depends on variability in the population rather than the size of population. Therefore, the percentage of farming families that must be included in the sample may vary substantially between recommendation domains. It has been found that 30 to 50 farmers of each recommendation domain usually reflects reasonably well the circumstances of farmers in that recommendation domain (Byerlee et al., 1980). Others have suggested a minimum sample size of 20 from each sampling category (Yang, 1965 and Shaner et al, 1982).

In line with such considerations, the sampling size of project farmers was set as 30 farm families from each province while the size of the control group was set at 20 farm families for each province.

Table 4.1 Details of diversified areas in the first year of operation, 1993/1994

Location/ province	No. of farms	Diversified area (rai)		Credit supply (Baht)	
		Actual	Target	Delivery	Target
Angthong - 2 districts, 10 tambols	142	585	500	5,700,000	(no targets set by province)
Ayuthaya - 1 district, 4 tambols	117	600	500	6,840,000	
Lopburi - 1 district, 10 tambols	124	584	500	7,001,000	
Supanburi - 1 district, 7 tambols	134	586	500	5,391,652	
Total	517	2,355	2,000	24,933,652	29,000,000

Source: DOAE, 1994

4.2.2 Training Enumerators

With cooperation from the DOAE officer, four junior staff of the DOAE were provided and utilized as field enumerators for this study. It could be argued that DOAE staff might be biased in terms of data collection. However, it was the most practical and productive way to use them in this study because:

1. They have knowledge of the study areas due to their agricultural background;
2. They had no problem with the field work situation, as they were familiar with extension work and knew how to communicate with farmers as a result of both their educational background and job training with the DOAE;
3. With limited time and budget, it was necessary to have disciplined and experienced survey team members;
4. Although they are staff of the DOAE, they were not involved in the diversification project; and
5. They are junior staff, and therefore derived no benefit from this project, especially at the initial stage.

All of them were called for a training session. Besides the objectives of the survey, the project description was briefly explained. This included information concerning the project areas, target groups and sampling frame. This aimed at making the enumerators understand the purpose of the survey and the working areas. After that, the questionnaires were explained in detail, question by question. The form of pre-coded answers was clarified. For example, coding of various occupations was provided likewise – "1" defined full-time farmers, "2" stood for

government employed and so on. However, the enumerators were free to write in the full text if necessary. The same principle was applied with regard to the local unit used. The enumerators were free to take down whatever the farmers said and rework this at the end of each day. In case there was additional relevant information, they had to note it down and clarify it later.

4.2.3 Structured Field Survey for Crop Year 1993/94

The survey was scheduled for June 1994, a year after the project was launched. The provincial and district agricultural officials of the pilot project were informed and asked for cooperation. The list of all the farmers in the project group together with their location, diversified areas, activities and credit obtained were provided. Since the members of the project group are scattered across 4 – 10 tambols in each province, the samples should include all those tambols. Trying to be practical and not biased, the samples were distributed across as many tambols as practical for the logistics of field work as a complementary criterion in addition to the requirements of scientific sample design. As a result of this procedure, the samples were drawn on a random basis in the three tambols with the highest density of farmers in the project group in each district of Ayuthaya, Lopburi and Supanburi provinces. With the two districts involved in Angthong, the sampling there included 5 tambols.

The names of farmers and appropriate reserves were clustered by tambol and sent to the extension officials at the district and tambol levels in advance. A time frame for interviewing was set. This was based on a rough estimation based on the experience of the pre-test questionnaires. The number of respondents in the non-project group was also identified. Although the sampling frame of this group was set as 20 farm families for each site, the random number was set at 25 - 30 for reserve purposes. These were distributed in the same tambol as the project group.

The place and time set for interviewing were pre-set and adjusted by the local officials in order to improve the logistics of field work. The interview places varied from site to site. Sometimes it took place at farmers' houses, at a temple, school or at the tambol agricultural centre. The places were chosen in terms of convenient accessibility for the interviewees. This was mostly organized by the tambol extension officers who knew the areas well.

Most of the farmers who came to the interview were heads of the household while some of them were spouses in case their husbands were not available. It is common in Thai society when one calls for an interview that the men are presented as household heads, but this does not mean that Thai women have lower status or are in a subordinate position to men. Benja (1992) stated that in practice, Thai society is a bi-dimensional decision-making system. While male household

heads are mainly concerned with extra-household matters (economics, policies), many important household decisions rest firmly in the hands of the wife and her mother.

Supervision during the structured field survey was essential despite the training beforehand. For example, it was explained in the training session that types of occupation identified in the demography part of the questionnaire related to non-farm employment, and that any family member who had non-farm work either on a part-time or full-time basis had to be recorded. However, enumerators often failed to record non-farm employment of the members who were engaged full-time in farm work, but were taking up non-farm work during the slack time. Land use of the project group was another point that caused confusion among the enumerators. Although it had been explained to them that in crop year 1993/1994 the project farmers began with one cycle of rice before modifying a plot to orchard due to late delivery of the credit, they simply missed the first crop of rice during this year. A similar confusion arose in the questions about vegetable growing. The enumerators were familiar with recording individual crops, but not with the mixed form of vegetables grown as an inter-crop and counted as a cycle. However, these problems were alleviated when the enumerators gained experience after a few days.

Although clarification and supervision were done at the time and place of interviewing, all questionnaire forms were collected and checked for accuracy in the same evening. The enumerators were asked to validate in case some parts were not clear. However there were some parts that they could not remember, so these were retained for validation later. This procedure consumed about five days for each site. The survey was carried out province by province, starting from Lopburi followed by Angthong, Supanburi and Ayuthaya. It took about a month to complete the structured field survey. However, the data was not clean enough for processing. So quick visits to some sites were made in order to meet some specific farmers for data validation.

4.2.4 Structured Field Survey for Crop Year 1994/95

In 1994, one year after launching the pilot project in four provinces, the project was integrated into the restructuring agricultural production work plan. The programme for diversification out of rice was expanded to cover both irrigated and rainfed areas. Any areas which farmers identified as not suitable for rice could request support for diversification from the project, with the same procedure of implementation. Thus from 1994 onward, the range of factors had grown so much that it would have been difficult and impractical to design an all-inclusive framework for research, i.e. studying all possible combinations by means of case studies. So in view of the research focus, the study was restricted to purposefully selected sample areas within the 22 provinces of the Chao Praya River Basin, as proposed a year before. Furthermore, the empirical study was limited to irrigated areas. This implied that no rainfed areas were included because

that would have diverted the focus from the central theme of competition for stored water resources.

The sampling frame was expanded further to cover the whole river basin. The provinces of Phitsanulok and Kampaengphet were selected in addition. As mentioned earlier in Chapter I, the former was selected to represent the conditions of a gravity irrigation zone without land consolidation in the Lower Northern Region of the country, while the latter represents the gravity irrigation zone with land consolidation in the upper Chao Phraya area. The structured survey in this year (1995) then was designed for these two provinces in addition to the four pilot provinces of the previous year. The second year survey of the latter aimed to see impacts of diversification on the farms' circumstances after a year of implementation.

Reconnaissance surveys were made to those sites. Since the same farmers who were interviewed in the previous year were the target group for the second survey in the central plain, a number of them were visited. It was found that the social and employment status of those farmers had not changed during the year. Most farmers still had the same occupations, the same farm size with same ownership status and similar attitudes about diversification. Only the education level of the young people had gone up by one class while very few of them had now finished schooling and were looking for a job or starting working.

The obvious change during the year was the much lower investment costs for diversification in the project group, because there was only maintenance cost for the orchards in this year, and no initial investment costs were involved. The significant change in this year was the slightly higher price of rice while much more irrigation water was available than in the previous year. These two factors affected both groups. They caused enlargement of cultivated areas for second rice and alleviated farmers' problems to some extent.

So the questionnaire designed for the second survey in these four provinces in 1994/95 followed the former form at which had been used for the first survey. But all of farm input/output, activities and income were based on a time frame from May 1994 to April 1995. A slight adjustment was made to the questions of the demographic part concerning number of family members, education and occupation. The questionnaire of the second year survey is also shown in Annex II.3 – 4.

Questionnaires used for the first survey in the central plain were also applied to the first survey of the two provinces in the central north. A pre-test for these questionnaires was carried out at the same time as the reconnaissance surveys of these two provinces, held in May 1995. The test showed that the format, sequence and content of the former questionnaires could be retained for

the northern provinces. Only some details in some sections were different, i.e., less opportunity for non-farm work of people in this part of the country, unsuitable areas for vegetable growing in Kampaengphet and so on. These were explained to enumerators before beginning the survey.

The local extension officers were asked to organize the structured field survey once again. In the case of the four provinces in the central plain, the list of farmers was sent for appointment with a pre-set schedule. The interviewees in these provinces however were the same respondents as the year before while the samples in the two provinces in the north were selected randomly, using the same procedure as before in the central plain. Although the project boundary was expanded to the non-suitable areas for rice in both irrigated and non-irrigated areas in the year 1994, samples were restricted within irrigated areas as explained in Chapter I. Based on these criteria, the samples in Phitsanulok Province were distributed in five tambols of the two districts of Prompiram and Banrai, as they were fully irrigated by the Phitsanulok Irrigation project with land consolidation. The samples distributed in the three tambols of Khlongkhlung District in Kampaengphet rely on gravity irrigation with pumping facilities from the Ping River of the upper Chao Phraya river system. The sample size in each province was restricted to 30 – 35 for the project group and 20 – 25 for the control group, the same as the samples in the four pilot provinces.

The survey was carried out in June 1995 in the central plain and in July 1995 in the north. It should be noted that it was not easy to get the same individuals in case of the central plain, especially within the specific time frame of the survey. However with good cooperation from the local extension officers, nearly all of the farmers interviewed during the first year were present for the second round of interviews. The summary of the sampling and time frame is shown in Table 4.2.

Table 4.2 Samples taken for the structured survey in the study areas

Provinces	No. of respondents in 1994			No. of respondents in 1995		
	Project Group	Non-project group	Total	Project group	Non-project group	Total
Lopburi	32	21	53	29	20	49
Angthong	30	20	50	30	20	50
Ayuthaya	30	20	50	29	16	45
Supanburi	30	26	56	29	23	52
Phitsanulok	-	-	-	30	21	51
Kampaengphet	-	-	-	30	20	50
Total	122	87	209	177	120	297

The structured surveys were performed in the same manner as in 1994. Questionnaire forms were checked at the end of the day and enumerators were asked for immediate clarification and validation when it was necessary. The interviews went smoother and faster because on the one

hand the enumerators were experienced (the same enumerators were employed), and on the other hand, recording the production costs of diversification in the four provinces of the central plain was less complicated than in the previous year, as only maintenance cost were incurred while there was no production yet. In order to obtain consistent information between these two years, the old filled-in forms relating to each farmer was provided in comparison. They were referred to from time to time.

4.2.5 Advantage of Co-operation with the DOAE Officials

One might argue that utilizing the DOAE officials as enumerators might lead to possible bias in the results. The farmers might give unreliable answers during interviewing because they are responding to officials. However besides the advantages of using officials as enumerators (as identified in section 4.2.2), in reality it is not easy to get co-operation from the local extension officers and farmers. One cannot go straight to the village and ask 50 farmers about their livelihoods, production, income, problems and so on. Farmers are far more likely to cooperate when DOAE officials work in collaboration with extension officers, who are known to farmers. It is not only a matter of efficiency in terms of organizing the survey over large areas of six provinces, but also effectiveness because farmers are more likely to answer questions concerning production when asked by enumerators who engaged with agricultural matter [1]. Moreover, it is not easy to assemble identified farmers for interview; they are highly mobile and often away from home. Then difficulties would arise because of high non-response rate. As enumerators and local extension officers are in the same department, this made for a smooth operation during the field work, especially those junior staff enumerators who gave respect to the local officers. Without the assistance of the latter, the interviews would not have been completed in time, farmers would not have shown up, and especially those farmers followed up in the year 2 survey (crop year 1994/95).

4.3 Data Processing and Analysis

After the data was checked, it was entered for processing and analysis. With the purpose of comparative study, the data collected from the structured field survey in crop year 1993/94 and 1994/95 (as mentioned in section 4.2.3 – 4.2.5) was arranged into 12 sub-groups, disaggregated according to location and group. That means the two batches of project and non-project groups of farmers from each province were approached separately. The data derived from the surveys

[1] Farmers were not directly asked about farm income, this was calculated from production figures. However respondents were questioned about non-farm income. Because extension officials are not concerned with tax issues – being in a separate government department, then farmers were willing to discuss such matters.

was processed by each variable and presented mostly in the form of descriptive statistics. This was used to describe the farmers' circumstances in the study areas, the details of which are presented in Chapter V. Even that, however, can only give a broad view of diversification, but not specific details. It turned out that even the great variety of *quantitative data* processed in this study could not adequately cover the complexity and diversity of diversification experience of each farmer. For example, the diversified areas and activities varied from farm to farm. Types of orchard, vegetable and fish were mixed in the diversified plot of each farm, and were different from the others. Therefore *qualitative data* was used to illustrate the effects of diversification on farmers' livelihood and is presented in Chapter VI.

The descriptive statistics showed potential of being analyzed by more advanced means. This provided a good opportunity for testing factors influencing decision making of farmers towards diversification. Since this is one of the most important aims of the study, the data was reshuffled and tested with a few selected variables. The detailed analysis regarding these issues is presented in Chapter VII.

4.4 Focus Group Surveys

After deciding to study the effects of diversification on farmers' livelihood and to illustrate them in the form of case studies, additional specialized focus surveys were carried out in mid-1997. These aimed to follow up the situation after a few years of implementation and select some farmers for case study at the same time. The farmers who were called for the meeting this time were screened from the information derived from the structured surveys. They are in the range of mean of variables set in questionnaires. For example, their farm size, diversified areas, is in the mean of average size in the same respondent group, diversified activities are in the same mode as the others in the same group and so on.

Therefore, 6 – 9 farmers from each tambol were selected and called for a meeting. That means the focus surveys were carried out in every tambol where the structured survey had been performed.

4.4.1 Use of PRA for Collecting Additional Information and Selection of Case Studies

Collecting information at this time was not in the form of individual interviewing, but rather as group discussion, using the PRA (Participatory Rural Appraisal) technique. The farmers were stimulated to discuss among themselves while the tambol extension officers and the author played the role of organizer and facilitator respectively. Time for group discussion was about 1.5 – 2 hours per group. The discussions yielded valuable results. It was found that a number of

farmers had converted back to rice while many farmers did continue with their orchards at the same time.

The debate in group discussions showed that farmers could find solutions suited to their circumstances. They were not making their decisions based only on maximizing economic achievement, but on a weighted assessment of farm resources management and the influence of external factors. The group discussions revealed that some farmers could be considered for more in-depth case study work. On this basis, one to two farmers from each province were interviewed individually in much greater detail after the group discussion. This aimed to illuminate the diversity of experience in different contexts. For example, reasons for diversification, objectives, farm resource management, impacts, results and expectations of diversification might be different from farm to farm. Altogether these individual discussions with farmers resulted in twelve preliminary case studies. They were compared to each other to finally decide on a set of only four case studies that were written up in much more detail, because they represent the most significant patterns of farmers' individual decisions and management. These four cases are presented in Chapter VI.

The focus surveys using a PRA technique were good as a complementary approach to the structured surveys. The outcome of the latter gave a good frame to the former and led to the specific issues. The debate among farmers arose automatically when some did not have the same view as the others. Reasons supporting each side were pointed out. Some had a louder voice and dominated the others. In such cases it is a job of the facilitator to encourage the quiet farmers to speak out from time to time.

In addition to the focus group discussions in 1997, several short inspection trips were carried out to Ayuthaya and Angthong during the year 1998. They served the purpose of keeping in touch with the study areas, farmers and the extension officers. This helped to prepare the ground for the focus group survey in 1999.

4.4.2 Use of PRA to Confirm Results

After reviewing extensive literature regarding the conceptual frame in relation to the empirical study, some doubts were felt about the actual field situation, in relation to the stage of analysis for conceptual discussion and conclusions of the study. The focus surveys were organized again in October 1999, with a similar strategy as two years before. Visits were made to the same farmers, met in mid 1997, in every tambol of the study areas.

Outcomes from the group discussions at this time were interesting. It was found that more farmers had reverted to rice while many of them still keep orchards. This mixture is found everywhere, even at the village level. The mix of practices and the different farmers' opinions at the micro level relates to their specific situation and requires a more participatory approach for project planning and implementation. So the focus survey confirmed the need for a more participatory approach to agricultural extension, and a careful analysis of alternative farming plans. Chapter VIII includes a discussion on how the empirical findings relate to the conceptual presentation on the changing extension approaches (in Chapter III).

4.5 Concluding Discussion

The conceptual discussion is distributed across several chapters. Aiming at supporting the quantitative and qualitative study, a wide range of literature is reviewed with the effect of discovering interesting linkages between concepts in the literature and the empirical findings from the field surveys. Hence the literature review is not a one-off activity, but was carried out continuously in the following areas:

a) Conceptual framework, comprised of

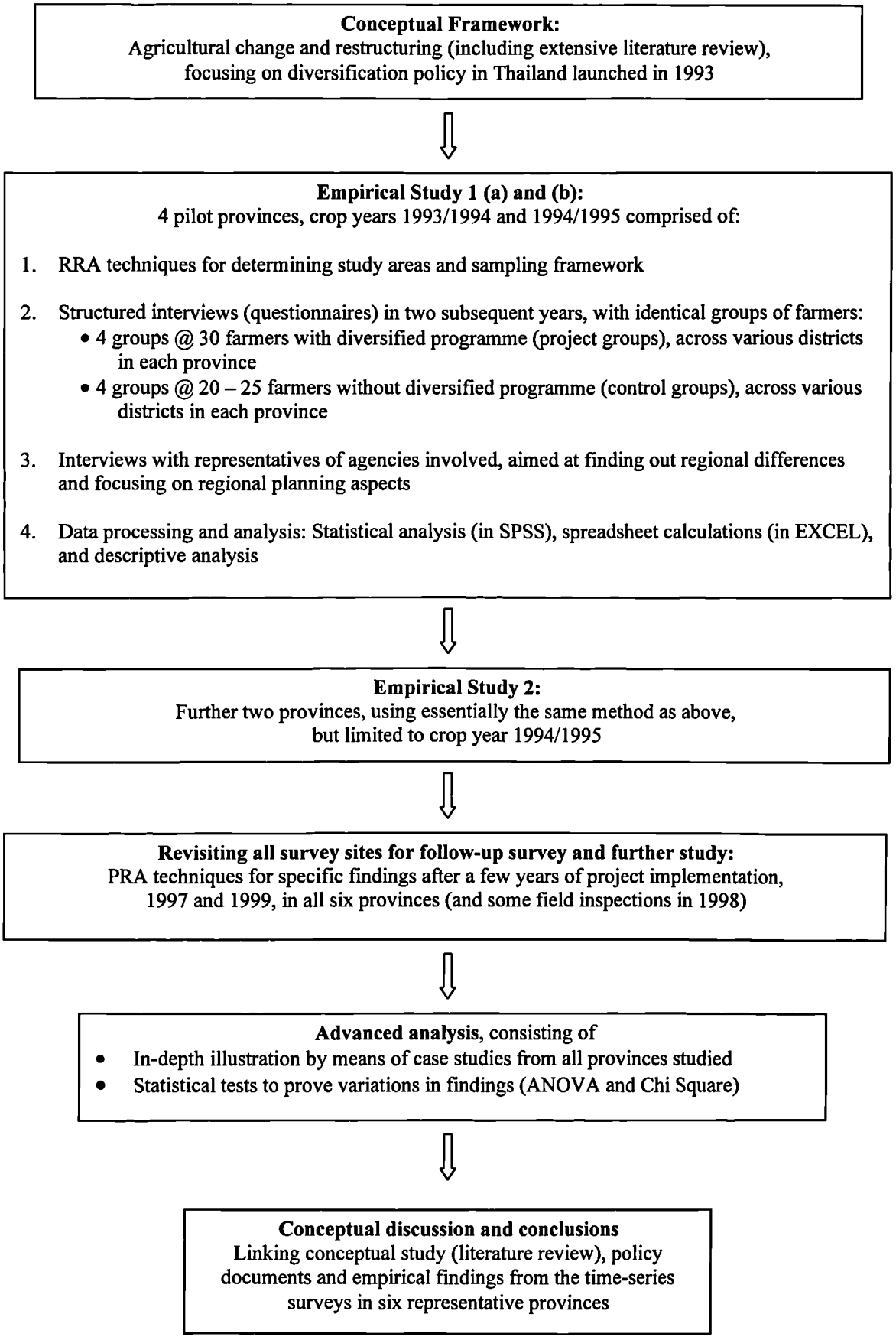
- Thailand's long term socio-economic development,
- Agricultural development and agricultural planning and policy especially in the Thai context.

b) Empirical study, consisting of

- Agricultural extension and participation,
- Farming Systems.

The same applies to the review and discussion of various policies and planning documents that were reviewed from the beginning to the end of the study. Examples are the national plans; documents regarding policy and planning in relation to agricultural development and extension; project descriptions; operating guidelines of the project; various statistics; project evaluations by various agencies; and so on. This multi-stage approach ends with a final conceptual discussion, conclusions and recommendations regarding policy implications of the project in the last two chapters (Chapter VIII and IX).

Figure 4.1: Outline methodology



CHAPTER V Survey Findings from Six Provinces, 1994 and 1995

This chapter is the longest in the entire study. It is the first of three chapters (V, VI and VII) presenting the analysis of the empirical data from the study areas in six provinces. It presents a descriptive analysis of the situation in the study areas, as it existed at the beginning of the long-term study. The ended up including several rounds of field observations and surveys over a period of six years. The analysis covered by this chapter is based on the interpretation of the data obtained from the observations during the initial exploration in 1993, the reconnaissance survey in 1994, and the structured field surveys on two crop years, 1993/1994 and 1994/1995. The primary data from the surveys are presented in combination with related secondary data from other studies and statistics. Data derived from the questionnaire-based surveys were processed, interpreted and analyzed to provide a comprehensive overview of the conditions in the study areas as a background to the in-depth interviews and qualitative discussion (in Chapter VI) and the statistical analysis (in Chapter VII).

Because of its length, this chapter is structured into eight sections that cover essentially two areas :

- first, a relatively brief overview of agricultural developments in irrigation areas in Thailand (all of which is presented in one section at the beginning), and
- second, the empirical findings from the surveys carried out in six provinces in 1994 and 1995. The second part takes up the bulk of this chapter and is further divided into seven sections.

The first section gives a broad background picture to the Chao Phraya River basin and the development of irrigation systems, changing land use and farming practices over a period of about 40 years. This is necessary in order to understand the physical and socio-economic conditions in the study areas.

The second part of the chapter leads into the empirical surveys and begins with a brief section (5.2) on how the data interpretation and presentation are organized (in both main body of the text and the annex). After that, there is a section (5.3) on the basic socio-economic conditions of the farmers in the study areas (as of 1994 and 1995), as a descriptive background to the centrepiece of this chapter, a relatively detailed analysis of aspects that are directly or indirectly related to household incomes (sections 5.4 - 5.6). In this analysis, the farm-based and non-farm income components are presented in separate but interrelated sections. Section 5.7 then summarizes the findings on total household income, and relates the empirical findings to national statistics for the regions in which the six provinces are located. The final section (5.8) adds a qualitative discussion to the statistical findings, based on points arising from the surveys that revealed the farmers'

constraints and perceived problems as well as their views with regard to the diversification project.

Throughout this chapter (sections 5.2 – 5.8), references are made to the statistical tables in Annex I.5.2 and Annex III, as they provide the details to the summaries in the form of bar charts and other graphs presented in the body of chapter.

5.1 Irrigation Systems Development and Changes in Rice Cultivation Practices in the Chao Phraya River Basin since the 1960s

Although the Chao Phraya River itself is not very long, the Chao Phraya river system including all its tributaries covers a very large area. The headwaters of the Chao Phraya originate in the mountainous terrain in the northern part of the country; the four tributaries, the Ping, Wang, Yom and Nan Rivers, join together as the Chao Phraya River in Nakorn Sawan before flowing southwards to the Gulf of Thailand. The distance from this meeting point to the river mouth is approximately 200 km only, much less than the distance from the origins of the tributaries in the North to the confluence at Nakorn Sawan. The Chao Phraya flows through a large alluvial plain, splitting into the four channels, namely the Tha Chin, the Noi, the Lopburi and the Chao Phraya Rivers. The main Chao Phraya flows southwards to join the Pasak River at Ayuthaya while the Noi rejoins the main channel about 25 km downstream of Ayuthaya. The Chao Phraya continues for a further 60 km before entering the Gulf of Thailand while the Tha Chin flows into the Gulf of Thailand some 30 km west of the Chao Phraya river mouth.

5.1.1 The Basin's Features

The entire basin covers an area of about 160,000 km ^{2} (99.5 million rai), nearly one third of the total land area of the country. In terms of land use, the majority of the area (93%) is forest and agricultural land in about equal proportions, while urban areas are small (only 3.5%), other land use and water bodies accounting for the balance. The various types of land use broken down at the level of the eight sub-basins are presented in Table 5.1. Figure 5.1 provides an overview map.

Although the proportions of forest and agriculture areas to the total area are nearly the same, the proportion of each type of area varies very much from sub-basin to sub-basin. As shown in Table 5.1, the forest areas in the Ping and Wang basins are as large as two thirds and three quarters of these basins while agricultural land occupies only 20 – 30%. The proportions of agriculture land in other sub-basins are larger, especially from the main Chao Phraya southwards. Forest areas in both the Pasak and Tha Chin sub-basins are about one third while agricultural areas constitute about two thirds. The largest portion of agricultural areas and smallest portion of forest areas

among these sub-basins is in the Chao Phraya "rice bowl", with nearly 80% of the land under agriculture and less than 10% under forest. [1] Moreover, the proportion of urban areas of this sub-basin is larger (rated at 10%) than in the others, reflecting the urban population concentration in the metropolitan core region.

Table 5.1 Land use in the Chao Phraya river basin (rai)

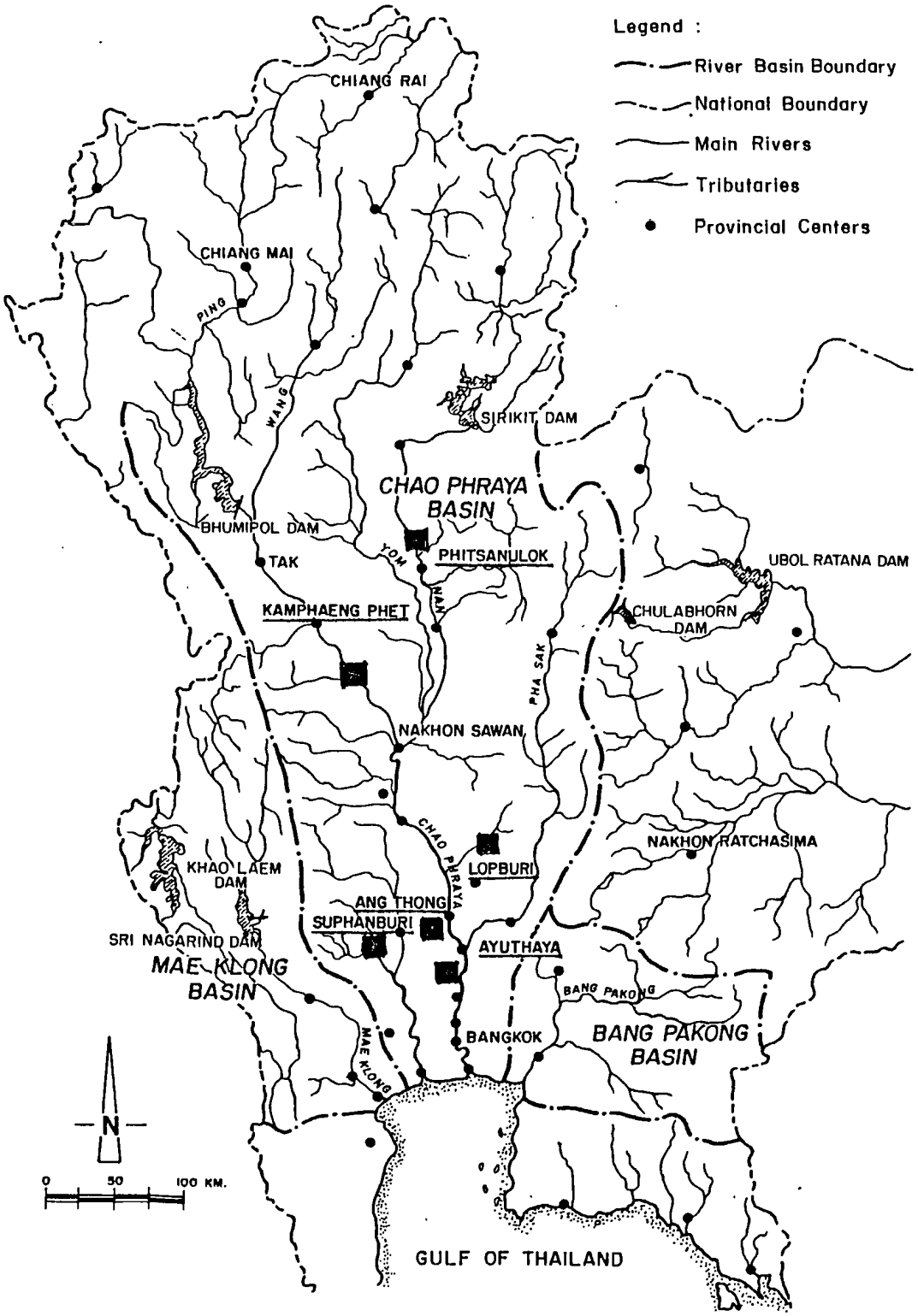
Sub-basin	Agriculture	Forest	Urban	Water	Other	Total
Ping	6,585,750	14,764,390	551,440	151,230	196,430	22,209,339
(%)	(30%)	(66%)	(2%)	(1%)		
Wang	1,412,570	5,058,520	141,410	33,320	281,970	6,927,885
(%)	(20%)	(73%)	(2%)	(0%)		
Yom	4,710,930	6,935,610	319,900	25,810	204,950	12,197,299
(%)	(39%)	(57%)	(3%)	(0%)		
Nan	9,744,740	9,750,820	446,840	242,100	349,190	20,533,787
(%)	(47%)	(47%)	(2%)	(1%)		
Chao Phraya	10,511,490	950,650	1,239,560	335,560	349,570	13,450,927
(%)	(78%)	(7%)	(10%)	(2%)		
Sakae Krang	1,403,110	1,621,570	45,760	28,640	38,690	3,137,869
(%)	(45%)	(52%)	(1%)	(1%)		
Pasak	6,201,208	2,944,860	325,880	18,990	288,490	9,779,596
(%)	(63%)	(30%)	(3%)	(0%)		
Tha Chin	6,210,650	4,104,730	387,390	340,880	272,200	11,315,947
(%)	(55%)	(36%)	(3%)	(3%)		
Total	**46,780,520**	**46,141,150**	**3,472,180**	**1,176,530**	**1,981,490**	**99,552,649**
(%)	(47%)	(46%)	(3.5%)	(1%)	(2%)	(100%)

Note: Most percentages without decimal points, not adding up to 100 due to rounding

Source: Binnie & Partners (Overseas) Ltd., 1997

[1] The data on forest areas appear to be all right in terms of an overall pattern, but do not seem to be accurate.

Figure 5.1: Overview map of the Chao Phraya river basin



Sites of structured field surveys in six provinces

Although the agriculture area of the entire basin is as large as 47 million rai (Table 5.1), the total *irrigated* area of the basin is only about 18 million rai (Binnie & Partners, 1997). But even so, the irrigated areas of the Chao Phraya basin alone account for nearly two thirds (63%) of total irrigated areas (28 million rai) of the country (Table 5.2). This simple comparison shows the great importance of the Chao Phraya basin for the rice economy of the country. Adding the figures for irrigated areas in the North and Central Regions in Table 5.2 (7.56 + 13.37 = 20.93 million rai) shows that most of these are located in the Chao Phraya river basin.

Table 5.2 Irrigated areas by region (million rai)

Region	Agricultural land	Irrigated areas	Percentage
North	29.11	7.56	25.97
Northeast	57.70	4.80	8.32
Central	28.01	13.37	47.73
South	17.23	2.95	17.12
Total	132.05	28.69	21.73

Source: RID, quoted by OAE, 1997

The crop diversification project has been implemented primarily in the irrigated areas of the 22 provinces sharing the basin. So the areas identified and selected for in-depth study do not cover the entire surface of all these provinces, because rainfed areas of some of the provinces were excluded. For example, the study area in Kampaengphet Province in the north is just a narrow strip on the Ping river bank, running from north to south through the province. The study area in Phitsanulok is larger, connecting the river basins of the Nan and Yom. However, the main part of the Chao Phraya basin, from Nakorn Sawan southwards, represents the central "rice bowl" of the country and it contains the largest parts of the study areas selected in four Central Region provinces, Lopburi, Supanburi, Angthong and Ayuthaya.

5.1.2 Changes in Rice Cultivation Practices since the 1960s

As a subsistence crop that is very suited to a river environment, rice has been grown throughout the "rice bowl" area since the beginning of the Ayuthaya period in the 14th century. Exclusive rice cultivation created the traditional pattern of land use in the basin which remained uniform and unchanging until the 1960s, as described by Takaya (1987). The most common rice growing system in the plains at that period was broadcasting for a single crop, relying on rainfall or natural inundation from the annual flooding of the major rivers. This corresponded to the tropical monsoon climate where rainfall is concentrated during five months (May to October). So rice growing and other agricultural activities were undertaken in the monsoon season, but stopped in the dry season. Most of the traditional rice varieties were photosensitive, which have reproductive

growth that responds to the shortening hours of daylight. So this type of rice can best be grown during the monsoon season.

The broadcast culture of the rainy season involved the use of a number of rice varieties to accommodate the subtle differences in ground height and therefore in water availability. Paddy fields were ploughed as soon as the rains began, between late April and early June, broadcasting was usually done in May or June, and the harvest was in December or January in the low land areas. In backswamp areas, harvesting was carried out in either late January or early February due to the cultivation of "floating rice" which takes longer to mature. This type of rice is suited to deep-flooded areas where no other varieties would grow.

It was only since the mid-1960s and particularly in the latter half of 1970s that rice culture in the central plains changed remarkably with the introduction of double cropping, improvements in the traditional broadcasting methods and transplanting, all of which have expanded greatly since that time. Such changes in rice culture also reflected an increase in intensity which was made possible by mechanization. For example, the four-wheeled and two-wheeled tractors quickly replaced buffaloes from the early seventies. Later, in the 1980s, the method of wet broadcasting (with germinated seed) was widely adopted, responding to labour shortages which were then increasing drastically due to competition for labour use from other sectors. However this technique is limited to places where water conditions allow it. In the late 1980s and 1990s, combine harvesters largely replaced the traditional harvesting and threshing methods. The growth in rice productivity was supported by the improvements in irrigation facilities since the Second World War, followed by the changes towards greater mechanization which was a response to the increasing labour shortage.[2]

The present rice-growing practices in the central plains differ very significantly from those of only thirty years ago, even though, at first sight, the appearance of the traditional rice-bowl landscape may not have changed so much (at least to the untrained observer who would probably not notice the irrigation system changes and improvements).

5.1.3 The Greater Chao Phraya Irrigation Project

The first large-scale irrigation works in the Chao Phraya river system was the Rangsit drainage and irrigation scheme north of Bangkok, which was built during the first decade of the 20th century. The project added a new dimension (both technically and economically) to the 19th-

[2] see Takaya (1987) page 25 and Kasetsart University, ORSTOM (1996) pp. 156 – 158 and 165 – 172.

century pattern of irrigation and drainage canals around the capital, and the traditional small-scale irrigation facilities further upstream. However, it was almost half a century later that a national irrigation project at a very large scale commenced in 1952 – the Greater Chao Phraya Irrigation Project.

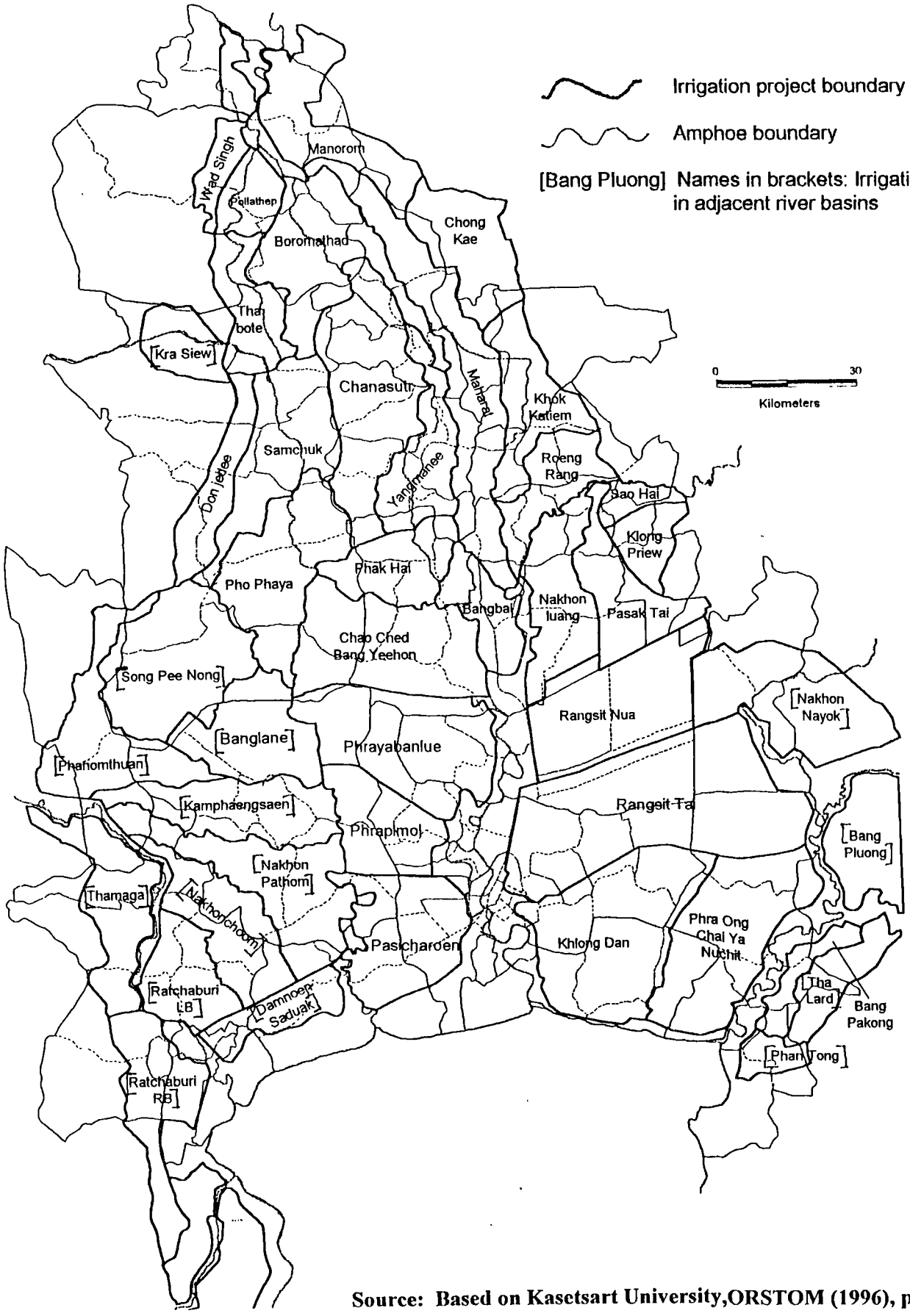
It is important to understand the differences between the traditional irrigation schemes that had been built and operated for a long time, notably in Northern Thailand, and the "modern" large-scale schemes such as the Greater Chao Phraya system. First of all, there is a major difference related to management. Traditional "muang fai" systems [3] in the North were village-managed affairs; modern systems are built and managed by the state. Technically, irrigation canal systems always consist of water supply and drainage conduits, but the difference mainly concerns the period during which irrigated agriculture is facilitated by the system. The difference lies not only in the scale, but also in the fact that traditional small schemes, but also the Rangsit system, are only able to provide supplementary water during the rainy season, i.e. reaching areas away from the natural water courses and providing water during the dry spells that would normally occur during the rainy season. The modern large-scale systems, however, provide irrigation water for the whole year, especially for the dry season when formerly water was not available for the cultivation of rice or other crops. So the effect of such full-scale irrigation facilities is the possibility of double or even triple cropping, where in former times there was only enough water for a single crop, and sometimes for a short vegetable crop in addition. The water supply for the dry season comes from water storage dams such as Bhumibol and Sirikit dams, the largest of the national dam projects built in the 1960s.

After completion of the Greater Chao Phraya Project, a second large-scale scheme was constructed in the upper Chao Phraya basin, namely, the Phitsanulok Irrigation Project which is located in the lower North Region. The two large irrigation systems are shown in Figure 5.1, along with the location of the six provinces selected for this study.

The Greater Chao Phraya Project started with the construction of the Chainat dam, or the Chao Phraya diversion dam, during 1952 – 1957 and its main and secondary irrigation systems during 1952 – 1963. This project provided an irrigation canal system and gave some degree of water control over one million hectares (about 7.6 million rai) in the Chao Phraya Plains, which occupies nearly 60% (56.8%) of the total irrigated areas of the central region (as shown in Table 5.2). This large project consists of 26 sub-projects (Annex I.5.1.1), and covers areas in 16 provinces of 4 regions (Figure 5.2 and Table 5.3).

[3] see Tanabe (1994) pp. 125 – 169.

Figure 5.2: Irrigation projects in the Chao Phraya plain



Source: Based on Kasetsart University,ORSTOM (1996), p. 18

Table 5.3: Provinces reached by the Greater Chao Phraya irrigation system

Region	Provinces
Central	Bangkok, Chainat, Nonthaburi, Pathumthani, Lopburi, Singburi, Saraburi, Ayuthaya and Angthong
East	Chachoengsao, Nakorn Nayok, and Samut Prakarn
West	Nakorn Pathom and Samut Sakorn
North	Nakorn Sawan

Source: Direk, 1986

Improved drainage and flood control and the possibility of using irrigation water during dry spells in the wet season enabled a shift from broadcast to transplant rice and reduced the damage caused by flooding. However it was found that the potential benefits from the major regulation works for the development of year-round irrigated agriculture were not fully achieved. Hence, there was a need to intensify the distribution and drainage system together with improvements in their accessibility. Therefore the "Ditches and Dikes" project was initiated in the early 1960s, aiming at improving the distribution of irrigation water at farm and inter-farm level. This included the construction of tertiary ditches and related structures to convey irrigation water from the laterals to the individual fields. Dikes were constructed to keep rain and irrigation water on the paddy fields. Although this programme helped to improve crop-growing conditions, especially for rice, it did not really improve the overall technical infrastructure down to the farm level. It was considered necessary to improve the existing main and secondary distribution system in order to increase the yield and cropping intensity (World Bank, 1989).

Following this concept, two pilot projects were initiated in the late sixties in an area of 2,500 ha (15,625 rai) in the northern part of the delta in Chainat province. These projects involved the construction of a dense network of tertiary irrigation ditches, field drains, and farm roads, land leveling and farm boundaries. Both projects succeeded in introducing double cropping, as well as assisting in the transition from broadcast to transplant rice culture and from traditional to high yield varieties of rice. The World Bank (1989) reported that the cropping intensity increased to 195% within three years from commencement.

5.1.4 The Chao Phraya Improvement Project

With the success of the pilot projects, the government embarked on a long-term programme to expand double cropping areas in the Chao Phraya plain. Hence "the Chao Phraya Improvement Project" was implemented in two stages during 1973 – 1978 (the first stage) and 1977 – 1982 (second stage). The first stage covered a gross area of about 16,000 ha (100,000 rai) while the second stage covered 63,000 ha (nearly 400,000 rai) of development areas together with 138,000 ha (nearly 900,000 rai) of rehabilitation works. Both projects were implemented in the northern

part of the delta in the form of construction of technical facilities similar to those carried out in the pilot projects and complementary improvements to the existing irrigation, drainage and road systems including on-farm development works. As a result of the improvement and rehabilitation works in these projects, double cropping of rice and the cultivation of dry-season crops, which were hardly practised before 1972, expanded dramatically during this period. Two of the most important supporting factors were dry-season water which had became available from the Sirikit Dam and the increasing rice price. The construction of the Sirikit Dam on the Nan river had been completed in 1972, complementing the Bhumibol Dam which had been constructed on the Ping river in 1964, principally for energy generation purposes. The water resources stored in these two dams enabled the Royal Irrigation Department to supply water to the delta downstream throughout the year, and most importantly in the dry season.

On-farm development measures have supported the objective of increasing dry-season cropping so as to ensure optimal use of storage water from the two large dams. Dry-season cropping in the northern Chao Phraya areas has greatly increased since 1976 in both project and non-project areas. It was reported by the World Bank (1989) that cropping intensities in the project area were higher than the non-project areas. The intensities were in the range of 150 – 200%, for two reasons (i) because it is technically possible for all farmers to grow dry-season crops in the on-farm development areas, and (ii) because these areas receive higher priority in water allocation.

On-farm development however does not cover the entire area of the Greater Chao Phraya Irrigation Project even though a land consolidation programme was implemented in 1974. In order to achieve full development of the area's production potential, many different forms of land consolidation were applied. Almost one million rai was consolidated through redesign and re-allotment of plots over the period of 15 years. However, a report from Kasetsart University, ORSTOM (1996), suggests that insufficient attention was paid to on-farm development and many areas still suffer from improper control (irrigation and drainage) at plot level, with inevitable impacts on the level of yield.

Therefore, the rest of the area which is about 40% of the central plain, has no on-farm development. Most of these areas are in the lower delta, where such concerns are less relevant because of the flatness of the area. Instead, this area requires water control by expanding canal excavation, in order to distribute water available to the whole area. This includes works at the secondary or tertiary levels, many of which can be done by the farmers themselves. This work comprises of pumping and the construction of regulators to keep the water in the dry season and to protect fields from salt water intrusion, dredging existing canals, and constructing dikes for flood protection purposes. As retaining fresh water coming through rivers and canals from the upper delta is the main objective, this type of irrigation system is often referred to as a "conservation

system" and the area as a "conservation area", in contrast with the "gravity irrigation area" of the northern part of the Chao Phraya plain.

5.1.5 The Phitsanulok Irrigation Project

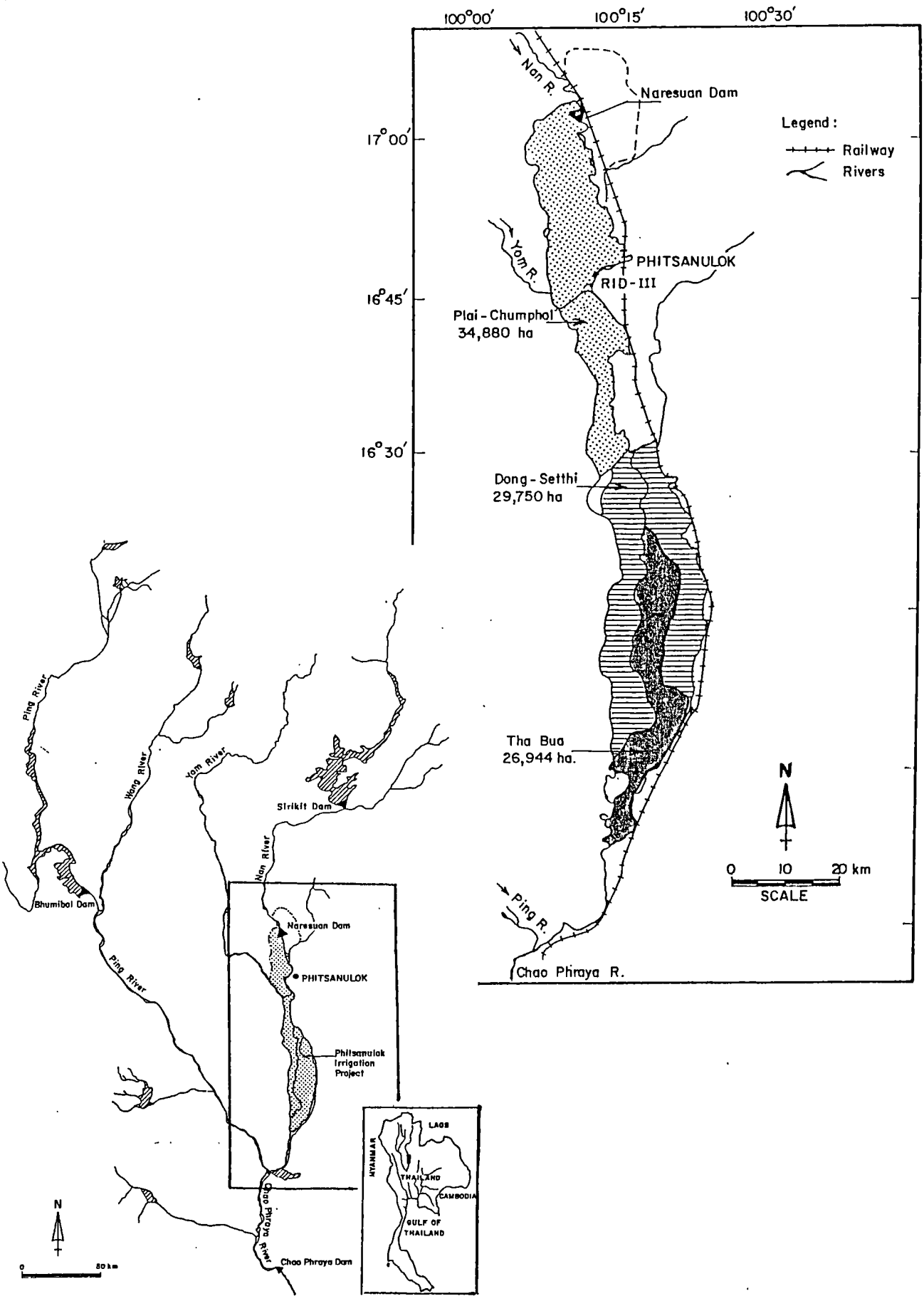
The Phitsanulok irrigation project provides irrigation and drainage for about 91,600 ha or 572,500 rai within a total project area of 148,000 ha on the banks of the Nan River in the provinces of Phitsanulok, Pichit and Nakorn Sawan. This is a development project of the Nan River Basin, utilizing water available from the Sirikit Dam. The project includes: (i) construction of the Naresuan diversion dam in Prompiram District in Phitsanulok Province and navigation locks on the Nan River; (ii) construction of canal systems, flood control works, drains and service roads; and (iii) on-farm works consisting of irrigation and drainage ditches, farm roads, land levelling, and possible realignment of farm boundaries.

The project consists of the three sub-projects (Figure 5.3), namely:

- Plai Chumpol, covering 34,880 ha or 218,000 rai near the headworks of the north
- Dong Setti, covering 29,750 ha or 185,940 rai in the centre, located in Pichit Province
- Tha Bua , covering 26,944 ha or 168,400 rai in the centre and the south, located in Pichit and Nakorn Sawan Provinces

With the completion of the irrigation system construction in 1985, a total area of 83,266 ha of on-farm development was brought into play. The system delivered water to supplement the wet-season rainfall in 1985 while it permitted the first dry-season cropping a year later (1986). This changed the agriculture characteristics (and the farmers' livelihood conditions) in the development areas. Rice cultivation was not limited to a single broadcast crop in the monsoon season. Facilitated by the irrigation facilities, rice varieties shifted from local to high yield varieties (HYVs), from broadcasting to transplanting practices, and increasing dry-season rice cultivation. It was reported by the World Bank (1989) that annual crop incomes per capita doubled or tripled as a result of the project (the World Bank, 1989).

Figure 5.3: Phitsanulok irrigation project (with three sub-projects)



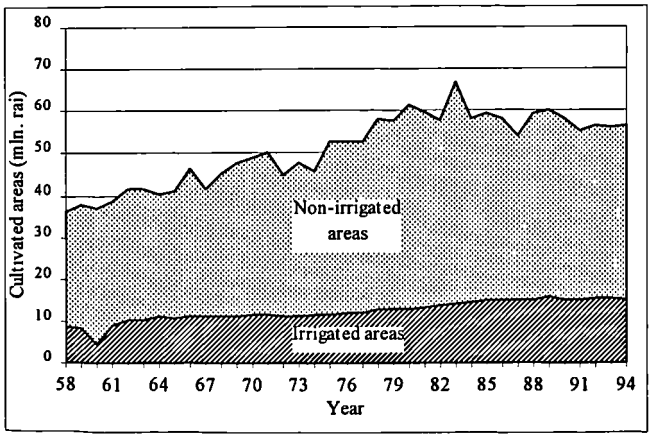
5.1.6 Land Use Patterns in Irrigation Areas

The Royal Irrigation Department (RID) keeps statistics about the developments in the major irrigation areas throughout the country. The RID statistics refer to 12 projects initiated and operated by the Department. (For an overview of the 12 project areas, see Annex I.5.1.2.) Against this general background, the focus is on land use characteristics in irrigation project 3 (Kampaengphet and Phitsanulok provinces) and irrigation projects 7 and 8, where the four central plain provinces are located. So this section provides a broad view of land use and land-use changes, before focusing down to consider the land use patterns of the respondents' farms in the selected six provinces.

- **Land use patterns in all 12 irrigation projects**

As one of the most important crops of the country, the rice cultivation area (both for subsistence and commercial crops), has increased over time, in both irrigated and non-irrigated areas. Statistics available from the RID (1995) show that, by 1993, cultivation area of major rice in irrigated areas operated by the RID was 15.14 million rai, representing about half (53%) of the total irrigated area of the country (as shown in Table 5.2 above), and about a quarter of the total rice cultivation area (approximately 56 million rai in 1993). Moreover, the statistics also show that the areas in irrigation projects during the long-term observation period of 35 years, from crop year 1957/58 to 1993/94, are more stable than the areas outside the projects. This is because of the supplementary irrigation provided in the rainy season during dry spells, while other areas show considerable fluctuations corresponding to the natural rainfall regime (Figure 5.4).

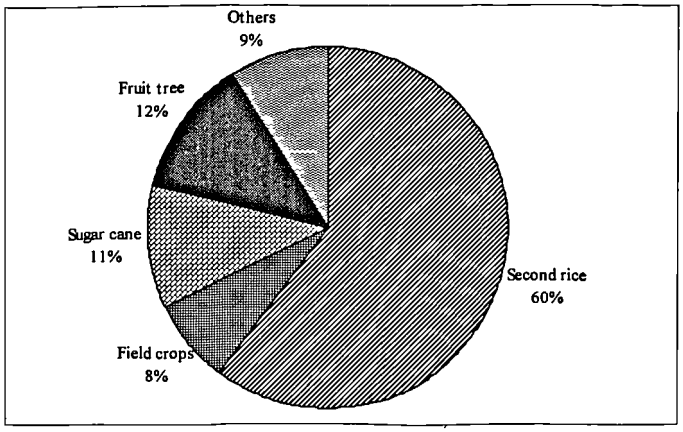
Figure 5.4 Long-term trends in major rice cultivation areas in irrigated and non-irrigated areas, 1957/58 - 1993/94



Source: RID, 1995

Irrigation does not only facilitate supplementary wet-season rainfall cropping, but also permits dry-season cropping. According to the RID statistics, about 8.5 million rai were utilized for dry season crops in crop year 1995/96. The share of second rice alone represented about 60% of the total irrigated area of all 12 irrigation projects. This is much larger than any other second crop enterprise. As shown in Figure 5.5, fruit trees and sugar cane had similar shares (12% and 11%) while field crops had a smaller share (8%). The remaining area, which is combined into an "others" category consists of vegetables, non-fruit trees and aquaculture, occupying 2, 3 and 4% to the total area respectively.

Figure 5.5 Share of dry season crops in irrigated areas



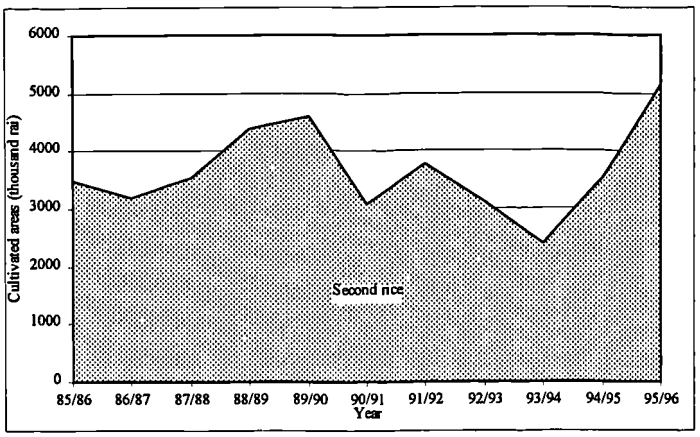
Source: RID statistics

In contrast with the observed steady conditions for major rice in irrigation areas, the situation of second rice fluctuates considerably (Figure 5.6). The area under second rice in all 12 irrigation projects increased by about 44% from crop year 1986/87 to 1988/89. This was a result of the completion of the "Phitsanulok Irrigation Project" (World Bank, 1989) in late 1985, which aimed at improving the efficiency of dry season water supply from the Sirikit Dam on the banks of the Nan River, and covered areas in Phitsanulok, Pichit and Nakorn Sawan. Figure 5.6 shows the considerable fluctuations in second-rice cultivation in the 12 RID project areas over a period of 10 years, with the lowest figure for 1993/94 at about 2.2 million rai and the highest figure for 1995/96, at over 5 million rai.

During the same ten-year period, the second-rice cultivation area in the upstream Phitsanulok Irrigation Project (which is part of the Chao Phraya basin) increased rapidly from around 140,000 rai in 1985/86 to an average of around 350,000 rai in 1989/90 and reached almost 450,000 rai in 1991/92. The changes after that correspond to the changing market prices and water levels available. The sharp decline in 1989/90 – 1990/91 relates to the decline of (i) water supply from the Bhumipol and Sirikit dams and (ii) the price of second rice during these years. Although second rice areas recovered slightly in crop year 1991/92 in accordance with stable water supply

in combination with a rising rice price during 1990 – 1992, it declined sharply in crop years 1992/93 – 1993/94. Rice farmers seemed to reach a critical stage at this time. The farm gate price of second rice fell as low as 2.96 Bt./kg, the same low as four years earlier (2.95 Bt./kg in 1990) while the availability of water from the two dams was the lowest since their establishment. The extent of second-rice increased again from crop year 1994/95 on. The area under second rice cultivation clearly responded both to fluctuations in the rice price and to variations in water supply (also compare Figures 1.1 and 1.2, Chapter I, where this point has been made in more general terms).

Figure 5.6 Cultivated area for second rice in all 12 irrigation projects, 1985/86 – 1995/96



Source: RID statistics

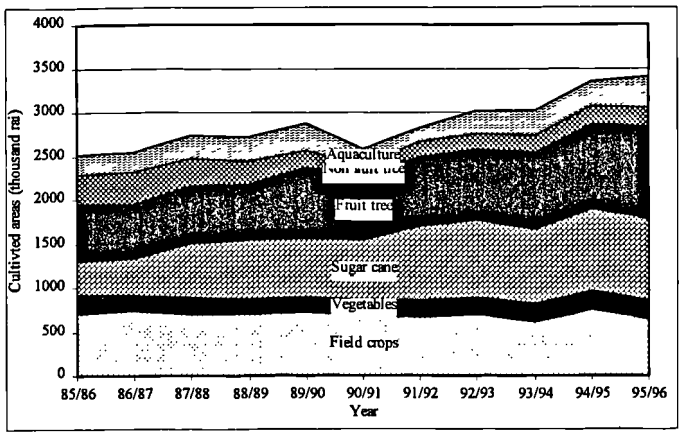
Unlike second rice, other dry season enterprises show less variability. Figure 5.7 shows that the cultivation areas of field crops, and non-fruit trees dropped slightly during the ten-year period while the vegetables area was relatively stable, and there was a slight expansion in fisheries. The only two crops that expanded significantly during this period were sugar cane and fruit trees. Their expansion rate was about 2.5 and 1.6 times, respectively.

- **Land use characteristics in irrigation projects 3 and 7&8**

After giving the overall picture of various dry season crops in all 12 irrigation projects across the country, it is worth-while looking at the RID statistics at the project level, focusing on the study areas in the North (project 3, Kampaengphet and Phitsanulok provinces) and in the central plains (projects 7 and 8). This break down shows that changes in the cultivated areas of second rice, field crops, and sugar cane in project 3 were very dynamic. From 1985/86 to 1989/90, the cultivated area of second rice increased by about 200% or three times more than the previous five years, while it was rather stable in projects 7&8 (only 10% increase), and rose by about 30% in all 12 projects. After declining in 1990/91 and 1992/93 – 1993/94, the latest available statistics for second rice area (crop year 1995/96) show that for project 3 the area cultivated is nearly 5 times

larger than that in 1985/86. In contrast, the expansion rate during this time in projects 7&8 was 1.4 and 2 times, respectively, (similar to the average value for all 12 projects).

Figure 5.7 Cultivated area of dry season crops in all irrigation projects



Source: RID statistics

Expansion of the sugar cane area was also significant during this period in project 3. Its cultivated area in crop year 1995/96 was about 3 times larger than that in 1986/87. This was less than its expansion rate in projects 7&8, about a five fold increase and similar to the average in all 12 projects which was about 2.5 times in the same period.

The experience of field crops was different again. Their cultivated area in projects 7&8 in crop year 1995/96 was only about 30% of that in 1985/86, and it was reduced by 10% in all 12 projects during the same period. However, an expansion of these crops could be found in project 3 where their cultivated area in 1995/96 was nearly 3 times larger than in 1985/86. In contrast, the fruit-tree area increased by 62-65% in projects 7&8 (and by a similar margin in all 12 projects), while it declined by 40% in project 3.

As a preliminary interpretation of the RID statistics, one might conclude that the expansion effect of irrigation improvements was felt very strongly in the area of project 3, because the ten years observed coincided with the period of time right after the opening of all-year irrigation. In contrast, the changes in the older areas (projects 7 and 8) where irrigation had been available before 1985, reflected the changes in market opportunities for the various crops that could be grown (or not) during the dry season.

Tables I.5.2.1 – 3 (Annex I.5.2) provide the essential statistical figures (in addition to the graphics in this section of the text) on the cultivated areas of dry season crops for these particular projects, because they are associated with the study areas, as a background on general land use changes

experienced over a ten-year period. This is useful as a comparison base for the data derived from the structured surveys in the six provinces.

5.2 Organization of Data Interpretation and Presentation

Owing to the fact that it has taken an unforeseeably long period of time to complete the study, the socio-economic and political reality in Thailand at the end of the study has been markedly different from the time when it was conceptualized in 1993. Therefore, the methodology had to be adjusted in order to capture the "external" events that have influenced the more "internal" changes, the latter include the agricultural policy formation and the farmers' decisions in response to those external and internal factors. Reflecting the adaptations of the research methodology over time, Chapter I includes an overview table (Table 1.1), which is referred to here; Chapter IV also has a flowchart on the organization of information gathering in several stages. This chapter focuses on the large-scale structured interview surveys that were undertaken in 1994 and 1995

As pointed out in Chapter IV (research design), the empirical study was designed to compare the conditions and decisions of those farmers who adopted the diversification project's recommendations, with those who did not participate in the pilot project. This being the main distinction between project and non-project groups, the survey was also designed to bring out the differences among provinces and regions, and as far as applicable, to compare the changes during two crop years (1993/94 and 1994/95). Therefore, the descriptive analysis presented in this chapter is not limited to the comparison between groups (project and non-project), but also covers the differences across the six provinces studied, and the emerging differences through the first two crop years covered by the diversification project. Apart from that, the analysis throughout this chapter relates the empirical findings to concepts (that have been discussed in some detail in Chapters II and III) and national or regional statistics.

5.2.1 Main Text and Annex Materials

The very large data sets processed and tabulated cannot be presented in the main text in detail, as this would result in losing sight of the main findings. However, all details of the tabulation of the survey data are available in two annexes. Annex I.5.2 presents a set of tables that resulted mainly from the farm economics analysis. So these tables provide details on cultivated areas, land use in six provinces and farm incomes. Annex III is broken down into 3 sets of tables (III.A, B and C) that are organized according to the three sets of survey data as follows:

- Tables III.A.1 – 14 cover the data set for the two groups of farmers in the four provinces in the central plain derived from the survey of crop year 1993/94.
- Tables III.B.1 – 14 cover the data set for the two groups of farmers in the four provinces in the central plain derived from the survey of crop year 1994/95.
- Tables III.C.1 – 14 cover the data set for the two groups of farmers in the two provinces in the north derived from the survey of crop year 1994/95.

Each group of respondents is divided into the two main categories of project and non-project farmers (for the sample size refer to Table 4.2, Chapter IV). The short names for the provincial sub-groups would be used in the text in order to avoid repeating the "long-hand names" such as "the non-project group in Kamphaengphet". This would sometimes be referred to as the "Ka-N group". The following Table 5.4 introduces such short names:

Table 5.4: Short reference names of respondent groups

Location		Representative group of respondents located in the same province	
Province	District	Project	Non-project
Lopburi	Banmi	Lp-P	Lp-N
Angthong	Samko and Wisetchaicharn	Ag-P	Ag-N
Ayuthaya	Latbualuang	Ay-P	Ay-N
Supanburi	Samchuk	Su-P	Su-N
Phitsanulok	Prompiram and Banrai	Ph-P	Ph-N
Kampaengphet	Khlongkhlung	Ka-P	Ka-N

As the diversification pilot project did not include the two northern provinces that were added to the study in 1994/95, this set of data is the closest for comparison with the data for 1993/94 for the four central-region provinces. This is viewed as permissible on the basis of the following reasons:-

- The major comparison is on the influence from the first-year of implementation of the project, which occurred in the north one year later than the four provinces in the central plain. In this respect, the two sets of data are comparable.
- The social conditions in the four central-region provinces (surveyed twice) - such as family structure, education performance, major land use - remained stable during these two years. It is suggested that they would have been similarly stable in the two northern provinces.
- Although the better water conditions in crop year 1994/95 allowed farmers in the four central-region provinces to cultivate dry season rice over a larger area than in the previous year (crop

year 1993/94), this was not the case in the two provinces in the north. The farmers reported that they did not have any difficulty in this respect in both crop years. Farmers in Phitsanulok are in the land consolidation area with good water supply from the Naresuan Dam, while farmers in Kampaengphet have good ground water resources to use in the dry season. Better water supply conditions affect the viability of second rice, but not major rice which still relies on rain water.

5.2.2 Characteristics of the Study Areas in the Six Provinces

The location of the study areas in the six selected provinces, is shown in Figures 5.1. The two provinces in the north have different environmental characteristics. The area of Khlongkhlung District in Kampaengphet is on the banks of the Ping River, receiving irrigation facilities from the Wang Yang sub-project while the areas in Prompiram and Banrai Districts in Phitsanulok are under the Plai Chumpol sub-project of the Phitsanulok Irrigation Project. Although both Wang Yang and Plai Chumpol are managed and operated under irrigation project 3 of the RID, irrigation facilities of the latter are better due to the facilities of the Phitsanulok Irrigation Project and a degree of land consolidation.

Although all four selected provinces in the central plain are situated in the same Greater Chao Phraya Project, they are distributed in areas of different geological land forms (Annex I.5.3). Samchuk district of Supanburi province and the two districts in Angthong province (Samko and Wisetchaicharn Districts) are located in the old delta, while Banmi District in Lopburi is in the flood plain area. The location characteristics of Latbualuang district in Ayuthaya province differ from the others due to the flatness of the area of the young delta. Hence it is situated in a conservation irrigation system, which has better irrigation in the dry season than a gravity irrigation system. Moreover, with the land consolidation programme in this province, farmers in this area hardly lack water in the dry season, even in a very dry year (e.g. crop year 1993/94).

5.3 The Basic Conditions of Farmers in the Study Areas

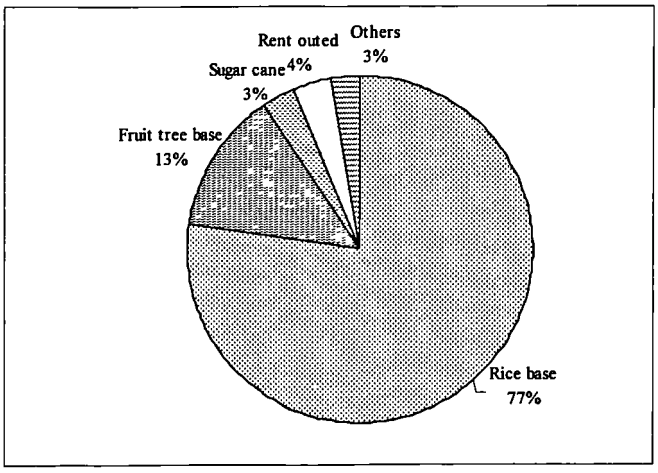
This section introduces the area characteristics of the respondents' groups, with regard to land use for different crops, land ownership patterns and farm practices. As far as possible, the survey findings are related to RID statistics on irrigated areas or provincial data, in order to control the representativeness of the survey results.

5.3.1 Overall Land Use

The land use patterns are described according to primary data derived from the structured field surveys. At an aggregated level, the overall land-use pattern of both project and non-project groups are presented together to illustrate the general land use in the six provinces. At a more disaggregated level, the different land use types are presented to compare the conditions of the project and non-project groups, in two survey years (for four provinces only), as well as the differences between the provinces, with their varied location and environment conditions. The comparison between the two groups of project and non-project will demonstrate differences in land use due to the influences of the project. The data discussed in this section is in the form of cross tabulation, by group, province and two crop years with reference to Tables I.5.2.4 – 6 of Annex I.5.2.

The survey data show that the major land use patterns of the respondents in these six provinces is not much different from the overall picture in irrigated area as described in section 5.1 above. The aggregated data based on the first year implementation of the project at both provincial and group levels show that rice base [4] is the major land use of the respondents (Figure 5.8). Its area accounted nearly 80% of total land use, followed by fruit trees (at a mere 13%) while rented out land was about 4% and other land uses, which consist of vegetables, fish, flowers and wasteland (which is sometimes turned into native pasture) constituted just 3% of the total.

Figure 5.8 Overall land use type of the respondents in the study area



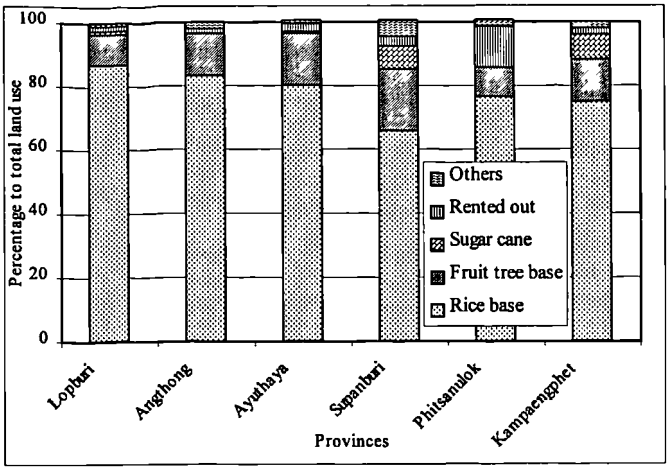
Source: Data derived from structured field survey, summarized from Table I.5.2.4 – 6

[4] Rice base includes rice as well as areas of other dry season crops, which are planted in the same piece of land under major rice.

This is similar to pattern of overall land use in irrigation projects 3 and 7&8 as described in section 5.1.6. Second rice in these two irrigation projects accounted for 70% of agricultural land use, followed by fruit trees (10%), 9% each for field crops and sugar cane, 1% for vegetables and 3% for the others (Table I.5.2.2 – 3 of Annex I.5.2). The slight difference between the respondents' land use and the national figures is because the rice base in the study areas also includes areas of other dry season crops such as vegetables or some field crops (e.g. mungbean, soybean and peanut). When these figures are added to second rice, this makes the rice base of the two irrigation projects quite similar to the rice base in the study areas (about 80% of total land use). The discrepancy in the area devoted to fruit trees and sugar cane (13% versus 10% and 3% versus 9% respectively) reflects the specific characteristics of the study areas which are reflecting in the structured field survey (Chapter IV, section 4.2.3 – 4.2.5). Fruit trees are promoted as alternatives in the study areas and sugar cane is not suitable in some parts of the study areas, especially those that are well-irrigated areas. (i.e. Ayuthaya and Phitsanulok)

Data by province show that the major land use patterns of the respondents in each province are similar to the overall picture of all study areas and national statistics, but varies from place to place due to specific local conditions as mentioned above. Figure 5.9 shows that each province had a combination pattern of rice, fruit trees, sugar cane, rented out and others. Although their proportion of total land use differs from place to place, rice remains the major type of land use in every province, followed by fruit trees (at ten or more percent) while sugar cane and rented land did not appear in all provinces. The rice base in the three provinces of Lopburi, Ayuthaya and Angthong in the central plain was as large as 80 – 87% of total land use, while its share was about three quarters in the two provinces of the north. Rice represents the smallest proportion in Supanburi (two thirds only), because this province has more varieties of other land use types. This comprises of fruit tree which has the largest share among all provinces (20%) while the proportion of sugar cane was about 7%, similar to Kampaengphet (8%). It should be noted that the proportion of rented land in Phitsanulok is the largest (13%) while it was only 2 –3% in the other areas. This is because the respondents were re-allocated land in the Phitsanulok Irrigation Project under the land consolidation programme. Some of them also hold other pieces of land outside the project at the same time. Since the land allocated in the project is irrigated and leveled (see section 5.1.5), the farmers cultivate here and rent out the land outside in those instances where their land is too large to manage.

Figure 5.9 Land use pattern in the six selected provinces (both project and non-project groups together)



Source: Data derived from structured field survey, summarized from Tables I.5.2.4 – 6

5.3.2 Rice Cultivation

Despite the diffusion of HYVs and the new technology in irrigated areas, this did not apply in all these six provinces. In some places, farmers still preferred the traditional varieties, which are of the photosensitive type of rice, as this adapts well to dry spells in the rainy season. It was found that the respondents in the two locations in Lopburi province and in Wisetchaicharn district of Angthong province planted these varieties in both crop years 1993/94 and 1994/95. Owing to the difficulty of accessing irrigation water in the dry season, single transplanted rice was the prevailing practice here. Harvesting in those years was still done by hand, but the harvesting machine came to these places in 1996 and 1997.

Rice culture was different in other places which have better water conditions. With the ability to access water, especially in the dry season, in Kampaengphet, Phitsanulok, Ayuthaya, Supanburi and Samko district in Angthong, the advanced practices of combining high yield varieties with wet broadcasting culture [5] were found here. Under the prevailing favourable water conditions, dry season crops were grown after rice. Therefore, their areas were larger than in the other two places, i.e. Lopburi and Wisetchaicharn district of Angthong.

5.3.3 Dry-Season Crops

Dry-season crops encountered in the six provinces are similar to those generally found in the irrigation project areas. However, types of these crops and cultivated area differed from place to

[5] This refers to pre-germinated seeds.

place due to local diversity and especially the major factor of water availability in the dry season. Second rice is a common dry season crop in Ayuthaya, Supanburi, Angthong and the two provinces in the north. Local specific situations show that vegetables after rice are traditionally grown in Angthong while soybeans are grown in the two provinces of the north. There is more diversity in Supanburi where vegetables, flowers and sugar cane are found. However there was no cultivation of these crops in Lopburi in the first year of the project.

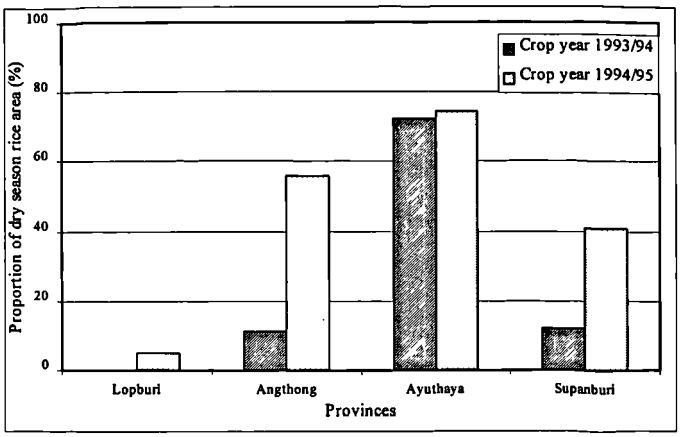
- **Dry season rice**

The dependency on irrigated water for dry season rice is reflected in the increase in second-rice area in crop year 1994/95 when the amount of water in the Bhumibol and Sirikit dams had increased significantly from the previous year. Data derived from the second-year field survey in the central plains show that the area for this crop increased from crop year 1993/94 to 1994/95 in the two provinces of Angthong and Supanburi. It expanded from 11% to 51% of respondents' total land use in the former and from 11% to 29% in the latter. Moreover, the good water conditions in crop year 1994/95 allowed a third crop of rice in a small area of these two provinces too (5% and 12% of total land use in Angthong and Supanburi, respectively). Although the effect was not great in terms of area expansion, it represented the first time that it was possible for a few farmers in Lopburi to grow second rice. Its area expanded from nothing in crop year 1993/94 to 5% of total land use in 1994/95. This situation is different in Ayuthaya, which is in a conservation irrigation system that always allows farmers to access water in the dry season. So the second-rice area in 1994/95 in this province was nearly the same as the previous year (increasing by only 2%). Figure 5.10 presents a comparison of dry-season rice [6] area as described above.

Better water conditions in crop year 1994/95 did not have much of an effect on other types of dry-season crops in the four provinces in the central plain. Although the vegetables area in Angthong slightly increased (from 2.5% to 3% a year later), its area in other provinces was in the 1% range in these two years.

[6] It should be noted that the area of third rice is added to second rice to be dry season rice in this case.

Figure 5.10 Comparison of dry season rice between crop year 1993/94 and 1994/95



Source: Data derived from structured field survey, summarized Tables I.5.2.4 – 6

- **Soybeans**

Soybean was found only in two provinces (Kampaengphet and Phitsanulok) because it had been introduced in the irrigated areas of the north and lower north since 1992. As a short-cycle crop (only 110 - 120 days duration) with lower water consumption than rice together, with high market demand, this crop aims to substitute for second rice in the dry season. Although there is a buoyant market for soybean, the plot size can usually not be large on any individual farm because this crop requires rather intensive labour for maintenance and harvesting.

The areas of dry season crops in the two provinces in the north were similar in terms of cultivated area and type of crop. Dry season crops in this region are a combination of second rice and soybean, but in varying proportions. In crop year 1994/95, second rice occupied about half of total land use in Phitsanulok but only 38% in Kampaengphet. This corresponded to a soybean area of 20% of total land use in Kampaengphet and 13% in Phitsanulok provinces. So the total area under dry season crops in these two provinces was similar.

5.3.4 Sugar Cane

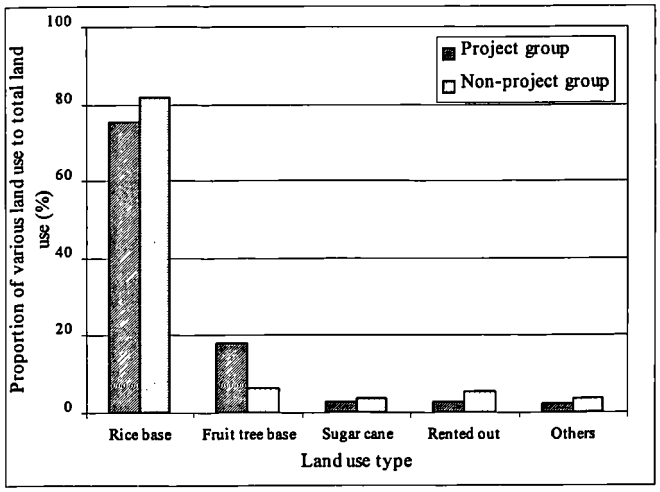
Although the expansion rate of this crop is very dynamic in irrigated areas, especially in irrigation project 3 where the two provinces of Phitsanulok and Kampaengphet are situated, sugar cane was found in relatively large quantities in only two provinces. Its area was very small among the project group of Lopburi (only 1% of total land use of Lp-P in crop year 1993/94, increasing to 3% a year later). The quick expansion rate from 1993/94 to 1994/95 was nearly double the rate in Supanburi province, with an increase from 2% to 12% of total land use in the project group (Su-P), and from 12% to 27% for the non-project group (Su-N). Its area in Kampaengphet province

was 9% and 6% of total land use in the project and non-project groups respectively. The enlargement of the sugarcane area was in response to the establishment of a sugar mill nearby. [7]

5.3.5 Fruit Trees

Although fruit trees have been found in the lower delta of the Chao Phraya since the latter half of the 1970s (Takaya, 1987) with high expansion rates during the 1980s and 1990s as mentioned above, their extents in the study areas were small. But as a result of the initiative of the project (details in section 3.6.1), the development of fruit trees rapidly expanded particularly for the farmers who joined the diversification programme. This made the area of fruit trees in the project group larger than that in the non-project group. Their area occupied 18% and 6% to the total cultivated land area respectively. Since the project group had to convert a piece of rice land to fruit trees, their rice base was slightly smaller than that in the non-project group (Figure 5.11).

Figure 5.11 Comparison of land use type between the two groups of respondents, at the first year of project implementation



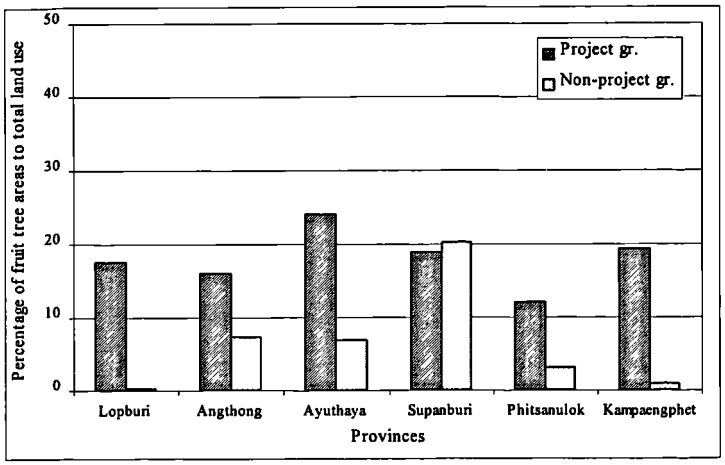
Source: Data derived from field survey, summarized Tables I.5.2.4 – 6

Fruit-tree area which occupied 18% of total land use in the project group was not all converted from rice base. About 3% to the total land use was occupied by orchards a year before the project was launched. That means 15% of total land use of this group was converted from rice to orchard (compared to 90% of land use under rice before the project started and 75% in the first years of operation).

[7] The sugar mill was a private initiative and not part of the diversification programme studied here.

The differences in fruit-tree areas did not only occur by group (P and N), but also by location. Figure 5.12 shows that its area share within the project group varied from a low of 12% in Phitsanulok to a high of 24% in Ayuthaya, with a middle range of 16 – 19% in Angthong, Lopburi, Supanburi and Kampaengphet. The range was wider in the non-project group of farmers, who invested in fruit trees on their own, without using the credit facilities offered by the project. Its share ranged from less than 1% to 3% in Lopburi, Kampaengphet and Phitsanulok (Lp-N, Su-N, Ka-N), and 7% in both Angthong and Ayuthaya (Ag-N, Ay-N), with a high of nearly 20% in Supanburi (Su-N). This reflects the potential for diversification by farmers themselves - particularly in this province, as will be shown in the discussion of contributing factors of success.

Figure 5.12 Comparison of fruit tree area between the two groups of respondents, at the first year of project implementation



Source: Data derived from field survey, summarized Tables I.5.2.4 – 6

In terms of plot size, it is not large due to the higher labour requirement compared with rice production. The average parcel area for the project group in the four provinces of Angthong, Ayuthaya Supanburi and Phitsanulok was in the range of 4 – 5 rai while the largest one was 6 rai in Lopburi and Kampaengphet. These are slightly larger than the plot size recommended by the project which is about 3 – 5 rai (as mentioned in Chapter 3, section 3.6.1 and Chapter 8, section 8.2.1). This slightly larger plot size was a result of farmers managing to mobilize sufficient family and hired labour to work larger areas. They were also able, in some cases, to stretch their credit a little farther than anticipated in the farm plan. However the size for the non-project group was smaller – less than 1 rai in Lopburi, Phitsanulok and Kampaengphet, but a large 7 rai in Supanburi. It was about the same size in Angthong and Ayuthaya (about 2 rai each).

Most of the fruit trees grown here are in the form of mixed crops. The plots consist of various fruit trees, dominated by mangoes. Minors are saton, jack fruit, coconut, rose apple and others. Farmers expected to earn more from mixed orchards than from a single crop, combined with a better income distribution. For example, rose apple yields earlier than mangoes, saton and jack

fruit. These types are chosen by farmers in response to market demand. Most of them plant mangoes as the main crop since it has a good market and the advanced technology such as improvement of early varieties and treatment allows for off-season production.

Although fruit trees are promoted as a crop for diversification out of rice, its area did not expand much over the two year period under investigation. A comparison of land use of respondents in four provinces in the central plain in two years shows that most farmers had nearly the same share of fruit trees to total land. A slight increase in its area can be seen in the project group of Supanburi, but it was only 2%.

5.3.6 Other Supplementary Enterprises

Some crops were cultivated during the immature stage of the newly planted fruit trees. As long as the trees are still small and do not provide any income, the spaces between the rows of trees can be used for production. In line with this well-known practice of inter-cropping, the extension officers specifically recommended short cycle crops such as vegetables and flowers.

- **Vegetables**

Vegetables are commonly grown as an element in the agricultural system in a very minor way besides home gardens, which are found everywhere. The area with vegetables before the programme launch was very small (less than 1%), except in Angthong, where a number of farmers continued to grow either mungbean or vegetables after rice. This has been done traditionally, so its share to the total land use of the crop in this province is larger than the others (about 2 %), but even so not very large, because of the twin constraints of water accessibility and labour availability.

In order to maximize the utilization of land and labour, and to allow farmers the opportunity of extra income, vegetables were recommended as an inter-crop during the vegetative stage of the fruit trees. Many project farmers pursued this option. The types of vegetables grown are mostly common vegetables for home consumption that are easy to sell in the local market. However, while this activity created income in the first year, it gradually declined due to the expansion of the fruit tree canopy, which inhibits the growth of the inter-crop and reduces production.

- **Flowers**

Because of their high potential for marketing, the DOAE have been promoting flowers as an important cash crop in Supanburi. So they are grown widely in the province even though the recommendation did not come from the diversification project. The cultivated area for flowers was found to be scattered, either as an inter-crop in fruit plantations, on the dikes, or - very rarely - in a single plot. Flowers are grown as a mix of roses, marigolds and jasmine. The planted area in each farm is very small because of the intensive care required.

- **Fish**

Fish ponds are another recommended activity to be integrated within the fruit tree plot. A ditch or pond is easily excavated and the removed earth used to make the levee. The farmers obtained a variety of fish from various sources, but most are herbicarbs which require low input costs. However, a few farmers in Lopburi and the two provinces in the north engaged in this enterprise on a limited commercial scale. The largest portion was in found among the diversified group of Lopburi and Ayuthaya, at about 2% of total land use, followed by 1% in both groups of Phitsanulok. Elsewhere, it was less than 1%.

5.3.7 Land Ownership Patterns

Not all pieces of land held and cultivated by farmers are owned by them. Findings from the two-year survey (in 1993/94 and 1994/95) reveal that many farmers in the central plain are tenants and part-tenants (Tables III.A.3 and B.3 of Annex III). The tenancy rate of respondents in the four provinces in the central plain is as high as 47% of total land holdings. Although this is higher than the figures from national statistics (23% of the central region, OAE, 1998), it is similar to the figures reported by Tanabe for 1973, who states that rented land amounts to nearly 50 per cent of the total area of the Chao Phraya delta (Tanabe, 1994, p. 69). Moreover, the differences among the provinces are also consistent with his analysis. For example, the highest rate found for crop year 1993/1994 in Lopburi was 56%, followed by 45% in Ayuthaya while it was lower at 31% and 27% in Angthong and Supanburi, respectively. These figures essentially resemble Tanabe's findings (Tanabe, 1994, pp. 68 – 71).

It should be noted that the rented area in the non-project groups of Lopburi and Ayuthaya provinces is even larger than that in the project group (75% and 60% to 43% and 33%, respectively). The discrepancy in these provinces is because most of the respondents in the project

group were included in the "Agricultural Land Reform Programme" [8] where land was redistributed to landless and land-poor farmers. This is also shown in the figure for the percentage of *chao sue land,* [9] which is higher in the project group. This is different in Angthong and Supanburi where the proportion of owned area in the non-project group is larger than in the other group. Its share to the total area in the non-project group is as high as 72% in Angthong (Ag-N) and 76% in Supanburi (Su-N). This made the rented area of the project group in both provinces proportionally larger (35%) than in the non-project group (20%).

Higher tenancy rates than the regional and provincial levels also applied in the study areas of the two northern provinces. The rate was about one third of the total area while it was about 16% at the regional and 18% (OAE, 1998) at the provincial level (applied to both Phitsanulok and Kampaengphet). However, the rates in both project and non-project groups were similar, i.e. about one third of the total area (Table III.C.3 of Annex III).

Average farm size of the respondents in all six provinces varied considerably (Tables III.A.2, B.2 and C.2 (Annex III)). However, the great majority had small land holdings. In general, the average respondent's farm size in Angthong, Ayuthaya, Supanburi and Phitasanulok ranged between 28 and 32 rai while in Lopburi and Kampaengphet it was between 40 and 42 rai.

Comparing these values with the regional statistics (OAE, 1998), shows that the average farm sizes in the three provinces of Angthong, Ayuthaya and Supanburi are similar to the average of the central region (31 rai) while the size in Lopburi is larger than the regional average. This was also the case in the north where the average farm size of the respondents in the two provinces of Phitsanulok and Kampaengphet was also larger than the regional average of 23 rai.

5.3.8 Farm Practices

The land-use pattern for different crops among respondents consistently showed paddy as contributing the largest proportion, followed by small plots of fruit trees among the project group as a result of joining the project, and even smaller proportions of other land use types, such as sugar cane, vegetables and flowers. For these farm enterprises, farmers usually utilized their own labour resources, but they hired additional labour whenever they faced labour constraints or required particular skills.

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[8] About 50,000 rai of the royal riceland in the Chao Phraya delta and adjacent areas were granted to the Agricultural Land Reform Office for land reform in 1975 (Tanabe, 1994, p. 73).

[9] "Chao Sue" literally means 'rent and buy'. Farmers are paying for their allocated land on a monthly

It was found, however, that more additional hired labour was required for rice culture and sugar cane than for fruit trees, vegetables and flowers. For example, harvesting of paddy and sugar cane is not carried out anymore by the owner. Rice is now harvested by combine harvester, which has become popular in the central plain areas since the early 1990s. Although sugar cane is still harvested by hand, the buyers, rather than the farm owners, hire their own labour gangs for that.

Besides harvesting, machinery is utilized more for these two crops, but in a different manner depending on topography. Land preparation was carried out by two-wheeled tractor for rice in the low land area while four-wheeled tractors were used for sugar cane. Due to the differences in cost involved, two-wheel tractors are usually owned by the farmers while four-wheeled tractors are hired. Weeding in these two crops is also carried out differently, i. e. by spraying herbicide for rice while using small tractors for sugar cane.

Although machinery has been replacing manpower in rice and sugar cultivation to some extent, this does not seem to be the case with fruit trees, vegetables and flowers. Although raising the bed for fruit trees requires hard work, it was still carried out manually in many farms. Most farmers in Ayuthaya and Angthong have learned from the vegetable growers that beds raised by hand give better yields than using tractor. All other activities like weeding, fertilizer application, and harvesting are carried out by hand, mostly by family labour. When the knap-sack sprayer is used, it was done by farmers themselves, unlike spraying for rice for which additional labour were hired to some extent. The practice with vegetables, flowers and soybean was similar.

5.4 Farm Household Income Analysis

Farm household income analysis is an established field in agro-economic research. The presentation in this section begins with the basic socio-economic conditions, i.e. household size, employment patterns and labour utilization. It then proceeds to a systematic approach for calculating farm incomes through a whole-farm analysis which was structured according to the standard system applied in Thailand (OAE, 1998, pp. 266 – 275).

5.4.1 Types of Employment

The people normally give priority to work on their own farms. However, they also take off-farm employment for extra income when they see opportunities. The same applies to the respondents in the six provinces. Among the respondent household members, there is a great variety of employment patterns that are discussed in this section. For consistency in the surveys and the

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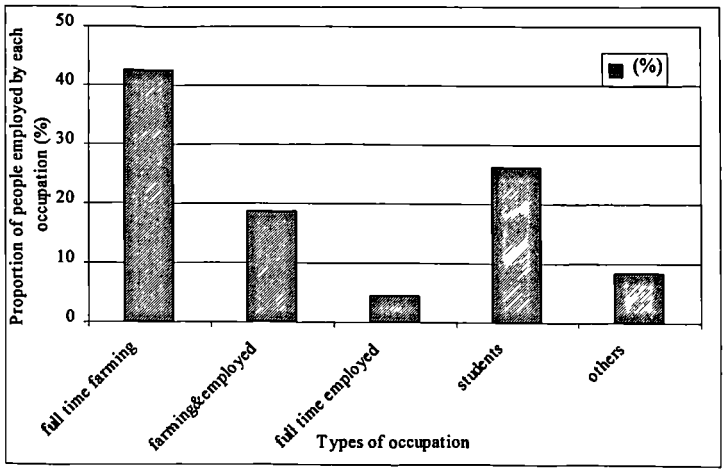
basis spread over 20 –25 years.

presentation in the study, the main occupations of the household members in the study areas are classified into five main categories, using the following terminology:

1. *Full-time farming:* This refers to household members of working age who are engaged full time on the three core farm activities of crops, livestock and fish sub-systems.
2. *Full-time farming and part-time employed:* This refers to members who give priority to full-time farming during the main cultivation period, but who also work at other activities in the slack season or whenever they can manage it. The part-time employment covers both on-farm and off-farm work. On-farm work includes home industry produced in the household unit; e.g. cloth weaving, basketry, bonsai, gem cutting and garland making. Off-farm work refers to employment outside the household's own farms, either for farm activities such as land preparation, spraying and harvesting (on other farms) or on non-farming activities such as construction work, driving and so on.
3. *Full-time employed:* This refers to those household members who are engaged full time working outside their own farm. This includes employees in the government sector such as teachers or in the private sector such as labourers in factories (mostly unskilled labour) or workers in shops and department stores. Although these people are working outside the farm, they still live in the same household unit, and commute daily to work.
4. *Students:* This refers to children who are still studying in school. Most members of this category are in primary and secondary school and some are in vocational training school.
5. *Others (not working):* This refers to the members who are not in employment. This includes old people and children too young to attend school.

In general, the largest proportion of household members in the six provinces (43%) are engaged in full time farming, with no other work. Where off-farm opportunities exist, about 20% of them are still working full time on the farm, while taking on other jobs in the slack season. The proportion of full time employees is not large, at only 5% engaged in. One third of household members are not working. This includes about a quarter still studying in school while the remaining 8% consists of old people and children before school age (Tables III.A.6, B.6 and C.6 and Figure 5.13). However these categories are not always clear-cut. It is commonly found in Thai society, especially in rural areas, that children help their parents with farm work after school or on weekends. This is similar for some full-time employees who work on the farm on their day off.

Figure 5.13 Respondents and their family members employed in various occupations (%)



Source: Data derived from field survey, summarized from Tables III.A.6, B.6 and C.6

5.4.2 Family Structure and Livelihood

The family size of the respondents is not large, within an average range of 3.5 to 5 persons. When age is categorized into three groups of youth (1-15 years), working age (16 – 65 years) and old age (over 65 years) [10], it is found that the average number of members in the working age group is much higher than those in the other two categories. It varies from a low of 2.7 in Angthong up to 3.2 persons in Ayuthaya, followed by the youth group, which ranges between of 0.5 – 1 persons, and the old age group containing the remainder. When this age group composition is compared between project and non- project groups, it shows no difference (2.9 persons; Tables III.A.1.2, B.1.2 and C.1.2).

The summary presented in Tables III.A.1.1 and C.1.1 shows that most of the respondents in nearly every site and their families are native to the region with more than 80% of respondents having been born there. Although about 60% of those in Kampaengphet were not born there, they had been living in the area for 30 years or more.

In terms of education, the summary in Tables III.A.1.3, B.1.3 and C.1.3 shows that more than half (55 – 60%) of respondents and their family members in the provinces of Angthong, Ayuthaya and Supanburi had obtained the former compulsory level of grade 4 (4 years of primary schooling). The proportion of this education level is lower in the provinces of Lopburi, Phitsanulok and Kampaengphet (within a range of 45 – 47%). This does not mean that their education level is lower than those three former provinces. The number of non-educated persons at an average of

[10] The official retirement age of 60 (Thai statistics) is too low for farmers. In reality, they work until they are over 70. So, 65 is used as a working definition of the dividing line between full time and "not working".

8% mostly refers to children who are not yet in school. They are only 2 adult persons who are illiterate. Due to the expansion in the compulsory period of education to level 6 in 1992, the proportion of people in this education level is second to that with the former compulsory level of grade 4. A range of 12 - 14% for grade-6 graduates applies to most places, except for higher values in Kampaengphet (23%) and Ayuthaya (25%). It should be noted that the low proportion of these two levels of education in Lopburi (45% for grade 4 and 12% for grade 5-6) is counterbalanced by the larger proportion of higher education level there. The people in this province have the largest proportion of grade 7 – 9 and technician level. The proportion of the former is 19% compared to 7-11% in the other five provinces, while the share of the latter is 11%, compared to 2 – 5% in the other provinces.

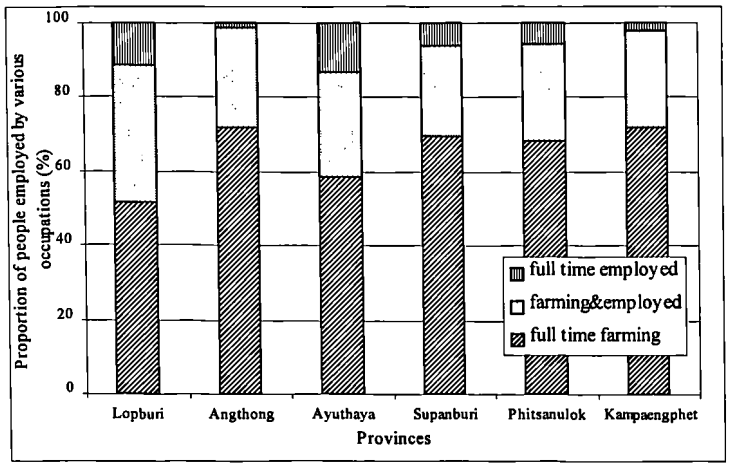
Findings derived from the field survey of crop year 1994/95, compared with the results for 1993/94, revealed the change was mostly in upgrading of the children's education. Only very few children (about 5) finished schooling during the previous year. Some of them obtained employment while some helped their parents in farming, while looking for jobs (outside their own farm) at the same time.

5.4.3 Labour Utilization

The working age group was analyzed in more detail and broken down to the provincial level, in order to better understand labour management among the respondent households. The provincial-level findings are similar to those at the aggregated level, i.e., the largest proportion of the working age group was in the category of full-time farming, followed by full-time farming and part time employed, and full-time employee, respectively. However, the situation varied from place to place. The summary in Tables III. A.6, B.6 and C.6 and Figure 5.14 shows that full-time farming is the main occupation (about 70%, with the range of 68 – 72%) of the working age group members in the four provinces of Angthong, Supanburi, Phitsanulok and Kampaengphet, while it is smaller in Lopburi (51%) and Ayuthaya (58%). This is because in these provinces, more people are in the other two categories (full-time farming and part time employed, and full-time employed outside the farms). Despite the smallest proportion of full-time farming (only 51%), Lopburi has the largest proportion of full-time farming and part time employed among the provinces (37%, compared to a range of 24 – 29% for the others). The explanation is that there are no dry season crops at all in this province. At the same time, the people here have a variety of home industries. They do cloth weaving, bonsai growing and gem cutting. The last activity is based on home-based piece work production, with the raw materials provided and taken back by the same persons, and payments based on the quantity of work.

It should be noted that the share of the last category (full time employed) is as high as 12 – 13% in Lopburi and Ayuthaya while it varied from only 1 to 6% in the other four provinces. This is caused by the expansion of the industrial sector around the suburbs of Bangkok. Examples are the establishment of large export-oriented manufacturing, such as Minibea, which produces computer components in Lopburi, and various types of factories (dominated by textile manufacturing) in Pathumthani, which is in close proximity to Lard Bua Luang district of Ayuthaya. These locations allow the villagers to commute daily by means of company-provided transportation.

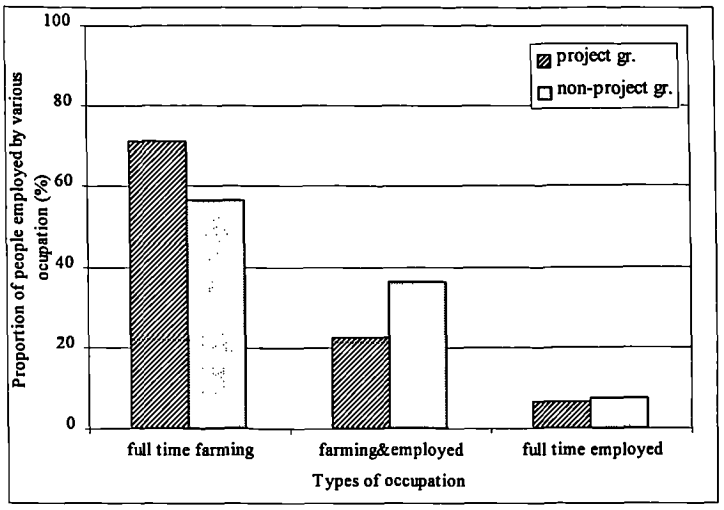
Figure 5.14 Proportion of respondents and their family members employed by various occupations and by province



Source: Data derived from field survey, summarized from Table III.A.6, B.6 and C.6

Disaggregated at the group level, the data show that more household members of the project group engaged in full time farming than the non-project group (71% to 56%). The opposite is true for the second category (full-time farming and part-time employed). Some 36% of household members of the non-project group engaged in this type of employment while the figure was only 22% in the project group. Both have the same proportion of people working as full-time employees (7% of the working age group, Figure 5.15).

Figure 5.15 Proportion of respondents and their family members employed by various occupations and groups



Source: Data derived from field survey, summarized from Table III.A.6, B.6 and C.6

5.4.4 Structuring Household Income Analysis

As illustrated by the different types of occupation within a household, farm household incomes are generated from both farm and off-farm sources. The household income analysis in this study is structured according to the guidelines and definitions of the OAE (OAE, 1998, pp. 266 – 275). So the analysis was carried out at the household level as shown in Tables I.5.2.7 – 42 (Annex I.5.2). Total household income then comprises of:

- **Farm income:** This refers to income generated in the agriculture sector within the farm, from the crops, livestock and fish sub-systems.
- **Non-farm income:** This refers to two sources of income, on-farm and off-farm. The former comprises of profit from trading and services (usually at home) and home industries produced in the household unit as mentioned above. The latter comprises of employment in both the agricultural and non-agricultural sectors outside the respondents' own farms. It also includes remittances sent by family members working far away, either in the city, Bangkok or abroad, which is commonly found in rural Thai society.

The income analysis of this study is based on the primary data derived from the structured survey in comparison to the national statistics. Analysis of both farm and non-farm income was carried out and is discussed separately before combining them into total farm household income.

The analysis is on a comparative basis, disaggregated at the provincial and group levels, and between the two years of survey for the four provinces in the central plain. The comparison between the two groups (project, non-project) should demonstrate the influence of the extension

officers' recommendations, while the comparison between the provinces aims to show the different farm income structures due to differences in locations. Therefore the processed data is presented in form of cross-tabulations of the individual groups by each province and each year. This is important because of the great differences due to locally specific conditions. The related tables are presented separately in Annex I.5.2 (Tables I.5.2.7 – 42) while interpretation and analysis have been placed in sections 5.5 and 5.6 in the main text. Both these sections are long and detailed, because only a detailed analysis of the survey results, in comparison with other statistics, would be able to bring out the finer differences across the various groups of farmers studied.

5.5 Farm Income Analysis

The techniques of both *gross income* and *gross margin* are utilized for the farm income analysis. Since the latter was highly influenced by the heavy investment in fruit trees in the project group, this cannot be compared with the general situation among the provinces. Therefore, this is done by the gross-income calculation. The analysis was carried out in detail in accordance with the categorization of farm enterprises described above, in section 5.3. The components of each sub-system are depicted as a tree diagram in Figure 5.16.

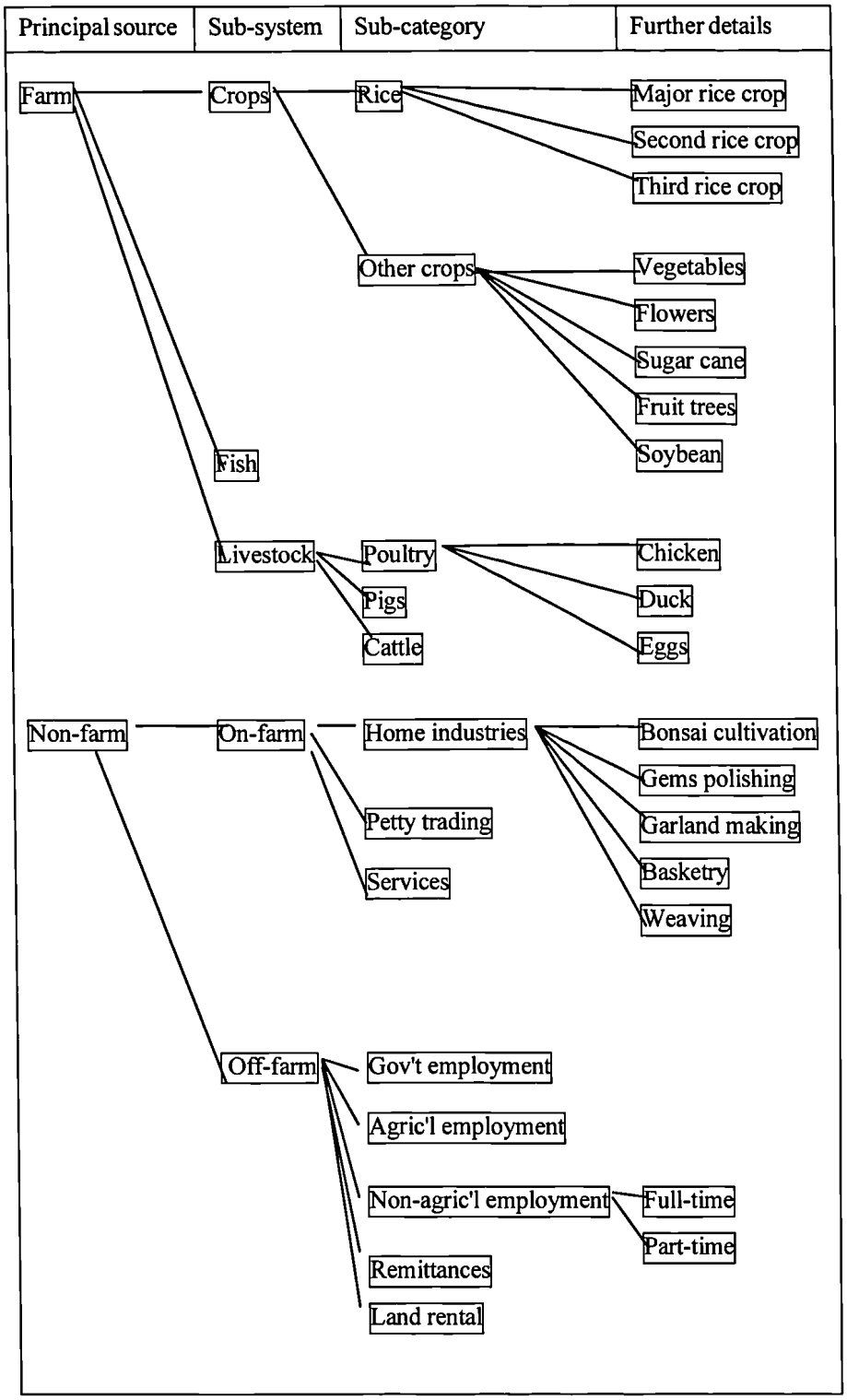
5.5.1 Sources of Farm Income

Farm income comprises of income generated from the three sub-systems of crop, fish and livestock, as mentioned earlier. Income from each sub-system is defined as cash received from selling the farm products. This excludes the amounts kept for home consumption or as stocks for the coming season.

5.5.2 Income from the Crop Sub-system

The study disaggregates the crop sub-system into the two categories of 'rice' and 'other crops', to show the importance of rice to the farm and household economy as the major source of farm income. The category of 'other crops' comprises fruit trees, vegetables, flowers, sugar cane, and soybean. In general, fruit trees have not contributed much yet due to their still being largely in the vegetative stage. Vegetables, however, contributed substantially to the income of the project group in Angthong, Ayuthaya and Phitsanulok, while flowers provided a good income in Supanburi. Considerable contributions were also gained from sugar cane in Lopburi, Supanburi and Kampaengphet in response to demand from a sugar mill situated in close proximity to the study areas.

Figure 5.16 Overview of the sources of farm household income



- **Rice**

Income from rice contributes the largest share of gross income in every study site for both groups. In crop year 1993/94 its share in the four provinces of the central plain is varied from about a half of farm income in the project group in Angthong and the non-project group in Supanburi, to about 90% and more in the non-project group in Ayuthaya and Lopburi.

Income generated by rice, however, depends very much upon the irrigation facilities and plot size. This is reflected by the highest income from rice in crop year 1993/94 in the non-project groups is Ayuthaya and Lopburi. Where irrigation facilities allowed for double cropping, gross and marginal income in Ayuthaya was over 100,000 and 50,000 Baht per farm, respectively, slightly higher than in Lopburi (about 95,000 and 42,000 Bt. per farm, respectively), even though average farm size of the Ayuthaya group is smaller (30 to 49 rai). The lowest was in the non-project group in Angthong - about 45,000 Bt. (gross) and 23,000 Bt. (marginal) - which relates to the smaller area of land under rice of this group.

The comparison between groups shows that rice income in the non-project group in Ayuthaya and Lopburi is higher than in the project group in the same province, while it is the opposite in Supanburi and Angthong. These variations are in accordance with the different average farm size and, particularly the relative proportion of rice land of each group (see Tables I.5.2.4 – 5 of Annex I.5.2). For example, average farm size of the non-project group in Supanburi was larger than in the project group. But the former earned less from rice than the latter group, because they had less land under rice.

The influences of two external factors, water and rice price, highly affected rice cultivation in crop year 1994/95. Better water conditions in this year allowed farmers to grow dry season rice over a larger area than the year before. With buoyant prices, farmers earned more from rice. Data derived from the year 2 survey in the four provinces in the central plain revealed that income from rice in nearly every group increased from the previous year, except for the non-project group in Supanburi. However, the ratio varied from place to place. It slightly increased in Lopburi, where only small areas of second rice could be cultivated (only a few thousand Baht per farm) while it was higher in Ayuthaya (an increase of more than 10,000 Baht per farm). The highest was in both project and non-project groups in Angthong and the project group in Supanburi, where farmers earned about 25,000 – 30,000 Baht per farm more from their rice.

In the two provinces in the north, income from rice also represents the largest proportion of farm income. Although its value in Kampaengphet is higher than in Phitsanulok (with a range of 84,000

– 96,000 Baht, compared to 61,000 – 65,000 Baht per farm) due to the larger farm size, its share of farm income in the latter is higher than the former (in the range of 78 - 83 % to 58 - 76%). It is rather clear in this region that its share in the non-project group is higher than in the project group (58 - 78% to 76 - 83% respectively). Among these groups, the highest rice income is about 96,000 Bt. in the project group of Kampaengphet, which seems to relate to the highest total household income in this province as well.

- **Fruit trees**

As mentioned earlier (section 5.3.5), cultivated area under fruit trees was second after rice, representing about 18% of total land use. However, most of the fruit tree area was developed in the year of the project launch. It occupied 15% while the remaining 3% was under fruit trees that had been planted earlier. So most fruit trees were still in the vegetative stage with only a few being classed as productive (more than 5 years old with extensive culture). As a result, both inputs and output were correspondingly low, especially at the first year of implementation. Initial cost of fruit trees will be emphasized and discussed more than the other crops, since this is the key point that the project provided credit for.

Because of the project adoption, the investment cost for fruit trees in the project group in every province was much higher than in the non-project group, except in Supanburi. It varied from about 23,000 Baht per farm in Angthong and Phitsanulok to over 43,000 Baht in Lopburi and Kampaengphet. This wide variation was not only because of the large plots in the last two provinces (an average of 6 rai each, see Tables III.A.13.3 and C.13.3), but also because of different types of land requiring higher development costs. The average plot size in Angthong is only 0.8 rai smaller than in Ayuthaya (4.2 and 5 rai respectively), but the investment cost for fruit trees in the former was about 14,000 Baht lower. One factor is the higher cost of land modification in Ayuthaya where the clay soils requires more labour than the loamy soil texture in Angthong.

Although income from fruit trees represents a combination of fruit trees grown by the farmers themselves and the ones initiated by the project, it was small as most fruit trees had just been planted in the first year of project implementation. The income ranged from 200 Baht per farm in Angthong to 600 Baht in Phitsanulok, and 2,000 – 3,000 in Lopburi, Ayuthaya, Supanburi and Kampaengphet. Besides some fruits from the trees, the yield came mostly from banana, which yields in a 6 – 8 month period. This crop is automatically grown by farmers who know that they can get a banana yield at an early stage, to be phased out as soon as the main fruit trees are growing. This gave a small return in the first year of project implementation.

Fruit tree returns were slightly higher a year later in the central plain. Some other ornamental crops (i.e. rose apple and guava) also started to yield. It ranged from a low of about 2,000 Baht per farm in Angthong, to 4,000 Baht in Ayuthaya, and up to about 8,000 Baht in Lopburi and Supanburi. Input costs were obviously much lower than a year before. Costs ranged from a low of 4,300 Baht per farm in Angthong, to nearly 7,000 Baht per farm in Lopburi to a high of nearly 8,000 Baht per farm in Ayuthaya and Supanburi. With some return and lower costs in year 2 of fruit trees, marginal income from fruit in Lopburi was nearly 1,300 Baht per farm and just 43 Baht in Supanburi, while it was still negative in Angthong and Ayuthaya (negative 2,500 and 4,000 Baht respectively). However, this was a much better condition than in the first year of project implementation, when marginal income was negative in all provinces (about minus 22,000 to 42,000 Baht per farm).

Cost and return of fruit trees in most non-project groups did not vary a great deal in the two years. The earnings were a few hundred Baht per farm in Angthong and Ayuthaya (Ag-N, Ay-N) while cost was in the range of 1,700 – 3,400 Baht per farm in crop year 1993/94. Only a few farmers grew fruit trees in these groups and the trees were not yet at the productive stage. This situation made the marginal income in Ayuthaya (Ay-N) still negative in crop year 1994/95 (about 4,000 Baht per farm) due to much smaller return than cost. Negative marginal income was also found in Lopburi (Lp-N), where one farmer just invested in fruit trees in this year (with a negative marginal return of nearly 3,000 Baht per farm). This is similar to the situation of the non-project group in the two northern provinces, which had low costs (with a range of 200 – 300 Baht per farm) and returns (range of 200 – 1,000 Baht per farm).

It should be noted that this situation did not apply in the non-project group in Supanburi. In crop year 1993/94, farmers in this group invested about 25,000 Baht per farm for fruit trees. This amount is only about 5,000 Baht lower than fruit tree investment in the project group in the same province (about 30,000 Baht per farm) and even slightly higher than the investment of the project group in Angthong (Ag-P, about 23,000 Baht per farm). The cost in crop year 1994/95 was nearly 12,000 Baht per farm. This is higher than the cost of fruit trees in the project group in all four provinces of the central plain in the same year (with a range of 4,300 – 8,000 Baht per farm, as mentioned above). So, it shows the scope for farmers to diversify independently.

- **Vegetables**

As vegetables are grown as inter-crops while fruit trees are growing, this means they can be cultivated for only a few years before production and income drops due to the constrained space available. Income from this source in the project group was higher than in the non-project group in

every study site. However its value differs from site to site due to each area's suitability, marketing facilities and farmers' skill.

In crop year 1993/94, the project groups in the central plain had marginal incomes from this crop ranging from 18,000 Baht in Angthong followed by Ayuthaya (about 15,000 Baht), Supanburi (nearly 3,000 Baht) and Lopburi (about 2,500 Baht). Although this marginal income dropped in crop year 1994/95 to about half the value of the year earlier, Angthong and Ayuthaya remained the lead provinces. Lopburi had higher income than Supanburi in this year (3,200 and 2,700 Bt. per farm respectively). This is because farmers in Supanburi (Su-P) grew more flowers in this year reducing the area allotted to vegetables due to limited labour resources. It should be noted that the marginal income from vegetables in these two years for the project group in Angthong was sufficient to cover the investment cost for their fruit trees. As shown in Tables I.5.2.11 and I. 5.2.13 of Annex I.5.2, marginal income from vegetables was about 1,000 Bt. higher than the investment and operating cost of fruit trees in these two years (27,717 compared to 26,716 Baht per farm). The high income in Angthong was facilitated by various factors. As mentioned earlier (section 5.3.5), farmers here traditionally grow vegetables after rice and therefore have the accumulated skills. This is in combination with suitable soil types in the area and close proximity to marketing outlets.

Vegetables are also grown in the non-project group, but income was lower than in the project group in every province. In crop year 1993/94 income was highest in Ayuthaya (nearly 5,000 Baht) followed by Angthong (about 2,700 Baht), Supanburi (1,200 Baht) and Lopburi (less than 100 Baht). In the following year, marginal income remained stable in Angthong and Lopburi, but declined markedly in Supanburi and Ayuthaya. This is because farmers in Supanburi were more involved in third rice, cottage industries and sugar cane while one farmer in Ayuthaya who used to earn a lot from vegetables converted his land and prepared it for sugar cane instead.

The same situation was found in the two northern provinces, where the project group earned more from vegetables than the non-project group. As shown in Tables I.5.2.23 – 26 of Annex I.5.2, marginal income from this crop earned by the project group was 4,500 Baht and 1,800 Baht per farm in Phitsanulok and Kampaengphet respectively. This seems to be influenced by better irrigation and marketing facilities in Phitsanulok. The situation was very different in the non-project group. Farmers of this group in Phitsanulok (Ph-N) earned only 45 Bt. and nothing in Kampaengphet (Ka-N). Small income in these two groups does not mean there are no vegetables at all, but they are grown mainly for home consumption. And farmers in Kampaengphet said that vegetables are not favoured there due to the high temperatures.

- **Flowers**

Income from flowers is not found in every place. Its value was high in Supanburi (both Su-P and Su-N) where this crop is highly promoted by the Supanburi Provincial Agriculture Office as a supplementary crop, as this province has a high market potential due to its proximity to Bangkok. Small earnings from this source were also found in Angthong and Kampaengphet.

In crop year 1993/94, respondents of the project group in Supanburi (Su-P) earned about 2,500 Baht marginal income from flowers while this was nearly four times higher in the non-project group. Hence its marginal income for the latter (Su-N) was about 9,500 Baht per farm in that year. Income from this crop increased in crop year 1994/95 in both groups. Its marginal income in the non-project group increased about 14% from the year before while it was six times higher in the project group. As it seems to be a productive enterprise with high marketing potential in this province, farmers in the project group grew more flowers as an inter-crop around the dikes of their fruit tree plots and some also replaced portions of their vegetable plots. This also made vegetable income of this group lower than in the previous year

Besides Supanburi, income from flowers was not significant in the other provinces. The project group in Angthong earned only a few hundred Baht in crop year 1993/94, increasing to about 1,500 Baht per farm a year later. Other than this, the project group in Kampaengphet (Ka-P) earned about 3,000 Baht per farm from flowers.

- **Sugar cane**

Due to the rapid expansion of cultivated area of this crop over the study period in the central plain (as mentioned in section 5.3.5), especially in Supanburi, income increased during the two years of the field survey (Table I.5.2.4 –5 of Annex I.5.2). Income in the project group of this province in crop year 1994/95 was about 10,000 Baht higher than in the previous year while it was nearly 30,000 Baht higher in the non-project group during the same period.

Although sugar cane income was also higher in crop year 1994/95 than before in the project group in Lopburi, this was only by a few hundred Baht (from about 6,200 Baht to 6,400 Baht per farm). Income from this source was also comparatively high in Kampaengphet. Farmers here earned about 25,000 Baht and 15,000 per farm in the project group and non-project group respectively. This is equivalent to a share of 14 – 15% of the farm income in those two groups. There was no sugar-cane income in Phitsanulok due to the unsuitability of the area, which was under consolidation mainly for paddy.

- **Soybeans**

As more land was use for this crop in Kampangphet than in Phitsanolok, income from this crop was accordingly higher. The marginal income in Kamphaengphet was in the range of 5,000 - 7,000 Baht per farm while it was about half this in Phitsanulok (between 2,400 - 2,500 Baht). As mentioned earlier, soybean was found only in the north due to its promotion as a dry season crop in this region.

5.5.3 Income from the Fish Sub-system

Income from fish can be distinguished into three types in relation to types of cultivation. The first refers to the extensive cultivation, which take place integrated within the ditch where water for the fruit tree plot is stored, or in a small pond. This system is small scale with low input costs, involving the release of fingerlings (mostly herbicarbs) and letting them grow. Small amounts of feed are sometimes provided, and harvesting is done when the people want to eat fish or sell their surplus. This system was found in the non-project group in nearly every province (except Supanburi and Phitsanulok). Costs ranged from nearly nothing in Lopburi up to 900 Baht per farm in Ayuthaya while return was in the range of a loss of 900 Baht in Ayuthaya up to a few hundred Baht in Kampaengphet.

Costs and returns were higher in the project group in Angthong, Ayuthaya and the two groups in Supanburi where farmers raised fish in the ditches for storing water for fruit tree plots, in combination with a few of the respondents who raised fish on a commercial basis. As one enterprise recommended in the package of diversification, investment was higher in the first sub-group. Farmers here delivered more fingerlings and fed more food than the non-project group. Together with higher inputs in line with commercial scale production, this made the cost range from about 2,300 Baht in Supanburi to nearly 7,000 Baht per farm in both Angthong and Ayuthaya while return was negative in Ayuthaya and Angthong and only a few hundred Baht in Supanburi. This is because many farmers just released fingerlings in the ditch in the first year of project implementation, where there were still many fish alive and not yet harvested.

With a higher number of commercial-size fish ponds in the project group of Lopburi and Kampaengphet, costs and return of this sub-system were higher than in other study provinces. At the first year of the project implementation, costs in Lopburi were about 10,000 Baht per farm while they were nearly 25,000 Baht in Kampaengphet. Both groups, however, earned negative margins (nearly 5,000 and 15,000 Baht per farm in Lopburi and Kampaengphet respectively).

As many fish stocks were still in the ditches and ponds, returns were higher a year later. This was the case in the project group of Angthong and Ayuthaya, and for both groups in Supanburi. Farmers here earned slightly better marginal incomes than in the previous year (from a 'loss' of a few hundred Baht in Ayuthaya to a few hundred Baht positive in Angtong and 3,000 – 4,000 Baht in the project group of Lopburi and both groups of Supanburi). It should be noted that although fish raising may be negative in terms of cash, the stock is still there. Also, the monetary results do not take account of the benefit of increased protein intake by the farm families.

5.5.4 Income from the Livestock Sub-system

Income from this sub-system generated from various types of livestock including cattle, pig and poultry (chicken, duck and eggs). Usually it is undertaken at a small scale with low inputs, and no more than 10% of every survey site had livestock rearing at a commercial scale with high input costs. As shown in Tables III.A.7.1 - A.7.2, B.7.1 - B.7.2 and C.7.1 - C.7.2, the average number of animals was small.

High income from this sub-system seems to be linked mostly to cattle, which can be sold at a high value, but involve very low input costs as mainly natural grazing is involved. This is different from pigs that were raised on a commercial basis. Hybrid piglets, vaccines and pig feed are produced and sold by commercial companies. The farmers just buys these inputs in the market and sells the pigs as fattening pigs or piglets to any local merchant who will resell the animals to the slaughter house.

Chickens and ducks are normally ranged freely around the house and mostly for home consumption, and a small surplus are for sale locally. The exception is a record of a larger number of poultry per farm in the project groups in Phitsanulok and Kampaengphet. The chicks were provided by the project. Another exception is that there are a number of farmers in the project group in Lopburi who had adopted the business of chicken raising on a commercial scale within a contract system. The chicks, vaccines, animal feed and other inputs are provided by the company. The company also buys the outputs back at an agreed price, deducting the input cost. The farmers have to invest in building the rearing house on their land together with the intensive labour required. The revenue they receive at the end is marginal. (Within a period of about 6 weeks for one cycle of the broiler, it allows farmers to have 3 - 5 cycles a year. Therefore it is not surprising to see large differences in the number of stock of chicken between the two years of the survey due to the quick turn of each cycle.)

Income from this sub-system varied considerably, according to specific local conditions. The summary in Table I.5.2.27 of Annex I.5.2 shows that the respondents in Lopburi, Angthong and Supanburi earned higher incomes from this sub-system than those in Ayuthaya. In crop year 1993/94, it was found that cows gave the highest income in these places followed by pigs and chickens that were raised on a commercial basis. With the low costs involved, cattle gave high returns in these three provinces, ranging from 2,000 to over 6,000 Baht per farm while costs were negligible. Low costs and returns from cows in Ayuthaya (with a range of 50 – 180 Baht per farm to 400 – 1,300 Baht respectively) corresponds to the small number of cows kept in this province.

The cost of the other two types of livestock was higher since they were raised on a commercial basis. However these two types are found in specific places only. Chicken raising under the contract farming system was found in the project group in Lopburi. It gave about 2,000 Baht marginal return per farm while costs were about 5,000 Baht per farm. This is similar to pig raising in both groups of Angthong which had about 7,000 – 7,800 Baht costs per farm while marginal returns were in the range of 2,100 – 2,300 Baht per farm.

These three types of livestock still gave good returns to farmers a year later (crop year 1994/95). The project group in Lopburi still received returns from chicken (about 4,200 Baht per farm) and both groups in Angthong also earned from pig raising (about 15,000 and 4,000 Baht per farm in the project and non-project group respectively). Although cows still existed in both groups in Angthong, returns were lower (only 1,600 – 2,500 Baht per farm) than in the previous year. This is the same situation in Ayuthaya where costs and returns from cows were in a range of 20 – 60 Baht and 400 – 1,600 Baht respectively. There was no return from cows in the project group in Lopburi and in the non-project group in Supanburi in this year, but it was still about 5,000 Baht per farm in the project group of Supanburi (Table I.5.2.28 of Annex I.5.2).

The situation in the four provinces in the central plain shows that livestock raising was most active in the Angthong, followed by Lopburi, Supanburi and Ayuthaya respectively. The situation of the project and non-project groups was similar. For example, respondents in both groups in Angthong, Ayuthaya and Supanburi had similar livestock systems while it was slightly different in Lopburi where the project group of this province (Lp-P) engaged in commercial chicken raising while the non-project group had none. This was different in the two provinces in the north. It appears that livestock income in the project groups of both provinces was higher than in the non-project group. The former earned from chicken, duck, pig and cattle while the latter earned small amounts from chicken and duck only. The project groups in both provinces received similar returns (about 2,400 Baht and 2,000 Baht per farm respectively). Despite higher returns from cows in Phitsanulok (about 3,400 Baht), compared with 1,800 Baht per farm in Kampaengphet, pig raising gave

negative returns in this province, but not in Kampaengphet (negative 1,600 Baht and positive 2,800 Baht respectively). However both groups received negative returns from chicken raising which was promoted as one of the diversification enterprises (Table I.5.2.29 of Annex I.5.2).

In summary, the incomes from the different sub-systems that have been discovered in section 5.5.1 to 5.5.4 very considerably from place to place. Income derived from these sub-systems of the farms reflect local opportunities as well as individual farmers' skills, or their strengths and weakness.

5.5.5 Farm Income Structure

The analysis in this section is in two parts. The first provides a descriptive analysis of farm income at the household level in terms of cash. The comparison is by individual groups as in the detailed analysis in the previous section, but aggregated to total income from farming. The incomes among the respondents' groups differ widely, in relation to factors influencing farm income generation, which are very specific depending on local conditions. The aggregated income figures resulting from the surveys are also compared to the national statistics of the closest years available. The second part of the analysis compares the structure of farm income as well as variations in component sources. This comparison again is among the respondents' groups.

- **Farm income**

As shown above, crops constitute the core sub-system of farm income rather than the other two sub-systems of fish and livestock. Income generated from the crop sub-system contributed the largest proportion of farm income in all six provinces while income from the latter two sub-systems played a minor, supporting role in the two years surveyed.

As crops generated most of the farm income, land becomes one of the most important resources used. However, the farm conditions surveyed in this study indicate that water is also a significant and critical resource. The non-project group of Angthong would be the classic example in this respect where the average farm income was the lowest due to the small size of land holdings. However, this was not true in the other cases. Respondents in Ayuthaya, Supanburi and in the non-project group in Angthong had smaller farm sizes than Lopburi, but their farm income was higher, especially in crop year 1994/95. This was because of the influence of water resources, which allowed for dry season crop cultivation.

Besides the non-project group in Angthong which had an average farm income of only 63,000 Baht and 92,000 Baht in both crop years surveyed, incomes in the other groups of all four provinces in the central plain were higher and close to the figures of the corresponding national statistics. Farm incomes were in the range of 93,000 to 115,000 Baht in crop year 1993/94, increasing to nearly 98,000 to 164,000 Baht in crop year 1994/95 (Figures 5.17 – 18). This is close to the national statistics showing that the average farm income of farmers in the central region in crop years 1991/92 and 1995/96 was 79,215 Baht and 124,384 Baht per farm respectively. The comparison to the national statistics however, cannot be made for the same year of the survey, because data for 1993/94 and 1994/95 are not available. [11]

The influence of water availability is reflected in the discrepancy of farm income compared with farm size. In crop year 1993/94, the respondents' farm incomes in the non-project groups in Ayuthaya, Supanburi and the project group of Angthong were higher than in Lopburi (more than 100,000 – 115,000 Baht, compared to 98,000 – 99,000 Baht per farm) despite the smaller farm size of the three provinces (30 – 34 rai, compared to 42 – 50 rai in Lopburi). Although the income of the project group in Ayuthaya and Supanburi was slightly lower than that of Lopburi for this year (about 93,000 – 97,000 Baht to 98,000 – 100,000 Baht per farm), this did not correspond with the difference of farm size (28 – 33 rai to 42 rai per farm). (Figure 5.17 and Table I.5.2.4 of Annex I.5.2.)

The influence of water was clearer in crop year 1994/95. Except for the project group in Ayuthaya (Ay-P), where farm income was about 3,000 Baht lower than in the project group in Lopburi (Lp-P), farm income of the other respondents (both groups in Supanburi, the project group in Angthong and the non-project group in Ayuthaya) was higher than in Lopburi (range 123,000 – 164,000 Baht to 97,000 – 107,000 Baht per farm). The best example for illustrating the influence of the water factor is the comparison between the project group of Lopburi (Lp-P) to the non-project group of Ayuthaya (Ay-N). Farm size of the former is 12 rai larger than the latter, but their farm income is about 17,000 Baht lower than the latter in both years even though the Lopburi farmers earned much more from livestock (about 9,000 Baht in 1993/94, and 3,500 Baht in 1994/95). Figures 5.17 – 18 provide an overview.

[11] It should be noted that comparison of primary data to the national statistics can be made for crop years 1991/92 and 1995/96 only, and not for the same year of the survey. This is because data is not available for those years. The "Agricultural Statistics of Thailand Crop Year 1995/96" presented the record of farm income in crop year 1991/92 and the following publication in the series, "Agricultural Statistics of Thailand Crop Year 1996/97" presented the income record for crop year 1995/96. No data is available for the intervening year.

Figure 5.17 Farm income in the four provinces of the central plain, by group (crop year 1993/94)

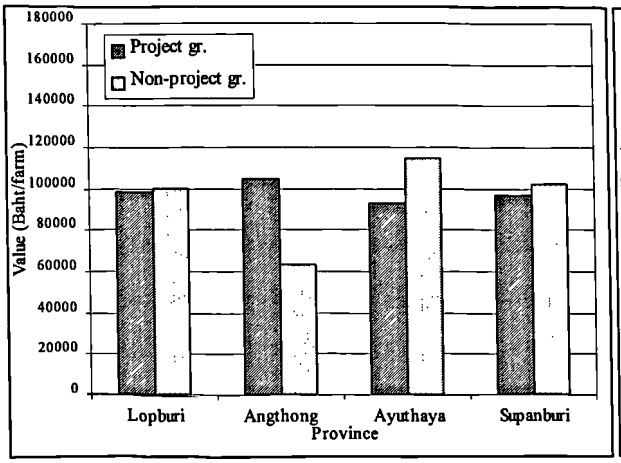
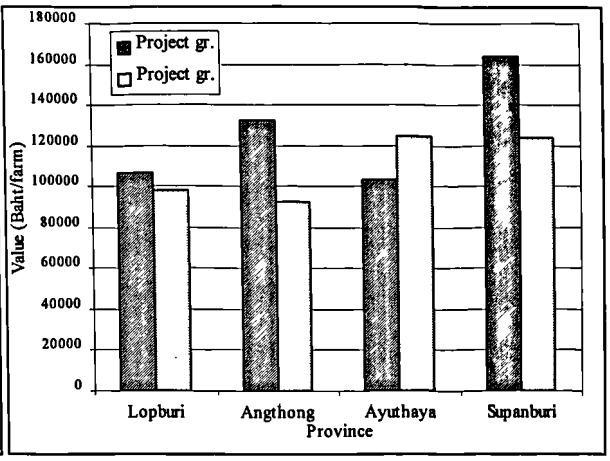


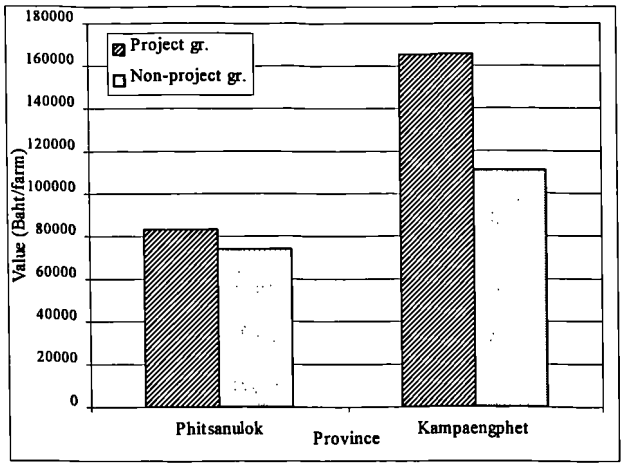
Figure 5.18 Farm income in the four provinces of the central plain, by group (crop year 1994/95)



Source (both figures): Data derived from field survey, summarized from Tables I.5.2.7 – 22

It was found that the respondents' farm income in the north was much higher than that included in the national statistics. The statistical average of farm income in the northern region was 57,655 Baht in crop year 1995/96 while its range in crop year 1994/95 in Phitsanulok and Kampaengphet was 74,000 – 82,000 Baht and 110,000 – 165,000 Baht respectively. Since both provinces do not differ much in terms of accessibility to water resources, the explanation may be traced to the larger land holdings of respondents (29 – 33 rai in Phitsanulok and 40 – 50 rai in Kampaengphet), compared to the average farm size of the region (22.5 rai).

Figure 5.19 Farm income of the two provinces in the north



Source: Data derived from field survey, summarized from Tables I.5.2.23 – 26

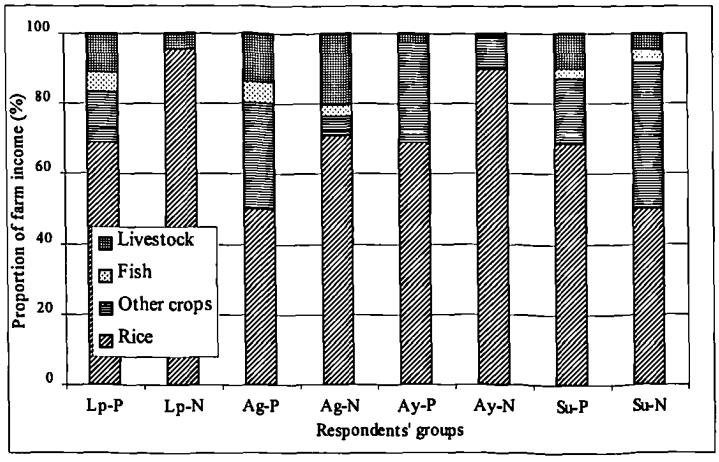
The data show the centrality of income from cropping within the total farm system. However, while land can be viewed as critical, strategic resource in this regard, the quality of land and particularly the quality of water resources is and important mediating factor. Areas with smaller

average land holdings but better quality water resources often produced higher income from cropping.

- **Composition of farm income**

Rice alone contributed the largest share of farm income in both regions and both years of the field survey. In general, its share in the non-project group was larger than in the project group, because a portion of the latter's paddy fields was allocated for fruit trees. However, the exception was in Supanburi where the share of rice in the non-project group (Su-N) was lower than in the other group (Su-P), in both years. In crop year 1993/94, the share of rice to farm income in the project group in the four provinces in the central plain was in the range of 50 – 69% while it was 71 – 96% in the non-project group, except for the non-project group in Supanburi (Su-N, share of rice income only 50%). This is because respondents here have the largest share of other crops at 42% of farm income. The explanation lies, as mentioned earlier, in the fact that more types of cash crops (e.g. sugar cane, flowers, vegetables) are cultivated by this group than anywhere else. In the project group, the range was from a low of 14 – 19% in Lopburi and Supanburi (Lp-P, Su-P), to a high of 28 – 30% in Ayuthaya and Angthong (Ay-P, Ag-P). This was mainly influenced by the income from vegetable growing as an inter-crop in the fruit tree plots. This structure is illustrated in Figure 5.20.

Figure 5.20 Structure of farm income of the four provinces in the central plain, crop year 1993/94

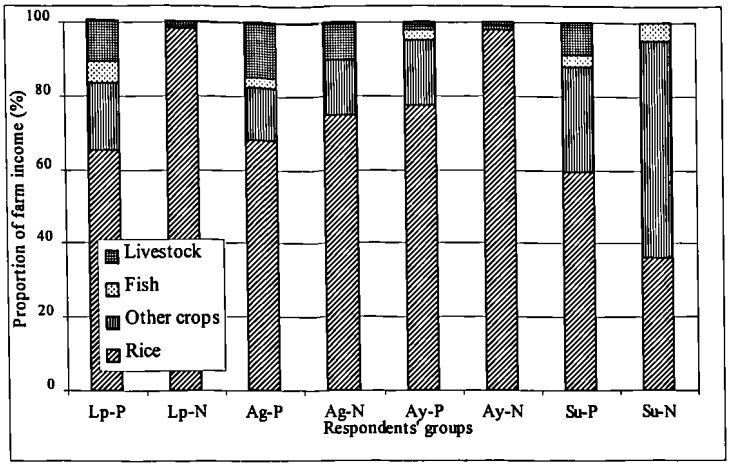


Source: Data derived from field survey, summarized from Tables I.5.2.7 – 22

The farm income structure of these respondents in crop year 1994/95 is similar to the previous year. It should be noted that most respondents gained more than from the previous year. The exception was the non-project group in Lopburi (Lp-N) which earned about 2,500 Baht per farm less. Although the increase in income was mainly from rice due to better water conditions and a slightly higher price, the exception was again in both groups in Supanburi province where the rice

share was smaller than in the previous year (36 – 59% to 50 – 68%) while the share of other crops was larger (29 – 59% to 19 - 42%). The share of income from rice in the project and non-project groups in the other three provinces was in the ranges of 65 – 77% and 75 – 98% respectively. It should be noted that while the share of income from other crops in the project group of these three province in this year ranged from 14% to 19%, the non-project group of Angthong had a share of 15%. Respondents in this group earned more from vegetables and fruit than in the previous year. The income structure in crop year 1994/95 is shown in Figure 5.21.

Figure 5.21 Structure of farm income of the four provinces in the central plain, crop year 1994/95

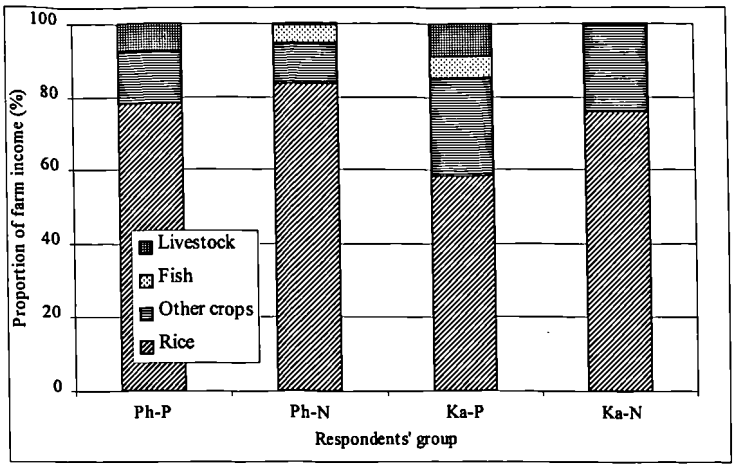


Source: Data derived from field survey, summarized from Tables I.5.2.7 – 22

The structure of farm income in the two northern provinces was similar to the four central-plains provinces. Rice contributed the largest share followed by other crops, and again, its share in the project group was smaller than in the non-project group (58 – 78% to 76 – 83%). Similarly the share from other crops was larger in the project group than in the non-project group (14 – 27% to 11 – 24%). This was also influenced by vegetable growing in the former group, as in the central plains. It should be noted that although both provinces received income from soybean, only Kampaengphet earned from sugar cane, not Phitsanulok. This made the share of other crops in the former province larger than the latter (Figure 5.22).

Summing up on farm incomes, the six provinces surveyed consistently show the dominance of rice as the main income-generating crop, but the comparison between project and non-project groups also shows the emergence of the income effects of diversification, even though the returns from fruit trees during those early years of the project could not be expected to be in any way significant. Local conditions with regard to marketing opportunities and soil suitability also accounted for considerable differences between the project and non-project groups, especially in the case of Supanburi.

Figure 5.22 Structure of farm income of the two provinces in the north



Source: Data derived from field survey, summarized from Tables I.5.2.23 – 26

5.6 Non-farm Income Analysis

This section deals with non-farm income separately, because its share of total household income varies particularly widely depending on local conditions. As shown in Figure 5.16 above, on-farm and off-farm income are distinguished in this analysis. While all types of farm income are strongly influenced by the land-resource base and the land-use pattern, non-farm income includes factors that are largely independent from the farm itself, such as employment on the respondents' own farms and remittances. So location and labour utilization (which are linked to household life cycle) become the most important factors enabling the farm household to respond to job opportunities outside the farm. As discussed in section 5.5 and depicted in Figure 5.16, the non-farm sources of income have been subdivided to take account of the differences in local conditions.

On-farm income in this study is defined in accordance with the OAE system (OAE, 1998, pp. 266 – 275), in combination with facts derived from the field survey, and includes profits from trading, services and home industry. Trading refers to running a small business such as a small grocery shop at home or selling cooked food in the village and market nearby, while services found in this case include, for example, tailoring. These two sectors are rather simple, unlike the many varieties in the home industry sector. In this study, it varied from bonsai cultivation, to gem cutting, cloth weaving (specifically in Lopburi), simple basketry which can be found anywhere, to garland making which is specific to Supanburi.

Off-farm income comes from various types of activities, as the following list from the field survey shows:

a) 'Official' refers to employment in the government and state-enterprise sector. All represents in this category are fully employed.
b) 'Agricultural employment' refers to employment in the agricultural sector, outside the household's own farm. Most of the cases were part-time employment, such as working on other farms (e.g. spraying, harvesting, land preparation, etc.) on a temporary basis.
c) 'Non-agricultural employment' refers to employment in the non-agricultural sectors. This covers both part-time and full-time employment. The former includes construction work and driving, either in the same sub-district or far away in other provinces. The latter refers mostly to employment in factories nearby, such as in the case of Ayuthaya and Lopburi.
d) Remittances sent by members of the family, mostly from Bangkok or even abroad in the case of Angthong
e) Income from renting out a piece of land.

The tabulation of non-farm income from both on-farm and off-farm sources is broken down in greater detail as described above. It is presented in Tables I.5.2.30 – 39 of Annex I.5.2, while the discussion is in the main text. In accordance with the household income analysis used by the OAE, income from this sub-system is recorded in the form of net cash income.

5.6.1 Components of Non-Farm Income

The analysis of the various forms of non-farm income was carried out in the same way as that of farm income, before combining both elements in the comparative analysis of total farm household income in section 5.7.

- **Home industries**

Home industries in this study are rather specific to Lopburi and Supanburi provinces. Therefore, income from this source in these two provinces is higher than in the others in the central plain. The respondents in Lopburi earned the highest from a variety of activities (e.g. bonsai, cloth weaving and gem cutting) in the two survey years. Both groups earned within the range of 5,900 – 6,700 Baht per farm in crop year 1993/94, which increased to 7,200 – 7,400 Baht in crop year 1994/95. The rate of increase was about 7% in the project group while it was as high as 25% in the non-project group. In contrast with Lopburi, the farmers in Supanburi earned very much from

making garlands, as a value-added activity in addition to flowers that they grown during the few years observed in this study. [12]

- **Official employment (government employment)**

'Official' here refers to various forms of government employment, such as teachers, chief of village or sub-district and employment (both permanent and temporary) in government and state enterprises. Since this type of occupation is viewed as highly prestigious and relatively secure, such a career is highly sought after. This is reflected in the four provinces of the central plain, where income from this source increased in crop year 1994/95 in most places. However, the exception was the two groups in Angthong which earned the lowest in incomes from this type of employment. The situation of the project group in Supanburi is similar to the non-project group in Lopburi, where some people got new public-sector jobs in crop year 1994/95. Increasing the official employment share of non-farm income from 27% to 40%. Income from this source varied from place to place, according to the ability of people to get such jobs. There was no discernable pattern between provinces, regions or project/non-project groups.

- **Agricultural employment**

Mechanization in the central plain dates from the 1960s but developed and advanced particularly from the latter half of the 1970s (Takaya, 1987). Labour-saving practices continued to spread within the delta where they now play an important role in farming practice. A number of farm machines such as the power tiller, water pump, sprayer and rice harvester, are used to substitute for man power. However, some farm operations that have to be carried out within a certain time frame require extra labour, for example manual weeding, spraying or manual harvesting. Therefore, some farmers work part-time on farms nearby, and other times, they have to employ additional labour too.

[12] Further details on the income from home industries are as follows: Despite earning the highest in Lopburi, the rate of increase was lower than in Supanburi. Farmers in the latter province earned not much in crop year 1993/94 (about 1,700 Baht and 500 Baht per farm in the project group and non-project group respectively). The increase to 2,900 and 4,500 Baht in both groups during these two years shows that the increase rate in the project group was about 70% while it was 9 times higher in the non-project group. As the farmers use flowers from their own farms to make garlands, they earned more when they grew more flowers in crop year 1994/95. This pushed the share from this source up, from a range of 2 – 7 % (1993/94) to 11 – 13% a year later. However, the largest share of this source among all areas was in Lopburi, at 20 – 28% (1993/94) and 14 – 27% (1994/95) respectively. It should be noted that the amount of non-project group in this province was higher in 1994/95 (about 7,400 Baht to 6,000 Baht in the previous year), but its share was smaller (only 14% to 20% in the same time series). This is because of the enormous increase in income from government employment among the household members in this group in crop year 1994/95. It grew from about 6,900 to 20,000 Baht per farm.

Income from this source is not high when compared to other employment. In the four provinces in the central plain, amounts varied in crop year 1993/94 from about 1,000 Baht per farm in the non-project group in Lopburi to 7,600 Baht in the same group in Ayuthaya. So the share of non-farm income in crop year 1993/94 varied from 4% in the non-project group in Lopburi up to a high level of 32% in the same group in Angthong. Although the amount of this group in Angthong was lower than the same group in Ayuthaya (about 5,400 Baht to 7,600 Baht per farm), its share of total income was higher (32% to 16%), because of greater total non-farm income in Ayuthaya, mainly from industrial jobs.

In crop year 1994/95, income from agricultural employment increased slightly in most places of the four provinces in the central plain (a few hundred Baht up to a thousand), but it did not change much in terms of its share of non-farm income. The reverse was true in both groups in Ayuthaya and the non-project group in Angthong. Although it declined to about half (in both value and share) in both groups in Ayuthaya and non-project group in Angthong, the non-project group in Ayuthaya earned the highest in the central plain (about 4,000 baht per farm). This is explained by the establishment of one large commercial fruit tree plantation in early 1993, where the farm needed a lot of temporary workers, particularly in the first year.

Although the non-project groups in both provinces of the north earned the same range as the non-project group in Lopburi, Angthong and Supanburi in crop year 1994/95 (with ranges of 2,000 – 2,600 Baht to 2,200 – 2,700 Baht per farm), their project groups earned much less (only 500 – 600 Baht per farm). So the share of non-farm income in the non-project group of these two provinces was higher than in the project group (12 – 19% to 3 – 4% respectively). This was caused by the higher number of full-time employees and those combine farming with part-time employment among the non-project group.

- **Non-agricultural employment**

The Chao Phraya delta had the bulk of all factories in Thailand even before World War II. These comprised of sugar and rice mills and workshops for consumer goods in and around Bangkok. However, the boom in the manufacturing sector in the early 1980s, which occurred at the same time as farm mechanization developed, allowed farmers to make their farm work more productive and efficient, and, at the same time, freed-up some family members for work outside the farm. So the development of this sector, together with the service sector, took advantage of low wages and plentiful rural workers, to the extent of exploiting the agricultural population (Kasetsart University, ORSTOM, 1996).

The findings in the study area confirmed these trends. Many family members of respondents were involved in the non-agricultural sector, outside their own farm. Types of work varied widely from unskilled labour to skilled labour, including carpentry, construction work, and industrial labour. In most places incomes from this source had became the largest portion of non-farm income. It should be noted that income from this source in the two provinces in the north was much lower than in the central plain. It varied from a low of about 1,000 Baht (project-group, Kampaengphet) to 7,500 Baht per farm (project group, Phitsanulok), while it was in the range of 5,000 to nearly 37,000 Baht per farm in the central plain. This is an effect of industrial development which has been dominant in the central region from 1980s onwards.

The unequal dispersion of industry did not only show up in the inter-regional, but it is also in the intra-regional comparison. Based on data from the Department of Industry (1990), the industrial sector in the central region is concentrated in the vicinity of in the Bangkok, especially in the three provinces of Samut Sakorn, Samut Prakan and Pathumthani. Furthermore, large parts of the three provinces of Ayuthya, Lopburi and Saraburi belong to the upper central region, where many factory sites have more latterly developed, further away from the metropolitan area. During 1981 to 1989, manufacturing grew in this region at the rate of 9.5% per year (Kasetsart University, ORSTOM, 1996).

These developments are consistently reflected by the findings from the field survey. The highest earnings in the central plain were found in Ayuthaya province which borders on Pathumthani. With the boom of the industrial sector here, farmers in Ayuthaya began to access jobs in Ayuthaya and Pathumthani. In some instances young people migrate to the work while in others industrial jobs are offered with company transportation provided permitting daily commuting to work. Although income from this source was lower in both groups in Ayuthaya in crop year 1994/95, the people here still earned the most of all groups surveyed (ranging from 20,000 – 37,000 Baht per farm in crop year 1993/94 and 16,000 – 24,000 Baht a year later). This is equal to a share of 67 – 78% and 53 – 56% of non-farm income in those years. The decline of income from this source also made total non-farm income in this province decline slightly in crop year 1994/95.

Unlike Ayuthaya, incomes from non-agricultural employment in both groups in the other provinces were increased in crop year 1994/95. The Lopburi and Supanburi groups had similar ranges in both years (6,000 – 12,000 Baht per farm, 1993/94, increasing to 7,000 – 15,000 Baht a year later), which was equivalent to a share of 25 – 43% and 26 – 42% of non-farm income in these two years. Although the respective amounts in Angthong were low (4,700 – 7,100 Baht and 5,200 – 7,900 Baht per farm in these two years), their share of non-farm income was as high as in the other groups (19 – 42% and 20 – 51% in these two years). Angthong had the lowest non-farm incomes among the four provinces in the region.

The wide range of income in each province presented here can be explained by the differences between project and non-project groups in the same province. Value and share in the non-project group were consistently higher than in the other group in every site. The ranges in crop year 1993/94 were 4,700 - 20,000 Baht and 7,100 - 37,000 Baht per farm respectively, equivalent to 19 – 67% and 42 – 78% of non-farm income in the project and non-project group respectively. In other words, non-project groups usually had more non-farm income than those households that joined the diversification project. The figures for crop year 1994/95 were similar at 5,200 – 16,000 Baht and 7,900 – 24,000 Baht per farm, equivalent to 20 – 56% and 26 – 53% in these two groups. These survey findings reflect the fact that larger numbers of family members in the non-project group were in full-time farming and part-time employment than in the other group (see section 5.4.3, Labour Utilization).

The situation in the north was slightly different. Although the non-project group in Kampaengpet earned more from this source than the project group (about 3,800 Baht to 1,200 baht per farm), the latter group in Phitsanulok earned more than the former (about 7,400 Baht to 2,700 Baht per farm). This made income from non-agricultural employment account for the largest share of non-farm income in the project group in Phitsanulok (30%) and the second largest in the other three groups. Its share in the non-project group of Phitsanulok was still high at 26% while it was lower in both groups in Kampaengphet (10% and 18% in the project and non-project group respectively).

- **Remittances**

It is commonly found in Thai society that a number of family members in rural areas (especially the young and unmarried) who are working in other places, mostly in Bangkok, some other large cities or even abroad, send money back home periodically. The same is true in the study areas, as the respondents in all sites in both regions earned from remittances. The value varied considerably, from site to site, and from year to year.

The highest amount earned from this source was found in the project group of Angthong in both years. Amounts of 12,000 Baht and 13,000 Baht per farm in these two years contributed about a half of non-farm income in this group. This relatively high average value can be traced to one member of a family in this group who worked in Taiwan and sent enormous amounts of money back home. It was also found out that amounts were increasing considerably in Ayuthaya and Supanburi (non-project group), but not much in the other groups, or even decreasing in the project groups of Lopburi and Supanburi. The increasing amounts of the project and non-project groups

of Ayuthaya were about 4,500 Baht and nearly 7,000 Baht, respectively. So their share of non-farm income per household increased from 0 – 7% (1993/94) to 15 –23% a year later. The amounts in the non-project groups in Supanburi and Lopburi were about 3,000 – 3,500 Baht per farm. However, it decreased by about 1,400 – 2,000 Baht per farm in the project group of these two provinces. So its share of non-farm income in these two provinces for the two years studied varied from 2% in the non-project group in Supanburi to 16% in the project group of the same province.

The respondents in the two provinces in the north seemed to earn much less from this source than in the four provinces of the central plain: Kampaengphet was lower than Phitsanulok (800 – 2,200 Baht and 2,800 – 3,900 Baht per farm respectively). So shares of non-farm income were lower in Kampaengphet than in Phitsanulok (7 – 10% and 15 – 27%, respectively).

- **Trading**

Small scale trading is another occupation found in the study areas. This can be a small grocery shop in the village or selling goods or food items, which are not direct farm products, in the local market. This was found in several areas but it does not exist in every site. For example, there was no such activity reported in the non-project group in Angthong in these two years, and it did not existing in the non-project group in Supanburi in crop year 1994/95. From the groups which engaged in trading, those in the central plain earned about 300 - 6,000 Bt. per farm in crop year 1993/94 and 500 - 5,500 Baht per farm a year later. The share of non-farm income was in the same range in both years (from 1% up to 23%).

The big difference between the groups in the north is that the project group in these two provinces earned a lot from trading, much more than the other group. Although the value in these two groups differed by about 3,400 Baht, its share to non-farm income of each province seemed to be large due to the smaller amount of non-farm income in Kampaengphet. This made its share of the project group in Kampaengphet the largest (about three quarter) while it was about 20% in this group in Phitsanulok. One respondent in the former province was a sub-agent of a company, trading on a larger scale than others in the sample. Values in the non-project group were very low, ranging from nothing in Phitsanulok to 700 Baht per farm in Kampaengphet, which is equivalent to a 4% share of non-farm income.

- **Land rent**

Renting out land is common, mostly to farmers in the same area. This happens when farmers have either labour or capital constraints in managing their own farms. Since most of them are small-scale farmers, renting is always in small pieces of land and involving small sums of money. Small portions of land were rented out in the non-project group in Lopburi and in both groups in Supanburi. Thus rental income is very limited (less than 100 Baht in Lopburi and about 600 Baht in Supanburi). Although values increased in the following year (1,200 - 2,300 Baht per farm), the share of non-farm income was still low (only 3 – 9% in crop year 1994/95 while it was 1-2% in the previous year). Its portion in the two provinces in the north is also low, only a few thousand Baht in the project group in Phitsanulok and the non-project group in Kampaengphet. So its share of total non-farm income was 7% and 10%, respectively.

5.6.2 Non-farm Income Structure

As shown, income from non-farm sources varied considerably. Although most of the non-project groups earned more than the project groups, this was not the case in Angthong and Phitsanulok, which had the lowest non-farm income among all groups of respondents. According to the two years survey in the central plain, it seems that non-farm income in 1994/95 was higher than in the previous year in most places, but not in the non-project groups of Ayuthaya and Angthong. With the lowest earnings from this sector, the non-project group in Angthong had only 17,000 Baht per farm in 1993/94 and slightly less in 1994/95 (nearly 16,000 Baht). The highest amounts were found in the non-project groups of Lopburi and Ayuthaya. In Lopburi, the figures were 30,000 and 55,000 Baht per farm in crop year 1993/94 and 1994/95 respectively, compared with figures for Ayuthaya of 47,000 Baht and 45,000 Baht in these two years. Only the high earnings in both groups of Ayuthaya and the non-project group in Lopburi come close to the national statistics, which give average non-farm incomes of nearly 30,000 and 49,000 Baht per farm in crop years 1991/92 and 1995/96 respectively. Non-farm incomes in the other places were lower at 23,000-26,000 Baht per farm in both years, and still lower in the non-project group of Angthong, as mentioned above. The survey findings on non-farm income generated by all groups in the central plain are illustrated, for both years of the survey, in Figures 5.23 and 5.24.

Figure 5.23 Comparison of non-farm income in the central plain (crop year 1993/94)

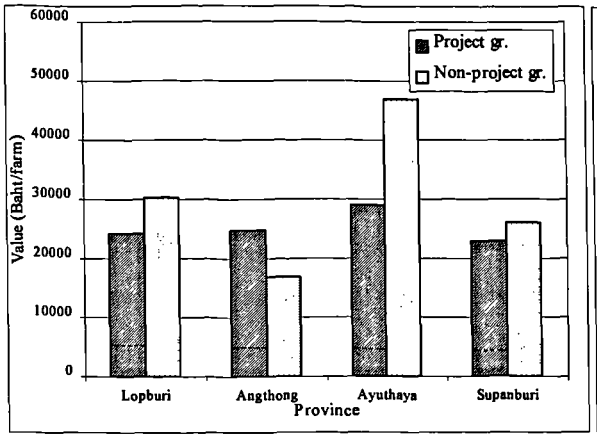
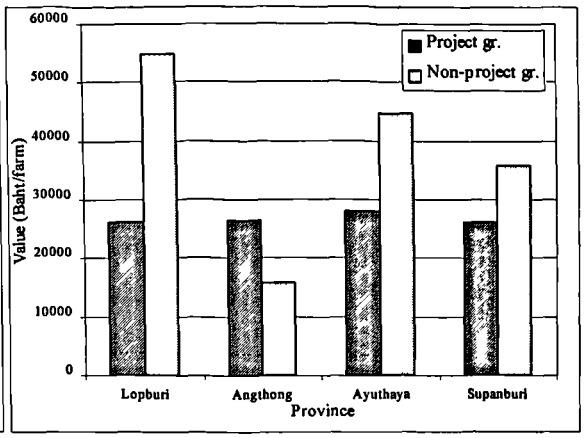


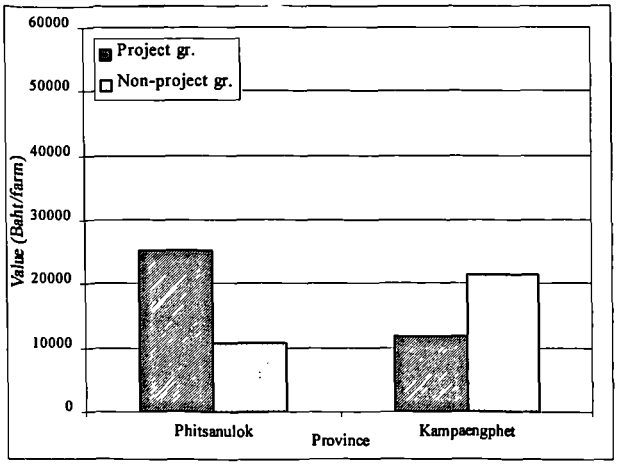
Figure 5.24 Comparison of non-farm income in the central plain (crop year 1994/95)



Source (both figures): Data derived from field survey, summarized from Tables I.5.2.30 - 37

Findings from the field survey and national statistics show that non-farm income in the north is expectedly lower than in the central region. As shown in Figure 5.25, this ranged from a low 10,000 Baht per farm in the non-project group in Phitsanulok to a high of 25,000 Baht in the project group of the same province. Only the non-farm income of the non-project group in Kampaengphet and the project group of Phitsanulok (about 21,000 Baht and 25,000 Baht per farm respectively) came close to the average non-farm income in the northern region, which is given in the national statistics as 17,000 Baht and 29,000 Baht per farm (crop years 1991/92 and 1995/96 respectively).

Figure 5.25 Comparison of non-farm income in the two provinces in the north



Source: Data derived from field survey, summarized from Tables I.5.2.38 - 39

- **Composition of non-farm income**

The composition of non-farm income is summarized in Figures 5.26 – 5.28. In order to underline the great diversity of the sites, the data is presented in disaggregated form for individual groups for each year. For the purpose of this summary presentation, the sources of income were combined into five categories:

1. On-farm. This comprises of trading, services and home industries.
2. Agricultural employment. This source is presented separately even though its value and share are small. This aims to illustrate the decline of this sector in comparison with non- agricultural employment.
3. Non-agricultural employment. This is a major source of non-farm income.
4. Remittances. Although this is not a major source of non-farm income, its value and share is large in some groups and with dynamic variations in some groups.
5. Others. This combines incomes from the relatively important source of government employment (officials) and land rent which was found to be insignificant.

Figure 5.26 Proportion of various sources of non-farm income in the central plain (crop year 1993/94)

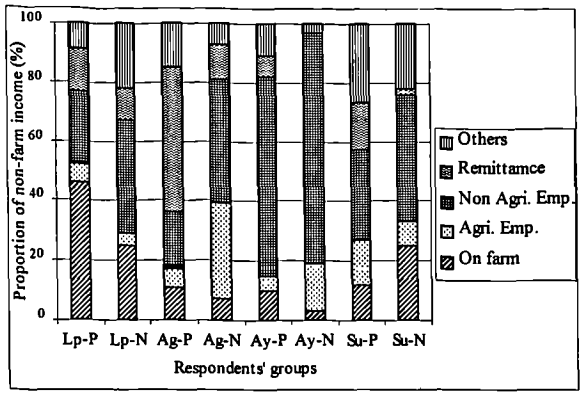
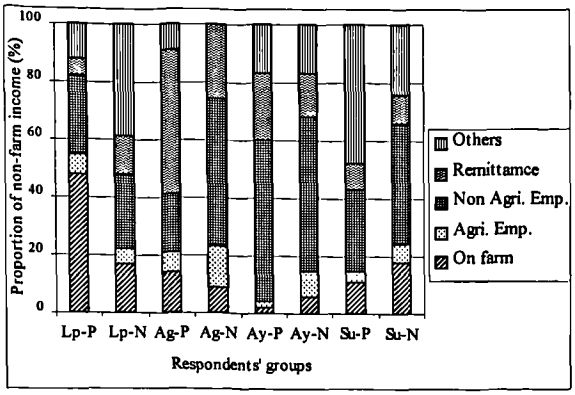
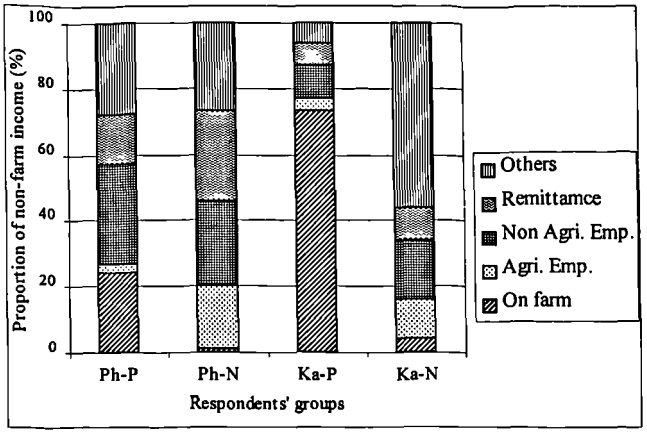


Figure 5.27 Proportion of various sources of non-farm income in the central plain (crop year 1994/95)



Source (both figures): Data derived from field survey, summarized from Tables I.5.2.30 - 37

Figure 5.28 Proportion of various sources of the two provinces in the north



Source: Data derived from field survey, summarized from Tables I.5.2.38 - 39

5.7 Total Farm Household Income

The farm household net cash income comprises of net farm income and non-farm income. Almost throughout all the study areas, the total household income of the project group was much lower than the non-project group in the first year of project implementation. This is because of the heavy investment of the former group in fruit trees, resulting in negative returns on this crop. The only exception was in Angthong, where the project group earned more in both farm income and non-farm income than the other group. This was due to inter-crop cultivation, together with high amounts of remittances from abroad.

The highest farm household income was in the non-project group of Ayuthaya where the farmers earned much from both farm and non-farm sectors, followed by this group in Lopburi and Supanburi (about 99,000, 76,000 and 59,000 Baht per farm respectively). The lowest total income was in the project group in Lopburi followed by the same group in Ayuthaya (about 25,000 and 33,000 Baht per farm respectively). In both cases, the low value was caused by the costly investment in fruit trees which was higher in these two provinces than in the others (refer to section 5.5.2). So net farm incomes in these two groups were only 3% and 12% respectively. The respective proportions in Angthong and Supanburi were higher at more than a half of total farm household income. In general, however, besides the costly investment in fruit trees in Lopburi and Ayuthaya, the proportion of net farm income was larger than that of non-farm income (ranges of 52 – 65% to 35 – 48%). Table I.5.2.40 of Annex I.5.2 and Figures 5.29 – 30 provide an overview of the results of the field survey in the four provinces in the central plain, at the time of project implementation.

Figure 5.29 Farm household income of respondents in the central plain (Baht, crop year 1993/94)

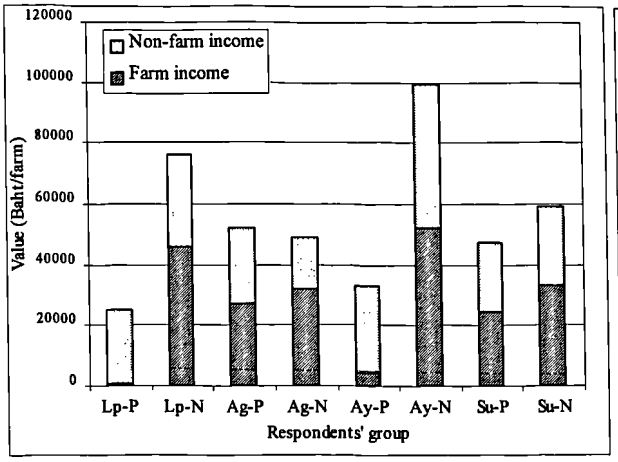
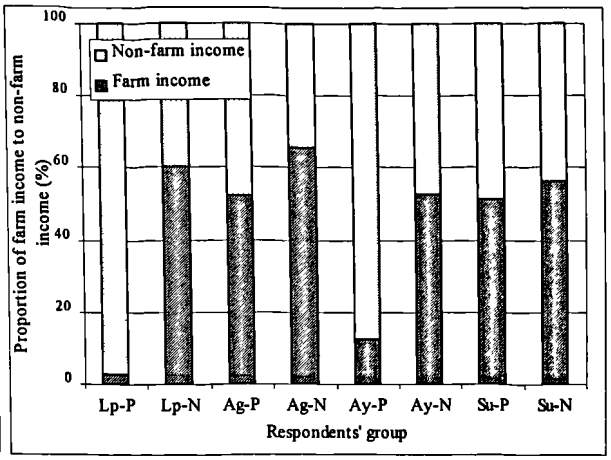


Figure 5.30 Structure of farm household income of respondents in the central plain (%, crop year 1993/94)



Source (both figures): Data derived from field survey, summarized from Tables I.5.2.40

The same experience applies to the two provinces in the north. With the influence of fruit tree investment, net farm income of the project group in both places was nearly nothing. This made the share of this sector low (only 0 – 3%). However the proportion of net farm income was large in the non-project group. It ranged from about 70 – 80%, even larger than the proportion of this sector in the central plain.

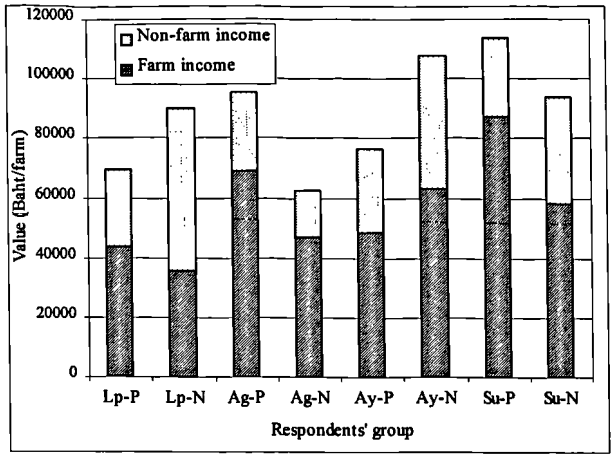
With higher incomes from both farm and non-farm sectors, together with lower costs for fruit trees in year 2 of implementation (crop year 1994/95), farm household incomes of respondents in the central plain increased. This was especially true for the project group, because of much lower costs of fruit trees after the initial investment. Hence the significant increase in farm incomes for the project group in these four provinces ranging from 80 – 180%, while they were was only about 10 – 60% in the other group.

So for 1994/95, the project group in Angthong and Supanburi (Ay-P, Su-P) had higher income than the non-project group, i.e. Ay-N and Su-N. Especially the latter earned the highest in this year, about 6,000 Baht per farm more than the non-project group of Ayuthaya who had been the leader a year before. This is because of the expanded area of dry season rice in combination with much higher income from sugar cane and flowers in this group.

This situation pushed the proportion of farm income up so that it was higher than non-farm income in most places (Table I.5.2.41 and Figures 5.31 – 32). The exception was in the non-project group of Lopburi where the proportion of non-farm income was the largest among all of groups (61% of total farm household income while it was in the range of 23 – 38% in the others). The large share of this sector is based on the high income generated by public-sector employment,

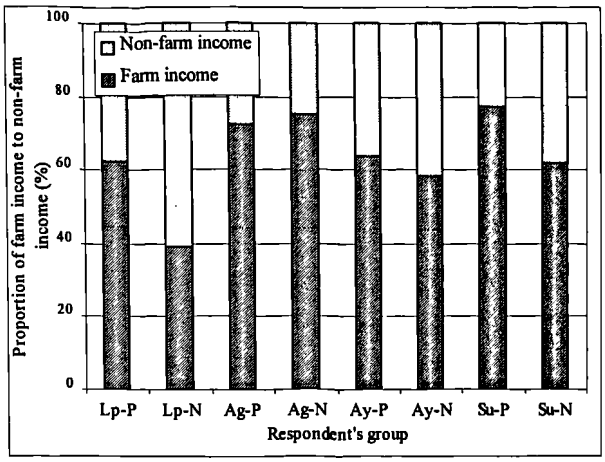
while the increase in farm income was modest because only a small area could be expanded for second rice.

Figure 5.31 Farm household income of respondents in the central plain (Baht, crop year 1994/95)



Source: Data derived from field survey, summarized from Table I.5.2.41

Figure 5.32 Structure of farm household income of respondents in the central plain (%,crop year 1994/95)



Source: Data derived from field survey, summarized from Table I.5.2.41

- **The study area findings in comparison with national statistics**

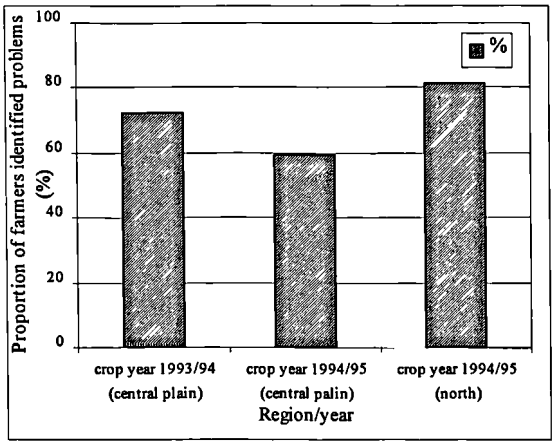
The proportion of farm income to non-farm income in most places of the study areas is the opposite of what national statistics reveal. Based on national statistics, Utis and Webster (1999) stated that, in 1996, 55 to 75% (!) of farm household income was derived from non-agricultural sources, where the high value is reported for the poorest region in the country, the Northeast. The OAE (1999) has a record of 45 – 80%, which varies widely by region. The proportion of non-farm income given by the OAE varied from 55% in the central region to 60% in the northern region, and 63% for the whole country. Related to such values, only the non-project group in Lopburi appears to be representative of the regional statistical average, while most other places had a lower proportion for the non-agricultural sector.

Assuming that the samples of farmers surveyed for this study are representative for at least the relatively prosperous districts in which they live, the results in this study show that income derived from the farm sector is still more reliable than that from the non-farm sector, especially with regard to the rice basis in the irrigated areas. However, the rather high proportion of non-farm income in the areas that have access to industrial jobs within commuting distance, also shows that the number of full-time agricultural workers in farm households in Thailand is declining, or at least, that it varies seasonally and by micro-region. This does not seem to be adequately reflected in the national employment statistics where agriculture still appears to be the main source of employment of about 50 per cent of the national labour force (Figure 2.6, section 2.3.2).

5.8 Constraints and Problems Perceived by the Farmers

The respondents in the study areas still rely primarily on farming even though they also have good opportunities for earning from the non-farm sector. However, more than a half of all respondents reported problems in agriculture. This varied from place to place and even from year to year. Figure 5.33 (which is summarized from Tables III.A.9.1, B.9.1 and C.9.1) shows that the majority of farmers in the two provinces in the north (about 80%) stated that they experienced problems in agriculture. Lower frequencies of problems were identified in the central plain, but that differed by year. In crop year 1994/95, fewer farmers reported problems than in the previous year (about 60% to 70%), to some extent perhaps because the rice price and water conditions in that second year were generally better than before. However, there were considerable variations depending on locally important causes of problems.

Figure 5.33 Proportion of farmers who identified problems, by region and year (%)



Source: Data derived from field survey, summarized from Tables III.A.9.1, B.9.1 and C.9.1

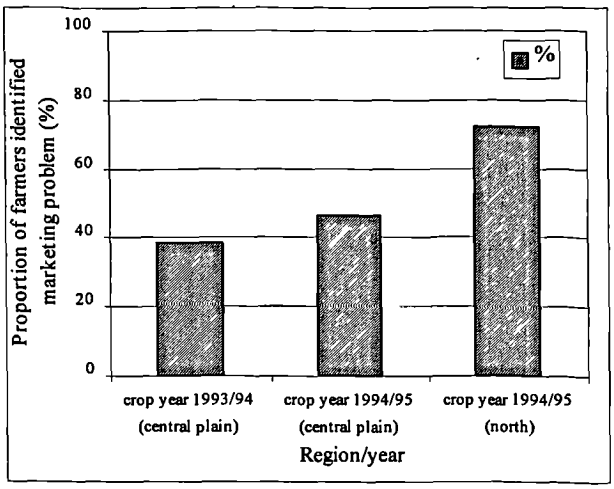
Problems included marketing, insufficient water for agriculture, especially in the dry season, lack of credit, pest damage, high input costs and flooding. Their influence and degree of seriousness varied from place to place and year to year, especially with regard to water availability which greatly improved between the periods of the survey. The problem of marketing seems to be the major problem, as it was addressed by the largest proportion of the respondents in both regions and years. So the marketing problem or rather, the low farm gate price, applies to most farm products including rice, although as a national staple food and export commodity, rice would have a high and steady market demand. The other types of problems, such as lack of credit, insect damage, high input costs and others were also identified by smaller numbers of farmers. As all

these points constitute constraints to the farming environment, which highly affects farmers' livelihood, they are discussed in more detail below.

5.8.1 Marketing as a Major Problem

Although marketing was identified by the largest number of farmers as a problem, the extent of this problem varied from place to place and year to year. The summary presented in Figure 5.34 shows that relatively more farmers in the two northern provinces addressed this problem than farmers in the four provinces in the central plain (72% of the former while 38% and 46% of the latter in crop year 1993/94 and 1994/95 respectively). This can be explained by the simple reason of the more favourable location to the market of the central-plain provinces, especially those within the sphere of influence of the market in Bangkok. The increase from 38% to 46% of farmers mentioning market problems in 1993/94 and 1994/95 can be explained by the fact that fruits and fish sub-systems were not very productive yet in the first years of being introduced to the diversification project.

Figure 5.34 Marketing problems, by region and year



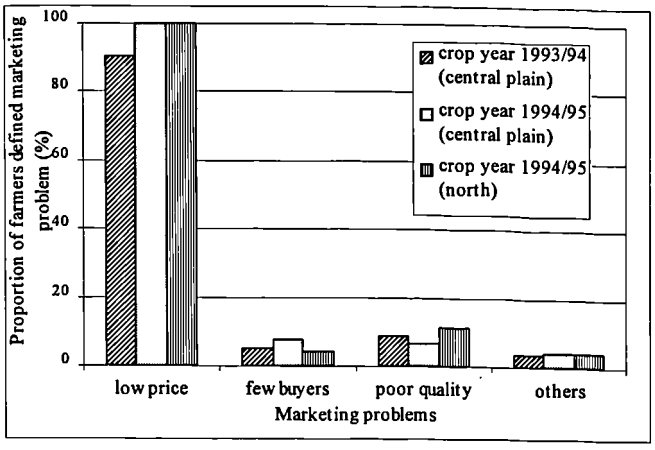
Source: Data derived from field survey, summarized from Tables III.A.9.2, B.9.2 and C.9.2 – C.9.3

Although there are a number of issues embedded in marketing problems, low price becomes the most critical one. As shown in Figure 5.35, most farmers who identified marketing problems referred to low prices of farm products while others concerned points such as few buyers, poor quality and others, but all of these were addressed by less than 10% of the respondents.

As rice is the most important crop, the low-price problem largely referred to rice. It was identified by nearly all farmers (97 – 100%), followed by low prices for vegetables, fish and fruit while low prices for livestock was identified by about 5% of the respondents. Since vegetables were

recommended as profitable inter-crop in fruit tree plantations, a number of farmers faced low prices for this crop as well. 10% of the farmers in the two northern provinces and about 15% in the four central provinces referred to such problems. Low prices for fruits was identified by a smaller proportion, but that simply reflected the initial stage of fruit production in the first year of implementation. The fruit-price problem was identified by only 3% of the respondents in the first year of the project, but this increased to 10% in year 2, as more yield could be sold. The same increase in actual or perceived problems applied to fish, as more and more fish was raised as part of the diversification programme (increasing from 3% in crop year 1993/94 to 17% in crop year 1994/95).

Figure 5.35 Causes of marketing problems addressed by farmers who have these problems



Source: Data derived from field survey, summarized from Tables III.A.8.17 – A.8.24, B.8.17 – B.8.24 and C.8. 9 – C.8.12

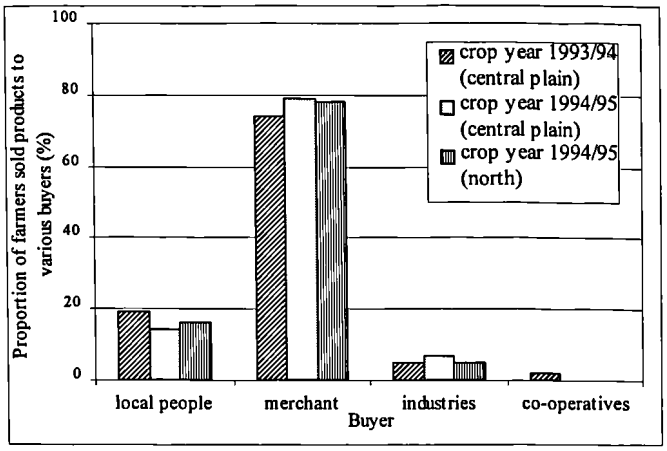
- **Marketing situation**

Low prices for farm products in this study can be related to a number of factors. Firstly, most farm products are sold in the same form as they left the farm, without any grading or processing for value added. Farmers have to sell at harvest even though they know that the price for crop products are lowest during and just after the harvesting period, and usually rise until just before the next harvest. However, small-scale farmers do not have storage facilities which would enable them to wait for prices to increase after harvesting. Furthermore, they always need cash as soon as possible as expenses and debts are waiting to be paid for. Therefore, most farmers sell immediately after harvesting.

Secondly, most products are sold locally to either local people or local merchants although some products, especially rice, may have a foreign destination. This influences the price due to the small number of buyers. Figure 5.36 shows that the respondents in both regions of the north and the

central plain during both years of the survey used similar marketing channels. The local merchant is the major buyer while some products are sold to local people for local consumption. It was found that about 80% of the farmers relied on merchants while about 15 – 20% sold to local people, mostly in the same village or a village nearby. However, some particular products such as sugar cane are also sold directly to the sugar mills nearby. This channel also includes those few farmers who sold rice directly to the rice mill. This was only done by about 5 – 7% of the farmers.

Figure 5.36 Existing marketing channels of the respondents, by region and year



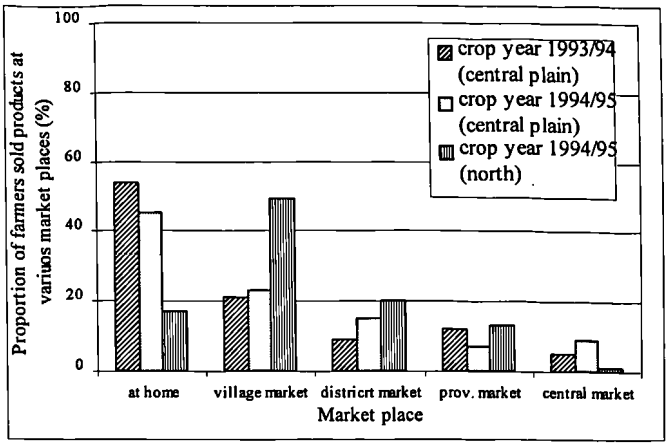
Source: Data derived from field survey, summarized from Tables III.A.8.1 – A.8.8, B.8.1 – B.8.8 and C.8.1 – C.8.4

Thirdly, it is not only that marketing channels are limited to traditional local patterns, but also that farmers' marketing is limited to the village where the farmers live. It was found that the majority of the respondents during both years of the survey sold their products at home ('farm gate'). This is possible because of the good transportation network. So the merchants just come with their four- or six-wheel trucks and buy products at the farm gate. This is the common way of selling rice in the central plain. This also applied to cattle, pig, fish and chicken.

Even sugar cane is sold at the farm, where the buyers usually pay for the crop, but hire workers for the harvesting. It is usually not carried out by the farm owners anymore. Although farmers in the two northern provinces did not sell at home as much as those in the central plain, the market is still limited to the local reach of the village market. Figure 5.37 shows that about half of respondents in the central plain sold products at home in both years while the same proportion of the respondents in the north sold in a village market. Hence the proportion of farmers who sold products in the village in the central region is similar to the proportion of farmers who sold products at home in the two provinces of the north (about 20%). However, some farmers sold at the district market (about 9-15% in the central plain and and 20% in the north). Far-away places (e.g. the provincial market) were accessed only by a smaller proportion of farmers. Besides these, a few farmers also

used a central market for rice which is located in the nearby district of the farmers surveyed in Angthong.

Figure 5.37 Existing marketing places in the study areas, by region and year



Source: Data derived from field survey, summarized from Tables III.A.8.9 – A.8.16, B.8.9 – B.8.16 and C.8.5 – C.8.8

Although the major crop of rice is exported to foreign destinations and Thai rice has had the largest share of the world export for more than three decades, farmers are not the ones who benefit from this dominance. Thailand has to compete with the other producers in the world market, especially the USA and Vietnam, who have become major rice exporters in the last decade. With a focus on export, Bangkok is the main market centre for rice in the country. Therefore the standard rice price is set here. Many intermediaries are involved the marketing channel of rice, from the farm, to local rice mills, larger rice mills, sub-agencies and agencies at the district and provincial levels and Bangkok, until the rice finally reaches the exporters. All these people have to cover their costs and normal profits while farmers are seen as the end of the chain and have to take the price that is left after all the others have earned their share. [13] So it is not surprising that farmers still receive relatively low prices -- although farm gate prices to some extent always reflect world market prices.

5.8.2 The Problem of Insufficient Water Supply in the Dry Season

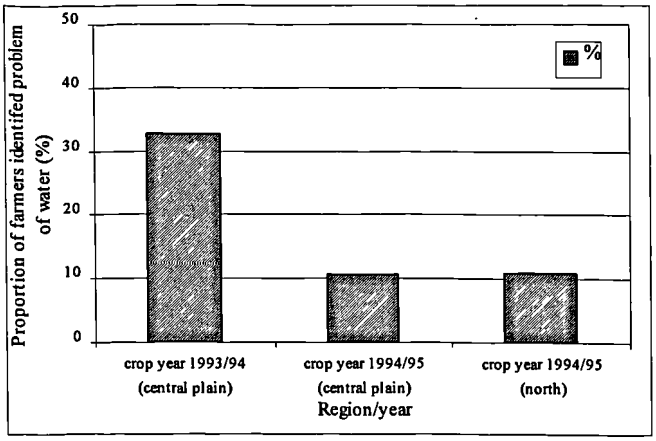
Since all six provinces in the study areas are located in irrigation areas, the farmers here have better production advantages than others in non-irrigated areas. Moreover, on-farm developments in the Greater Choa Praya and Phitsanulok Irrigation Project facilitate farmers to access water in both the rainy and dry seasons, which is far better than having to rely on rainfed farming. The

[13] See Ammar Siamwalla and Viroj Na Ranong, 1990, *Knowledge of Rice*, pp. 193 – 224 and pp. 314 – 319.

irrigation water supply for this area, however, depends on the water storage in the two major dams (Bhumibol and Sirikit), and the allocation of water for farming is set at a lower priority than for power generation or industrial consumption. So water has become a crisis resource in the country because there is strong competition by various sectors, especially in the central plain which is the most dynamic development area of the whole country.

Owing to this situation, severe problems of water use and allocation can arise, as they did particularly in the unusually dry crop year 1993/94. So it was not surprising that about one third of respondents in the four provinces of the central plain stated that they did not have sufficient water for dry season crops, although they are in well-irrigated areas. However this problem was alleviated a year later (1994/95) due to greater rainfall and therefore, much more water available in the two large dams in 1995 (refer to Figure 1.1). So the number of farmers who cited this problem was much lower in the second survey year (only about 10% of repondents). Due to the good rains that year, only very few of the respondents in the northern provinces (10%) had problems with insufficient water supply for dry season crops. Figure 5.38 illustrates these findings.

Figure 5.38 Problem of insufficient water in the dry season, by region and year

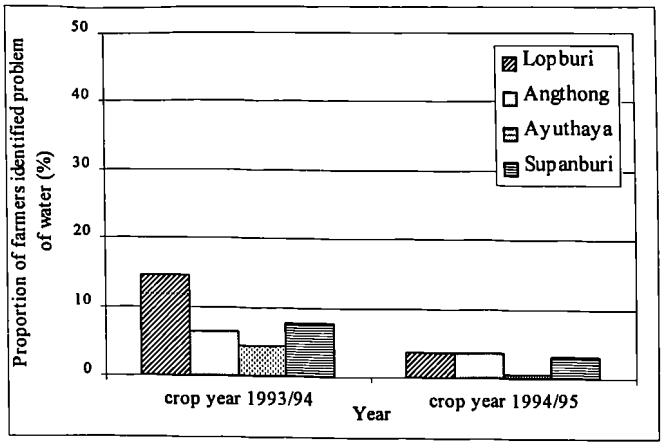


Source: Data derived from field survey, summarized from Tables III.A.9.2, B.9.2 and C.9.2

Analyzing the complaints about dry-season water availability by province shows some differences (Figure 5.39). The problem was addressed by similar proportions of respondents (3 –4% of regional total) in the three provinces of Lopburi, Angthong and Supanburi, but the situation was different in the dry year before. Its proportion in Lopburi was higher than the other three provinces in 1993/94 (14% to 4 – 8%, related to the regional total as in Figure 5.38). This is due to the higher elevation and different land form in Lopburi (refer to section 5.1). Based on the relative topographic advantage of Ayuthaya ('young delta' and conservation irrigation), the smallest

number of respondents there had dry-season water problems in both years (4% in 1993/94 and only 1% a year later).

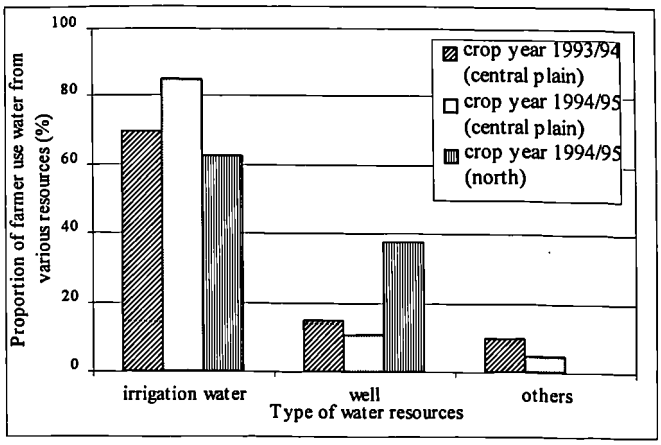
Figure 5.39 Problem of insufficient water, by province and year



Source: Data derived from field survey, summarized from Tables III.A.9.2, B.9.2 and C.9.2

Some respondents used supplementary means for overcoming dry-season water problems, such as shortages of water released from the storage dam, or poor operating and maintenance systems. Hence they tried to find other resources to be on the safe side. Findings from the field survey show that although irrigation water is used as the first priority by the largest proportion of farmers, a number of farmers also used water from wells and other sources as the first priority. The numbers of farmers who used such supplementary sources differed from place to place and year to year. Due to good rains in 1995, the central-plain farmers used irrigation water in a larger proportion than in the previous year (85% to 70%) while they also used water from wells, or from other natural sources (such as rivers, canals and ponds) in a larger proportion in the dry year of 1993/94 (15% to 11% and 10% to 4%). Respondents in the north used water from wells in a larger proportion than in the central plain, because the water distribution system in Kampaengphet is not so developed as in the central plain. Furthermore, the area in Ban Rai district in Phitsanulok province is under extensive land consolidation where the irrigation system does not function as well as under the semi-intensive and intensive systems. Therefore, farmers here have to find their own ways to alleviate this problem. Wells in this region however are of the deep-well type, unlike the shallow wells in the central plain. Figure 5.40 provides a summary.

Figure 5.40 Water resources for agriculture use in the dry season, by region and year



Source: Data derived from field survey, summarized from Tables III.A.4.2, B.4.2 and C.4.2

5.8.3 Lack of Credit

Lack of credit was identified by only a small number of farmers in the central plain (9% in 1993/94 and 2% in 1994/95), but not in the north. This does not mean that the situation of farmers in the study areas is different from that of other small-scale farmers who usually do not have enough money left over from the previous crop for investment in the coming crop. They all do require capital support. However, summarizing the survey results (from Tables III. A.10.1, B.10.1 and C.10.1), Figure 5.41 shows that a large number of respondents already received credit for farm investment (about 80% in both regions in the first year, and about 65% in the central plain in the second year). This was the loan that the farmers received independently from the project. So in the first year of project implementation, the farmers in both regions got credit before the diversification project, which also offered a credit facility. Hence they got two sources of loan, the ordinary one and the one from the project. Since the project-related credit is a long-term loan (15 years), some farmers did not want to be in debt with two credit providers, because that is rather complicated in terms of collateral management, especially for resource-poor farmers. Therefore a number of farmers in the project group of the four provinces in the central plain who had asked for credit support, declined later even more than the non-project group in year 2 of the project (21% to 15%; Figures 5.42).

Figure 5.41 Farmers with credit, by region and year (%)

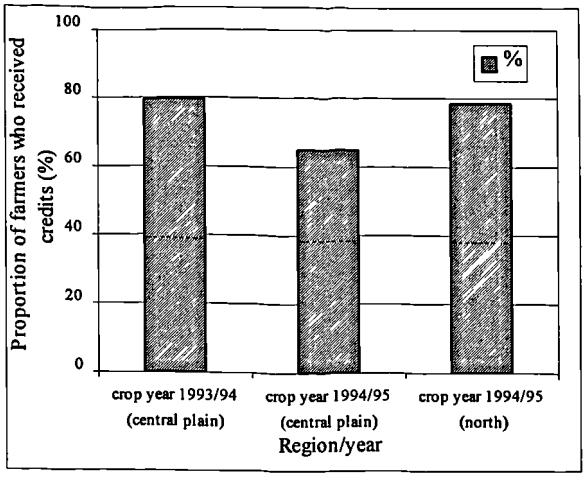
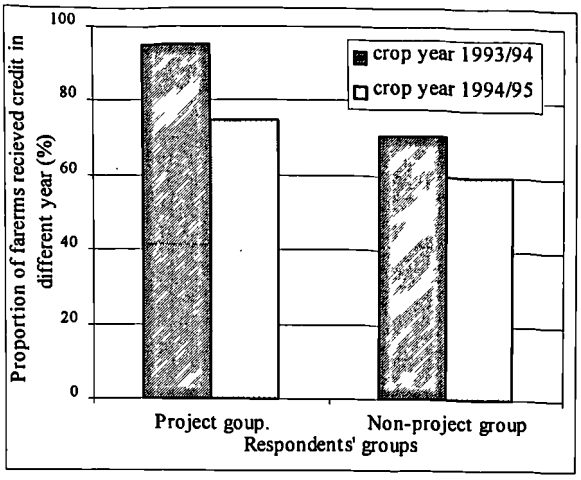


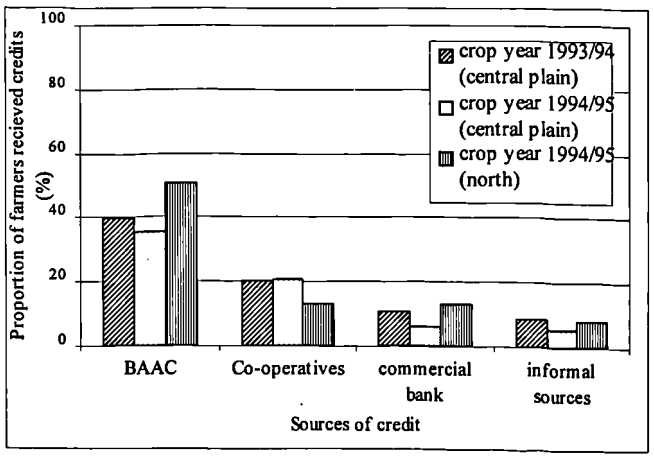
Figure 5.42 Farmers with credit, by group (project and non-project) and year (%)



Source (both figures): Data derived from field survey, summarized from Tables III.A.10.1, B.10.1 and C.10.1

Nearly all farmers received credit from formal institutions while a small number (less than 10%) obtained credit from informal sources such as relatives, friends and merchants. This applied in both regions and both years of the survey. Among the formal institutions, the BAAC is the most important and well-known one. The largest proportion of farmers received credit from this bank (in the range of 35 –50% in both regions and both years) followed by agricultural co-operatives and commercial banks (ranges of 13 –20% and 6 – 13% respectively, Figure 5.43). This is a result of the government policy in favour of the BAAC as the most important institution for providing credit to small-scale farmers.

Figure 5.43 Sources of credit, by region and year



Source: Data derived from field survey, summarized from Tables III.A.10.2, B.10.2 and C.10.2

5.8.4 Other Problems

Several other problems were mentioned by the respondents in both project and non-project groups, such as pest damage, high input costs, flooding and others.

Pest damage is mostly caused by insects, which usually attack all crops, rice, sugar cane, fruit trees and especially vegetables and flowers. This problem varied from place to place and season to season and was identified by 24% of the respondents in the central plain in crop year 1993/94, and by 17% in 1994/95, while it was addressed by about 30% of those in the north.

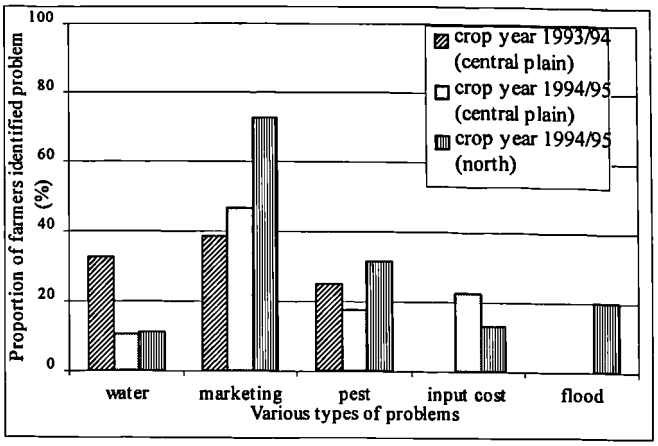
High input costs refer to increasing prices of farm inputs, especially fertilizer in crop year 1994/95, while the price of farm products was stagnant, resulting in lowers returns. This problem was identified by about 20% and 15% of respondents in the central plain and the north respectively.

Flooding usually happens in the rainy season, especially in large low-land areas. This is commonly found in the southern part of Phitsanulok where the two tributaries of the Chao Phraya, the Nan and Yom rivers almost meet (see Figure 5.2), and further down in Pichit and Nakornsawan where the four tributaries join to form the Chao Phraya river. This area is often flooded in the rainy season, and experienced big floods in 1994 and 1995. This includes one part of the study area, located in Ban Rai district, the southern part of Phitsanulok. Hence the number of farmers identifying flooding problems in Phitsanulok province is larger (27%) than in Kampaengphet (12%). There, flooding occurs from time to time because of the water flow from the mountains in the west which overflows local natural canals and river banks before joining the Ping river.

Other problems refer to by some respondents were lack of knowledge and labour constraints, but the numbers were rather small in both regions. In the central plain just 4% in 1993/94, increasing to 6% a year later; in the north, the figure was 7%.

All these problems are summarized in Figure 5.44.

Figure 5.44 Overall problems identified by respondents, by region and year



Source: Data derived from field survey, summarized from Tables III.A.9.2, B.9.2 and C.9.2

5.8.5 Concluding Remarks: Farmers' Problems in Relation to the Diversification Pilot Programme

In concluding this chapter, it appears to be useful to summarize the farmers' problems in a wider framework, where the common farmers' problems overlap with those that were triggered by the diversification project. As the survey results clearly show, marketing problems are perceived by most farmers as the main obstacle to successful and profitable farm operations. Low prices for farm products, the main point mentioned again and again, seriously affects the entire farm economy. Rice continues to be the main crop in all areas surveyed, and therefore low farm gate prices and related aspects of marketing are primarily perceived in relation to rice. However, as experienced in those areas where farmers had already begun to diversify, marketing and price problems were also felt with regard to other crops such as fruits and flowers, where better storage facilities and grading procedures would be needed to achieve better farm gate prices.

Changing external factors such as the fluctuations of the rice price and its share for the producers, is well beyond the capacity of the farmers themselves. Therefore, many farmers tried to find alternatives to the traditional pattern of being totally dependent on (low) rice prices which is the dominant problem, in conjunction with the problem of seasonal water shortages. The survey results reflect the great variety of agricultural land uses and farming practices, especially in the non-rice sectors, where farmers in some areas have been surprisingly innovative and sharp in responding to opportunities and incentives offered by government (such as in Supanburi). The survey results also show the great range of sources of household income, where the income from non-farm sources in some places, and at least at certain times of the year, exceeds the income from crops and other farm sub-systems. The findings from the survey do not seem to confirm the figures from the national statistics on the very large extent of the non-farming proportion of farm

household income, presumably because farmers in irrigated areas are better off than those in rainfed areas. Nevertheless, the figures for 1994/95 (i.e., a year after the main diversification investments had been put in place in the central region areas) show that some 25 to 40 (and more) percent of the household income was from non-farm sources (refer to Figure 5.32). This would indicate the transition, in these households, from full-time farming as the main source of income to mixed patterns, with a large extent of part-time farming.

The survey findings also shed some light on the differences between the project and non-project groups in the various study areas. The comparison of their respective social and economic conditions reveals that those farmers that may be called 'innovators' (or early adopters) are in fact scattered in both the project and non-project groups. These include primarily those who had already begun to diversify on their own before the diversification policy was conceived. The 'majority of adopters' then, are those who joined the diversification pilot programme in 1993/94 and 1994/95 (in the central plain and north respectively), because that gave them the necessary financial basis as well as the advisory assistance to enable them to venture into a more diversified farming practice. However the 'non-adopters' (the rest of the non-project group who did not diversify) had various reasons for rejecting the programme. Some did not have the capacity to move away from a low-profit but safe 'rice-only' farm practice, even when the opportunity was offered by the project. Some might have those capacities, but they were satisfied with their own situations.

Government support is needed particularly with regard to those key factors that are beyond the farmers' control, such as farm gate prices and water availability. Therefore, the diversification pilot project, and later on, the agricultural restructuring programme, were formulated and implemented in order to help farmers to adjust to the two core problems, by offering additional options and real alternatives. The pilot project for diversification out of rice initially only offered fruit trees and other alternatives to growing rice. It thus provided an initial and partial solution to the government's core problem, namely untenable competition for limited water resources; and a partial solution for the farmers' core problem, namely better and more diverse sources of farm incomes. However, the project did not provide much of a solution to the related core problems of the farmers, particularly those related to marketing, including more information, better quality of farm products, and higher farm gate prices.

It was not possible to study such policy implications and effects during the large-scale field surveys in the first two years, because the project implementation had barely begun. However, in the five years after the second round of field surveys, the focus of the study shifted to a more qualitative and in-depth understanding of the mutual effects of government policy and farmers'

own decision-making, their ability to respond to policies and market signals, and their inventiveness based on experience. This type of analysis and discussion begins (in the next chapter) where the presentation of this chapter ends, after a detailed analysis of the baseline conditions and the initial impacts of the diversification programme.

CHAPTER VI Detailed Analysis of the Effects of the Project on Farmers' Livelihood, with an Emphasis on Selected Case Studies

As the second chapter in Part B, (Analysis), this chapter builds upon the descriptive analysis in Chapter V, where the emphasis was on a comparative view of the socioeconomic conditions of the sample groups in six provinces. This chapter takes the analysis into the farmers' views of diversification options, their expectations from the project, and how its support functions relate to common problems experienced by farmers. These were, in the early 1990s, the combination of the low price of rice and scarce water supplies – which together represented the main rationale for establishing the diversification project. So in this chapter, the emphasis is on the farmers' attitudes towards the diversification project, with a view to elucidating the differences within the groups of 'adopters', both those with and without project support.

The analysis of the different groups of farmers was carried out at two levels – a general one, based on the field survey data from all groups (during 1994 and 1995), and a specific one, based on selected in-depth case studies that were actually carried out several years after the initial field surveys. The follow-up interviews with target groups in all provinces took place in the years 1997, and 1999 together with filed inspections in 1998. Such interviews provided interesting insights into the farmers' responses to the continuously changing conditions, with regard to water availability, rice price, marketing chances related to the growing of fruit trees and other alternatives introduced in the years of the first field surveys and before. Following on from these group interviews, which yielded more qualitative than quantitative data, two farmers in each province were selected for further visits and more in-depth interviews. Some of these interviews turned out to be so interesting that the material was worked into specific case studies. These case studies are as follows:

1. Cases 1 and 2: Two farmers who had diversified on their own, before the project was launched, one in Ayuthaya, and one in Angthong.
2. Cases 3 and 4: Two farmers who joined the diversification project and performed well. These two case studies are again in Ayuthaya and Angthong.

The cases of the 'early adopters' are presented in section 6.5, and the other two cases, of diversifiers with project support, are in section 6.8. The case studies include different versions of partial and whole-farm analyses of the economic effects of diversification over time series of five to nine years.

The chapter is structured into nine sections and a number of corresponding annexes with detailed supporting tables and other supplementary materials. Sections 6.1 and 6.2 deal with the most commonly perceived problems of low rice price and water shortages, and the role of these factors in the decline of second rice. Sections 6.3 – 6.5 deal with farmers' views of crop diversification, especially the views of farmers who diversified before the project was launched, including the two case studies of 'early adopters'. After that, sections 6.6 – 6.8 highlight obstacles to diversification, as perceived by respondents, in comparison with the measures provided by the project. These sections also include the effects of the project support on farmers who diversified, including the two cases studies noted earlier. Finally, section 6.9 summarizes the results of the analysis in this chapter.

6.1 The Problem of Low Rice Price

As mentioned in section 5.8.1, findings from the field survey show that most of the marketing problems identified by the respondents related to the price of rice. Over the past thirty years, the Thai Government has experimented with many policies for stabilizing and supporting farm gate prices of rice so as to provide a better deal to paddy farmers, and to cushion them from the sometimes drastic fluctuations.

The main factors influencing the farm gate prices are:

- World market rates (which relate to production patterns of major exporting countries).
- Domestic factors influencing production: natural factors such as rainfall and water storage issues; and economic factors such as expected farm gate prices and price levels of alternative crops.
- Domestic factors influencing farm gate prices: Traders' and exporters' price-setting actions, including speculation; production volumes available for export and domestic consumption; and government policies for price stabilization (e.g., rice premium, credit facilities).

The summary in Annex I.6.1 shows how strongly the individual farm economy is linked with exogenous factors that then determine the livelihood of those farmers who are mainly dependent on rice. The summary shows that the rice price in Thailand is mainly set according to the world market price situation, and is not based on production costs, as in other countries (e.g. India; Ammar Siamwalla and Viroj Na Ranong (1990), p. 304). However, the trend of the production costs of rice, unlike the price, does not fluctuate, but has steadily increased over time. The comparison of total cost, which is a combination of variable and fixed costs, to major and second rice price over time shows that in some years, farmers hardly received any profit (Figure 6.1 – 6.2). During the years of low prices, 1980 – 1987, the price received for major rice was lower than the cost of production, and this

was similar to the situation with regard to second rice in those years. Farmers can only endure this situation because they still receive a small profit when the fixed costs (which are about 10 – 15% of total cost) and the utilization of family labour are excluded from the calculations.

Figure 6.1 Comparison of cost of production and price of major rice by year

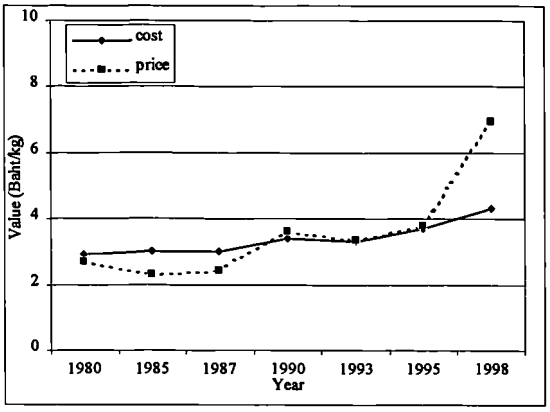
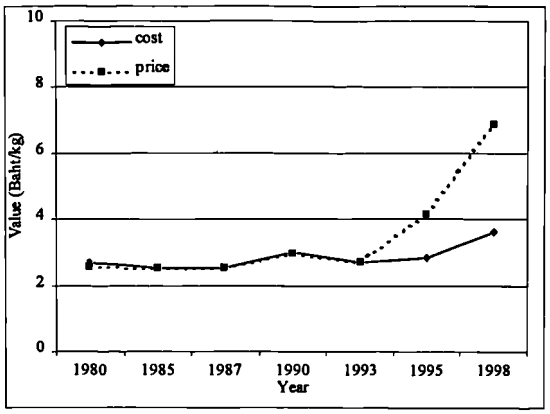


Figure 6.2 Comparison of cost of production and price of second rice by year



Source (both figures): OAE; various statistical year books

As long as they grow mainly rice, farmers will be exposed to the fluctuations in the world market as well as from those of government intervention (which may, or may not, be successful). It is in this context that the diversification policy, which aimed at making farmers less dependent on rice, has to be discussed.

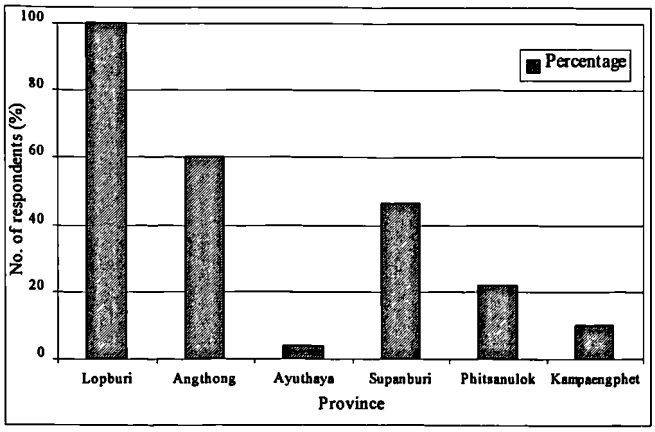
6.2 Farmers' Response to Water Constraints: Cultivating Less Second Rice

Generally speaking, the water available from rainfall in a tropical country like Thailand, is abundant (in a range of 1,200 to 3,000 mm and more), as long as the whole year is considered. However, as the distribution of rainfall over the year is so uneven, there are long periods of time when not enough water is available, and even during the rainy season, there tend to be dry spells that affect agriculture. All over the country, during the dry season, the natural supply of water hardly meets the demand, although for several decades, the government has been trying to capture as much as possible by means of constructing dams, reservoirs and other similar facilities. The lower rainfall in some years (e.g., in the north and central regions in the four or five years before 1995) directly impact on the volumes of water available in those reservoirs.

The problem of insufficient water in the dry season has affected farmers even in well-irrigated areas, such as the study areas that are within reach of the two large schemes of the Greater Chao Phraya and Phitsanulok Irrigation Projects. As discussed in section 5.8.2, the amount of water available for irrigated agricultural areas is limited to the extent that other competing demands on water have to be satisfied too. But although the reservoir levels in 1997 were almost as low as those in the very difficult year of 1993, farmers did receive more water in 1997 than before, when energy and industrial production demands were given higher priority than agriculture. Due to the economic crisis in 1997, urban-industrial demands were lower than four years earlier.

As the field survey results show, farmers tried to alleviate the problems of seasonal water shortages by themselves, in various forms, but the most important measure taken was to stop growing dry-season crops, and especially rice. Many respondents had reduced the area of second rice in the past. Findings from the field survey in the central plain (in 1994) show that all respondents in Lopburi stopped growing second rice in the year before the introduction of the diversification programme, while only 4% of farmers in Ayuthaya did so. The proportion was much larger in the two provinces of Angthong and Supanburi (60 and 46%, respectively). The respondents who still grew second rice in these two provinces did not cultivate it in full scale like in Ayuthaya, but only partially according to water availability. This is similar to the two provinces in the north, even though the proportion of farmers who had stopped cultivating second rice was smaller (10% in Kampaengphet and 22% in Phitsanulok). The remainder continued to grow second rice, but again not in full scale (Figure 6.3, summarized from Tables III. A.11.1 – 2 and III.C.11.1 – 2 of Annex III).

Figure 6.3 Proportion of respondents who stopped growing dry season rice



Source: Data derived from the field survey, summarized from Tables III.A.11.1 – 2 and III.C.11.1-2

The reasons for not growing second rice differed from place to place, but they resemble the problems experienced in other forms of farming as described in section 5.8. The three major categories were insufficient water, low prices and insect damages (Tables III. A.11.3 and III. C.11.4).

6.2.1 Insufficient Water as a Major Cause

Insufficient water in the dry season was cited by the largest proportion in the central plains. However, the percentage differed from place to place according to the conditions of water accessibility and irrigation system performance. Within the conservation irrigation system, this problem was cited by only 4% of respondents in Ayuthaya. Due to the different types of irrigation system and land form (see section 5.1.4 and 5.2.2) in the other three provinces, this problem was cited by a much larger proportion of the respondents (about 60%, two thirds and three quarters of the respondents in Supanburi, Angthong and Lopburi respectively).

Similar to the findings discussed in section 5.8.2, insufficient water in the dry season in the north was less serious than in the central plains. So this problem was noted by a smaller proportions of respondents in the north (18% in Phitsanulok and 8% in Kampaengphet).

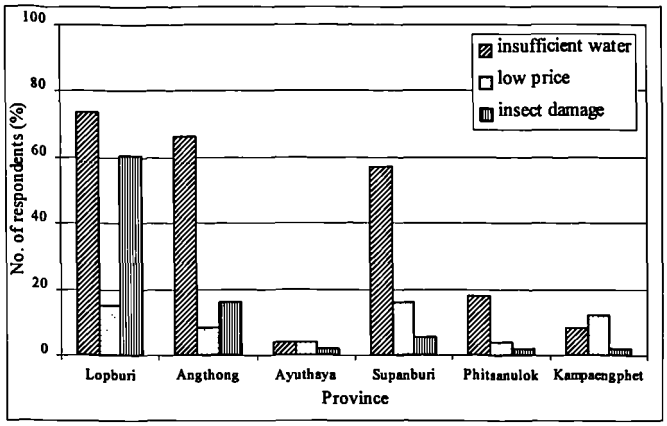
6.2.2 Other Reasons for not Growing Second Rice

Compared to water problems, other reasons for not growing second rice were identified by fewer respondents. For example, the low price was addressed by 4 – 16% of respondents in all six provinces. Although insect damage was identified as one of the causes by a large number of respondents, it was specific to Lopburi (60%), but was not highlighted as a major issue in the other provinces (2 -16 %). This perspective is also consistent with information obtained from the extension officers at the Lopburi Agricultural Provincial Office who reported that most farmers received hardly any yield from their second rice crop in crop year 1990/91 due to insect damage and drought, causing them to stop cultivating second rice since then. The low price of rice was cited by a smaller number of farmers, only 4 - 15%, of the respondents in all provinces.

The reduction of the area of second rice is also related to the introduction of soy bean as a substitute to second rice, which was promoted by the government in the early 1990s in the north (see section 5.3.3). This point was mentioned by some respondents in Phitsanulok (11%) and Kampangphet (14%).

These findings reflect the diversity of local environments and differences in irrigation systems and land forms, as noted in the previous chapter. The results are illustrated in Figure 6.4.

Figure 6.4 Causes of reduction of second rice area



Source: Data derived from the field survey, summarized from Tables III. A.11.3 and III. C.11.4

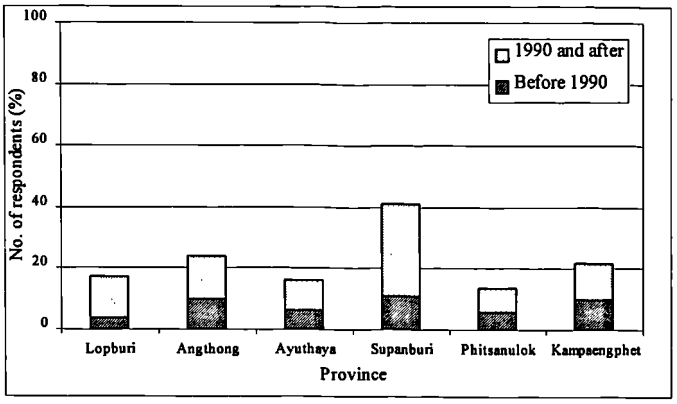
6.3 Diversification Before the Programme Launch

It is common practice for farmers to have other enterprises besides the major one of rice, for example growing fruit trees around the homestead, vegetables cultivated after or before rice, raising native chickens or grazing cattle. Traditionally, the outputs were mainly for home consumption and the surplus for sale. The transition to a commercial scale production came in the 1950s and in some areas in the 1960s, wherever there was a market demand. More recently, farmers have started to raise broiler and layer chickens under contract farming systems, while pigs and fish are raised at a commercial scale. Similarly, traditional vegetables have been developed in response to the market, flowers have been introduced recently in Supanburi, while soy bean was also introduced a few years ago in the north. Although orchards have been particularly promoted by the diversification programme, other forms of diversification out of the rice base have been important too, especially sugar cane and fish. However the discussion below focuses on diversification in to orchard cultivation, to be consistent with the programme.

The survey findings show that some respondents in both regions had started to grow fruit trees in the 1970s. This confirms Tanabe's findings (1987), who reported that fruit trees were cultivated from the latter half of the 1970s. However, the number of fruit tree farmers during the period of the 1970s and 1980s in the four provinces of the central plain was comparatively small compared with the number

who took up growing fruit trees since 1990 (but before the programme launch). It should be noted that the number of fruit tree farmers during these two time periods (before 1990 and after 1990) is similar to the figures in the national statistics for the central plains (RID). It is found that the numbers of these two groups (before and after 1990) are similar in the north (Figure 6.5). However, this is different from the national statistics, which indicated that fruit tree areas in irrigation project 3 (where the two provinces in the north are situated) had been declining during this period (section 5.1.6).

Figure 6.5 Proportion of respondents diversified before programme launch (by time series)



Source: Data derived from field survey, summarized from Tables III.A.12.1 and III. C.12.2

The average size of orchard plots of those who diversified in the four provinces in the central plain lies within a range of 2 – 6 rai (Table III.A.12.3), while it is a bit smaller in the north (3 – 5 rai each; Table III.C.12.3). The rest of the farm remains under paddy cultivation.

Besides diversification into fruit trees, a handful of respondents (1 farm in Lopburi, 4 in Supanburi and 4 in Kampaengphet) changed the land use from rice to sugar cane. Because this is an industrial crop, the average plot size in these farms is large in comparison to that allocation to orchard crops (an average of 9.5 rai in Lopburi, 25 rai in Supanburi and 51.5 rai in Kampaengphet).

There were also a few respondents (2 – 3 cases in each province of the central plain , and 4 cases each in the north) who had started fish ponds. Most of them had small-scale ponds (an average of 1 rai in size) utilizing extensive fish culture systems. The exception was in Lopburi where 2 farmers had a large pond (an average of 14 rai), integrated with chicken raising under a contract farming system.

6.4 Reasons for Diversification

People had many reasons to diversify. As usual, they expected to earn more from the alternatives than the traditional enterprise. This was also found among the respondents who had earlier diversified out of rice. The expectation of higher income was the main reason for diversification in most places, followed by low income from rice and insufficient water for dry season crops. Some respondents in the two provinces in the north also gave the reason that some areas are not suitable for rice (Tables III.A.12.4 and III.C.12.4). These reasons are elaborated as follows.

As mentioned above, higher income was an expectation of the largest proportion of respondents (83 – 87% of those in the three provinces of Angthong, Ayuthaya and Supanburi, followed by 55% in the two provinces of the north, and only 45% in Lopburi). The respondents in Lopburi gave the reason of insufficient water for dry season crops as the primary reason for diversification (some two thirds of them). This reason was declared by a smaller proportion of respondents in the other provinces (30% in the two provinces of the north and in the range of 9 –17% in the other three provinces of the central plain).

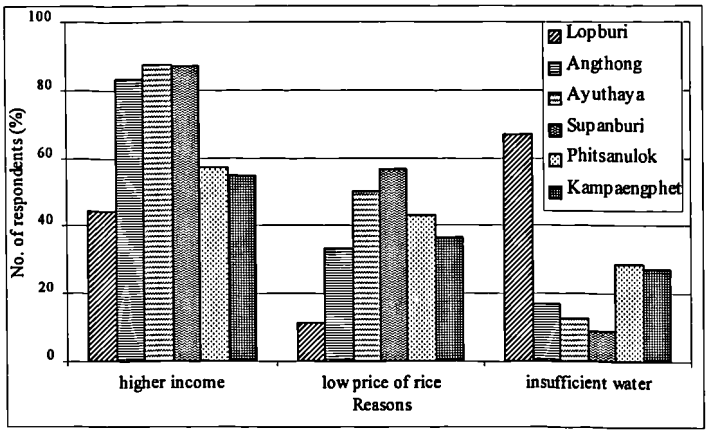
Insufficient water in the dry season seemed to be the most critical factor in Lopburi, where the topography is particularly difficult in terms of access to irrigation water. By comparison, the low price of rice was identified by just 10% of respondents in Lopburi, compared with a range of 33 – 57% in the other provinces.

The apparent lack of concern about the rice price in Lopburi is linked to the rice variety that is grown here: It is a photo-sensitive type which requires a certain day length for productive growth. The advantage of this type of rice is not only that it gives a higher price than the non photo-sensitive varieties due to consumption preferences, but it is also resistant to the dry spell during the rainy season. The disadvantage of this type is that it gives lower yields than the non photo-sensitive variety, which responds well to water control and fertilizer application. Moreover, the non photo-sensitive rice does not require a certain period of daylight, as both the vegetative and productive stages of growth are dictated by age. It is also more resistant to flooding while photo-sensitive rices prefer a somewhat higher elevation for cultivation. It is for these reasons that farmers in Lopburi grow the photo-sensitive type of rice while farmers in the other three provinces cultivate non-photosensitive varieties. These latter rices are not to the consumers' taste, and also faces low prices due to their high moisture content.

Although the respondents in both northern provinces stated their land was unsuitable for rice, there is the difference between the two provinces. The respondents in Phitsanulok declared this reason in a smaller proportion (29%) than in Kampaengphet (55%). This was caused by the differences in irrigation facilities between these two provinces (as mentioned in section 5.2.2).

Figure 6.6 gives the main reasons for diversification, provided by the respondents who had diversified before the project was launched. In contrast with the high income expectations, however, the actual income generated from orchards at this early stage was not high. This is because a larger number of respondents had just started to diversify in the early 1990s (Figure 6.5), so most of the fruit trees were still in the vegetative stage, with only a low yield, and even these not in full scale (see more details in Chapter V, section 5.5.2).

Figure 6.6 Reasons for diversification given by respondents



Source: Data derived from field survey, summarized from Tables III.A.12.11 – A.12.14

6.5 Two Cases of Farmers who Diversified before Crop Year 1993/1994

The first two case studies are of farmers who had diversified on their own, without the support of the project. These case studies aim to illustrate farmers' decisions and the effects of diversification on their livelihood. Both partial analysis and whole-farm analysis are utilized for comparison. A comparison is also made between a hypothetical scenario of 'doing nothing' or 'business as usual' (i.e., continuing with the traditional system) and diversification (as actually carried out). In this way, the consequences of the farmers' actual decisions are contrasted with the 'no-change' conditions of other comparable farmers.

6.5.1 Case Study 1, Ayuthaya: Mr. Thonglor Suparp,

- **Objectives**

This case presents the example of one farmer who diversified before the project was launched, using his own capital resources. Although he was not very successful in his early attempts at diversification, the lessons learned from the diversified plots helped him to make better decisions when he attempted diversification later with project support. Emphasis here is on partial analysis, and a comparison is drawn between the traditional rice-based system and of the diversified fruit tree and rice system.

- **Background**

Mr. Thonglor is 55 years old, and was born in Kusalord Sub-district, Lard Bua Luang District in Ayuthaya Province. His family comprises 5 members, his wife and himself and three children. The eldest son is 26 years old and works full time in farming while the other two children (aged 21 and 14) are still studying. Like most of the farmers in this area, Mr. Thonglor has a small land holding of only 12 rai, which was allocated by the Agricultural Land Reform Office in 1985. He also rents an additional 20 rai.

- **Land use and occupation**

The family operates 32 rai of land in total. The 12 rai of owned land comprises 2 rai for the homestead and 10 rai under fruit tree cultivation, which is divided into 2 plots of 5 rai each. Both plots used to be under rice cultivation and were cultivated to fruit tree, but at different times. The first 5 rai plot of land was converted in 1986 and planted with a mix of fruit trees, consisting of jack fruit and four varieties of mango. The second plot of 5 rai was converted from rice to fruit trees with the support of the project in 1993. Mixed types of fruit trees were also planted here namely mango, jack fruit, custard apple (*noina)* and rose apple (*chompu).*

Mr. Thonglor also rented 20 rai for rice cultivation (but this is not considered in the partial economic analysis below). There is no commercial livestock raising on this farm. His other source of income comes from him being the village headman, with modest earnings of about 13,200 Baht annually.

- **Reasons for diversification**

Mr. Thonglor and his family diversified out of rice in two stages. The first plot was converted in 1986, long before the project was launched, because the farmer had seen the success of his neighbour who had diversified out of rice to fruit trees a couple of years before him. That neighbour used to be an employee in a fruit tree plantation in Nonthaburi province for some years. After observing the success of farmers in Nonthaburi, and particularly the farm they used to work on, the neighbour's family came back home at Kusalord and converted some land into a mango plantation. They applied the same practices as the farm they used to work on, by planting those varieties that give a good price and can be treated using hormones for off-season fruiting.

After having seen the success of his neighbours together with facing the problem of low and fluctuating rice prices, Mr. Thonglor decided to diversify a 5 rai plot in 1986. By doing this, he expected to earn more from fruit trees and to have a better income distribution over the year at the same time.

Although not entirely successful with his first plot, this farmer nonetheless converted another 5 rai in 1993, with the project support. In fact, the family had considered converting this plot before this, but it was not done due to capital constraints. They considered that the lessons learnt in (mis)managing the first plot could usefully applied to the second one. Therefore, with the confidence that he could do better second time around, Mr. Thonglor asked for credit support when the project began.

- **Economic analysis of the first 5 rai plot, which was diversified before the project**

Mr. Thonglor started the first 5 rai plot with semi-intensive cultivation. Inputs in the first year (1986/87) amounted to 5,300 Baht cash. About 5,000 Baht was spent on land modification by making fruit tree bedding and ditches along the side. This was done manually. The other 300 Baht was spent on saplings, which were repropagated later. The expenses in the next few years, however, were mainly on maintenance, consisting of fertilizer, pesticide and petrol for the water pump. The expenses in year 9 (1994/95) were the highest. This was not only due to the increasing costs because of the growth of the fruit trees, but also because of the cost of hormone treatment for the "Kiaw Saveoi" mango variety. This particular mango can be treated with hormones so that it yields

in the off-season, attracting a higher price. The summary of the input/output analysis of this plot is presented as follows :

- **Economic analysis of the first plot of fruit trees, 1986/87 – 1994/95**

Year		Cost (Baht)	Revenue (Baht.)	Benefit (Baht.)	Accumulated benefit (Baht.)
1	1986/87	5,300	0	- 5,300	- 5,300
2	1987/88	1,000	0	- 1,000	- 6,300
3	1988/89	3,700	3,000	- 700	- 7,000
4	1989/90	2,800	4,000	1,200	- 5,800
5	1990/91	3,100	11,000	7,900	2,100
6	1991/92	4,300	55,000	50,700	52,800
7	1992/93	5,300	13,000	7,700	60,500
8	1993/94	6,000	20,000	14,000	74,500
9	1994/95	10,000	55,000	45,000	119,500

Total accumulated benefit = 119,500 Baht

If Mr. Thonglor had not cultivated fruit trees in this 5 rai and continued to grow rice, which can be double cropped due to the conservation irrigation system in the area, then his income from rice during these 9 years would be as follows:

Economic analysis of 5 rai of rice, 1986/87 – 1994/95

Year		Revenue (Baht)		Variable Cost (Baht)		Gross Margin (Baht)	
		first rice	second rice	first rice	second rice	first rice	second rice
1	1986/87	8,700	8,632	5,650	6,200	3,050	2,432
2	1987/88	9,030	9,972	5,650	6,200	3,380	3,772
3	1988/89	14,213	14,448	5,650	6,200	8,563	8,248
4	1989/90	15,345	14,712	5,650	6,200	9,695	8,512
5	1990/91	13,538	11,808	5,650	6,200	7,888	5,608
6	1991/92	14,055	14,848	5,650	6,200	8,405	8,648
7	1992/93	14,595	14,112	5,650	6,200	8,945	7,912
8	1993/94	11,250	12,000	5,650	6,200	5,600	5,800
9	1994/95	12,000	14,000	5,650	6,200	6,350	7,800
Total (9 years accumulation)		112,725	114,532	50,850	55,800	61,875	58,732
Double Cropping (9 years accumulation)			227,257		106,650		120,607

Note: Prices for rice are based on secondary data as per the OAE record of that particular year while yield and cost of production are derived from the field survey. Yield is assumed to be constant due to the stable yield of rice in fully irrigated areas in this district. The variable cost however, is set to be constant based on the cost of this particular farm.

- **Lessons learnt for further diversification**

The analysis shows that the total gross margin of this 5 rai plot in these 9 years would have been 120,607 Baht. which is slightly higher than the accumulated benefit from fruit trees during this period. However, Mr. Thonglor did not give up, but instead joined the diversification programme in 1993. He learnt from the first plot that the varieties of fruit trees were improperly mixed. His first plot was dominated by the "Kiaw Savoei" variety of mango because of the good price that it attracts. However, he found that this particular mango is difficult to cultivate requiring careful treatment. The first yield of Kiaw Savoei at this plot was in year 6. The second yield of this mango was in year 9 when he treated the trees with hormones. With this lesson learnt, Mr. Thonglor changed the composition of the second plot of fruit trees initiated in 1993. It is still a mixed crop with a smaller number of mangoes and a larger number of jack fruit trees due to their relatively low input costs compared to production. Custard apple, rose apple and coconut were also planted in this plot. All the trees were selected in accordance with the market potential in the areas.

The emphasis in this case study is on the early lessons learnt. Despite 'failing' in his early attempts at diversification. Mr. Thonglor was sufficiently confident that he could learn from the experience and succeed at the second attempt. So in his case was the project important beyond providing cheap loans?

6.5.2 Case Study 2, Angthong: Mr. Samlitra Njamlamai,

- **Objectives**

The case of Mr. Samlitra Njamlamai demonstrates the success of a farmer who diversified by himself before the project launch. The success of diversification in this case was such that he could stop renting an additional piece of land.

- **Background**

Mr. Samlitra and his wife are a young couple, living at Huay Khan Laen Sub-District of Visetchaichan District, Angthong Province. Their ages are 30 and 28 years respectively and they have a young 7 years old son. So, only Mr. Samlitra and his wife are available for work.

- **Land use and occupation before diversification**

This family owns 9.5 rai of land which was inherited from the parents of Mr. Samlitra. The small plot was formerly under rice but did not generate enough income to support the family. Therefore they rented another 18 rai of land for rice cultivation. Because the supply of irrigation water in this area is on a rotation basis every other year, Mr. Samlitra was not able to grow vegetables in the year the irrigation water was provided to his land because it overflooded the area. With such a situation, he had no choice but to double crop rice on all of his 27.5 rai.

In the alternate years when no irrigation water was provided, Mr. Samlitra could cultivate only first rice and then grow vegetables in the dry season. To be on the safe side, he dug a shallow well and used the water from this source for his vegetables in the dry season, allowing him to grow vegetables in two cycles before cultivating first rice again. However, the vegetable area was limited to only 4 rai for each cycle due to labour constraints. The costs and returns under this system are as follows:

- **Economic analysis of traditional system (27.5 rai)**

	Revenue (Baht)	Cost (Baht)	Marginal income (Baht)
• **Year with irrigation water supply (double rice)**			
First rice	46,338	17,450	28,888
Second rice	69,520	29,370	40,150
Total	115,858	46,820	69,038
• **Year with no irrigation water supply (rice and 2 cycles of vegetables)**			
First rice	46,338	17,450	28,888
Vegetables	69,520	35,000	55,000
Total	115,858	52,450	83,888
2 Years combined	252,196	99,270	152,926
Average for 1 year	126,098	49,635	76,463

Notes: Revenue is based on the usual yield of this farm. Yield and input costs of first rice is lower than second rice due to the native variety used for the former while the high yield variety and high inputs were required for the latter. Price is based on the average farm gate price over 15 years (1981 – 1996) of both first and second rice. Revenue and input costs of vegetables are also based on the primary data of this farm. In this case, the revenue and costs are summed up for two years combined due to the rotation basis of the irrigation system. This requires different cropping patterns and affects the average income for one year.

- **Diversification and its rationale**

Under the traditional rice-based system, the young couple considered that they did not earn enough to support themselves and also faced the serious problem of a fluctuating price of rice. So they actively looked for other possibilities for earning a higher income with a better distribution over the year. After seeing the success of the tambol agricultural extension officer who had established a mango plantation 5 years earlier in the same tambol, they considered fruit trees to be the most attractive alternative. Based on the booming teak market at the time, they inter-planted mangoes with teak. The conversion of the land to teak and mango in 1992 was financed, using their own capital.

Recognising that there would be no yield from fruit trees and teak in the first few years, together with the limited canopy of the trees, Mr. Samlitra grew vegetables as an inter-crop during this period. As the labour requirements could be managed, 18 rai of land was still rented for rice cultivation in years 1 and year 2 of diversification. However, renting was stopped in year 3 when the fruit trees started to yield, requiring more labour for intensive work of management (e.g. maintenance, harvesting). Furthermore, the couple also found that, after year 3, the hormone treatment they used for mango limited the growth of teak. As a result they uprooted the teak and planted another type of fruit tree – 'Makhamthet' – instead (fruits are eaten as snack). This crop is one that people formerly harvested from natural sources. Given the low inputs and good market, Mr. Samlitra decided to plant the tree in place of the teak. A small return from mango was generated in years 2 and 3, escalating in years 4 and 5, when the trees had matured. By this time the 'Makhamthet' trees were also yielding a return.

Although being busy with his own farm's activities, Mr. Samlitra continued to engaged in off-farm work, of two different types. One was acting as a resource person in 'Natural Farming', organized by the DOAE while the second was working loading rice from farms to farm machines in the harvesting time, when extra labour is always required. By both areas of work, he earned about 50,000 Baht annually.

The economic analysis carried out here is distinguished into partial and whole-farm analysis. The analysis of diversification over a period of five years is presented first, followed by the whole-farm analysis which is based on the actual situation, including returns to rice in the first two years and the income generated from off-farm work.

Economic analysis of Mr. Samlitra's 9.5 rai of fruit trees

	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue (Baht)					
Fruit	0	2,000	7,000	120,000	150,000
Vegetables	32,000	27,000	45,000	0	0
Fish	0	0	0	2,000	3,000
Cost (Baht)					
Fruit	45,000	5,626	16,500	20,000	22,000
Vegetables	7,200	6,170	12,340	0	0
Fish	1,200	0	800	500	700
Benefits (Baht)					
Fruit	- 45,000	- 3,626	- 9,500	100,000	128,000
Vegetables	24,800	20,830	32,660	0	0
Fish	- 1,200	0	- 800	1,500	2,300
All	- 21,400	17,204	22,360	101,500	130,300
Accumulated benefits (Baht)	- 21,400	- 4,196	18,164	119,664	249,964

This analysis shows that earnings from diversification for this plot alone moved from a substantial deficit in year 1 even though there was a good income from vegetable in this year to an increasing level of profit from year 3 through to year 5. Mr. Samlitra's expectation was that the accumulated benefit under diversification would be higher than that accumulated under the traditional system from year 6 onward, even though the benefit of the former was still lower than the latter in year 5 (about 250,000 Baht to 382,000 Baht).

- **Comparison between the diversified and traditional systems**

A comparison between the two systems, on the basis of a whole-farm analysis is presented below. The comparison is based on the benefits from each source of income for each year and accumulated for five years duration.

- **Whole-farm analysis since starting diversification**

Sources/Benefits	Year 1	Year 2	Year 3	Year 4	Year 5
Diversification plot	- 21,400	17,204	22,360	101,500	130,300
Rice	21,190	22,090	0	0	0
Off-farm income	50,000	50,000	50,000	50,000	50,000
Whole farm income	49,790	89,294	72,360	151,500	180,300
Accumulated benefits (Baht)	49,790	139,084	211,444	362,944	543,244

When this is compared to the accumulated benefits of the traditional system generated from 27.5 rai of rice cultivation together with off-farm work, the calculations as follows:

Sources/Benefits	Rice	Off farm income	Whole farm income
Yearly income (Baht)	76,463	50,000	126,463
5 years income (Baht)	382,315	250,000	632,315

Although the whole-farm income under diversification exceed that under the traditional system in years 4 and year 5, and it was expected to be higher still from year 6 onwards (as the fruit trees reached maturity), the accumulated benefits of the traditional system in year 5 were still higher than the alternative of diversification (about 630,000 to 540,0000 Baht). However, this comparison is made under the condition of different sizes of land during year 3 – year 5, after the farmer stopped renting. The land resource cultivated under the traditional system still partially relied on rent within the total of 27.5 rai while diversification takes place only on the farmer's own land of 9.5 rai. Thus the following analysis is based on similar land resource, namely a rice area of 27.5 rai for the first two years (with a portion rented) and 9.5 rai during years 3 – 5, under this system the farm economy would be as follows:

- **Economic analysis of traditional system in case of no rent (9.5 rai only)**

	Revenue (Baht.)	Cost (Baht.)	Marginal income (Baht.)
• **Year with irrigation (double rice)**			
First rice	16,008	3,541	12,467
Second rice	24,016	10,146	13,870
Total	40,024	13,687	26,337
• **Year with no irrigation (rice and 2 cycles of vegetables)**			
First rice	16,008	3,541	12,467
Vegetables	90,000	35,000	55,000
Total	106,008	38,541	67,467
2 Years combination	146,032	52,228	93,804
Average on 1 year	73,016	26,114	46,901

The whole-farm analysis under the traditional system in which land resources are the same as under the diversified system (27.5 rai in year 1 – 2 and only 9.5 rai in year 3 – 5) would be:

Traditional system:					
Benefits/Sources	Year 1	Year 2	Year 3	Year 4	Year 5
Rice/vegetables	76,463	76,463	46,901	46,901	46,901
Off-farm income	50,000	50,000	50,000	50,000	50,000
Whole farm income	126,463	126,463	96,901	96,901	96,901
Accumulated benefits	126,463	252,926	349,827	446,728	543,629
Diversified system:					
Whole farm income	49,790	89,294	72,360	151,500	180,300
Accumulated benefits	49,790	139,084	211,444	362,944	543,244

Taking these figures the benefits from diversification exceed those of the traditional system from year 4 onwards (151,500 to 96,900 Baht in year 4, escalating further in year 5). The accumulated benefit over 5 years under diversification is just about the same as 5 years under the traditional system assuming the same land resources (543,244 Baht to 543,629 Baht).

- **Decision on choosing farm enterprises and combination of resources**

In this case, the farmer chose to diversify and cultivate only his own land. However combining the renting of 18 rai for rice cultivation during years 1 and 2 shows how he managed to 'subsidize' diversification during the immature stage of the fruit trees when returns were low and costs were high. This decision was made before the project took place and looks like a success.

6.6 Perceived Obstacles to Diversification and Measures Taken by the Project

While some farmers could diversify by themselves, there were many who could not. The major constraint was capital. Since the land in the study regions is mostly suitable for rice cultivation, it requires modification if it is to be put to the other uses. The majority of farmers in every province (77 – 91%) who diversified using project support said that they had considered growing fruit trees before (Figure 6.7). However they could not do so because of a lack of capital (quoted by 50 – 60% of respondents). Other constraints included not having the necessary technical knowledge for fruit tree cultivation (11 – 23%) and a lack of encouragement (5 – 21%). Figure 6.8 shows a summary of the constraints mentioned by the respondents.

Figure 6.7 Respondents who thought about diversification before

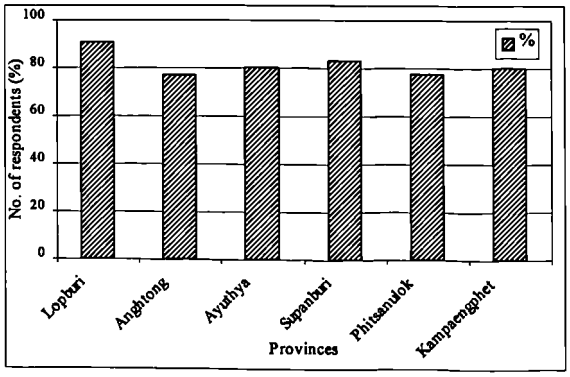
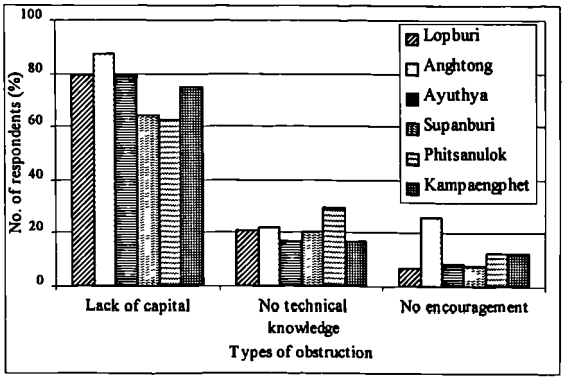


Figure 6.8 Obstacles to diversification of those respondents



Source (both figures): Data derived from field survey, summarized from Tables III. A.13.7 – 8 and III.C.13.7 – 8

These constraints were also recognized by the government. Therefore, project support focused on providing (a) credit, with the emphasis on land modification, (b) input supplies such as fruit tree saplings and vegetable seeds and (c) technical support, such as training courses on fruit tree cultivation and farm visits by the extension officers (as presented in section 3.6). Since credit supply was managed under the BAAC, the farmers had to go through the BAAC procedure. The collateral required sometimes is beyond the ability of the poor and small scale farmers. With recognition of this constraint, the project allowed collateral in form of either land or a group guarantee (see Box 6.1).

Box 6.1 Collateral in form of group guarantee

To provide poor, landless or small scale farmers who lack collateral access to credit for agriculture, the BAAC allows farmers to set up groups and guarantee each other. This means that if one among the group can not pay the loan back, the rest of the group have to take responsibility for the debt of that person. Thus, these people have to form a close unit where trust can be maximized. Normally the group members are relatives and people in the same communities. This does not necessarily exclude marginal farmers as they are always welcome to join a credit group, just so long as the other group members trust them. However in practice the very poorest farmers may find it hard to join such a joint liability group. The size of the group varies from place to place and project to project, as determined by the BAAC. The group size for the diversification project was set at 5 persons.

In general, the credit farmers received was higher than the investment cost. As the analysis in section 5.5.2 showed, the first-year production costs for fruit trees was in a range of 23,000 and 43,000 Baht per farm. This was much lower than the credit received which had an average range of

42,000 – 70,000 Baht per farm in the central plains, and 75,000 – 99,000 Baht per farm in the north (Tables III.A.13.2 and C.13.2). The reason for this is that the actual cost involved is calculated on a cash basis, excluding non-cash costs which include inputs from family labour and any materials available on the farms or received free from other sources, especially from the government. Likewise, manure and planting materials supplied by the government were free, and some saplings were propagated by the farmers themselves. As mentioned in section 3.6.2, vegetable seeds and fruit tree saplings were supplied free by the DOAE in the first year. Taking all these factors together explains why the actual investment cost for fruit trees was lower than the amounts of credit farmers requested from the project.

6.7 Effects of the Project on Farmers who Diversified

The integrated package provided by the project, which is dominated by orchard and complemented by the inter-crops and fish raising, differs considerably from rice monoculture. The project not only affected the land use pattern, but also farm resource utilization, income generation and livelihood. In this section, some of the related important points are briefly summarized, before proceeding to an economic analysis of the changes due to diversification.

6.7.1 High Investment Costs vs. Low Return from Fruit Trees during the Immature Stage

Annual crops such as rice, and perennial crops, such as orchards, are principally different in terms of investment, profits and investment risks. The 120 days period of rice allows one, two, or even three cycles per year, depending on water conditions. In contrast, an orchard, which requires investment only once, provides yields for many years (10 to 20 years or more according to the type of trees). The production stage of fruit trees varies from type to type. Apart from the quick return of banana, the other early varieties like rose apple and guava provide a yield within only one year, but it takes longer for mango, jack fruit or saton to mature (about 3 – 5 years). Although the returns from early varieties are normally lower than from longer-term ones, the farmers tend to grow a mix of varieties in order to balance quick returns against longer term income generation.

Inputs and outputs of orchards were correspondingly low at the initial stage. Their costs were high while returns were low, especially at the first year implementation. However the situation was improved in the year 2. Fruit tree returns were slightly higher in this year while their costs were lower because mainly maintenance costs were required. Thus returns had begun to exceed costs in

some provinces (e.g. Lopburi and Supanburi; see details in Chapter V, section 5.5.2). The comparison of costs and returns in these two years is shown in Figures 6.9 and 6.10.

Figure 6.9 Comparison of costs and returns of fruit trees in year 1

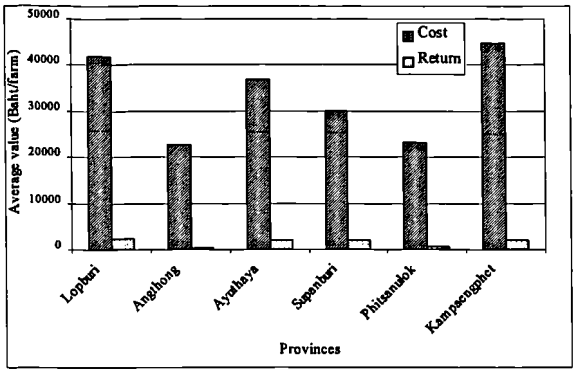
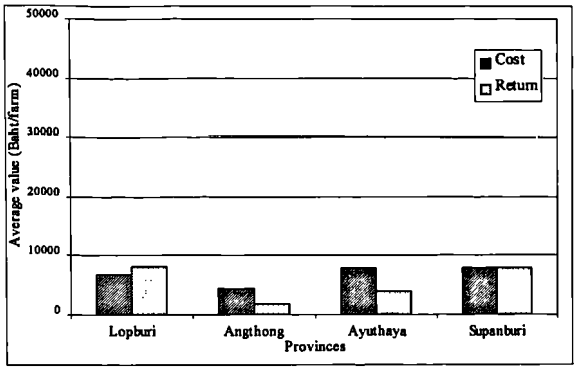


Figure 6.10 Comparison of costs and returns of fruit trees in year 2



Source (both figures): Data derived from field survey, summarized from Tables I.5.2.7 – 26

6.7.2 Complementary Income from Inter-Crops

With the recognition of no return from the major fruit trees in the first few years, the project encouraged and supported farmers in growing vegetables in the open space between the immature trees. However, inter-crops are not limited to vegetables, and the farmers in Supanburi also grew flowers as an inter-crop as well. Therefore income from inter-crops in this study covers both vegetables and flowers. Although marginal income during year 1 was low in Kampaengphet and Lopburi (only about 1,800 and 2,500 Baht per farm or equivalent to 4 and 6% of the initial cost of fruit trees in these two provinces), it was notably higher in the other provinces. The highest amount was in Angthong, followed by Ayuthaya (an average of 19,000 and 15,000 Baht per farm which is equivalent to 83% and 40% of the initial cost of fruit trees respectively). Figure 6.11 shows a summary for year 1, which compares the marginal income from inter-crops to the investment costs for the orchards.

With the lower input costs of fruit trees in year 2 coupled with continuing production from inter-crops, marginal incomes in the central plains improved; it varied from about 3,000 Baht per farm in Lopburi to 16,000 Baht per farm in Supanburi. It should be noted that the Supanburi figure related to flowers cultivation, as mentioned in section 5.5.2. Thus the accumulated benefit from inter-crops in these 2 years in Angthong was about 3,000 Baht higher than the accumulated cost of fruit trees during the same period (nearly 30,000 Baht as compared with 27,000 Baht) while the returns enabled the farmers

to cover between half and nearly 60% of the orchard costs in Ayuthaya and Supanburi, respectively. However, the proportion of complementary returns from inter-crops remained low in Lopburi (only 12%). This is because of low productivity of inter-crops in this province because the limited skills of the farmmers, as mentioned in section 5.5.2. Figure 6.12 shows a two-year summary for four provinces.

Figure 6.11 Comparison of marginal income from inter-crops to cost of orchard (year 1)

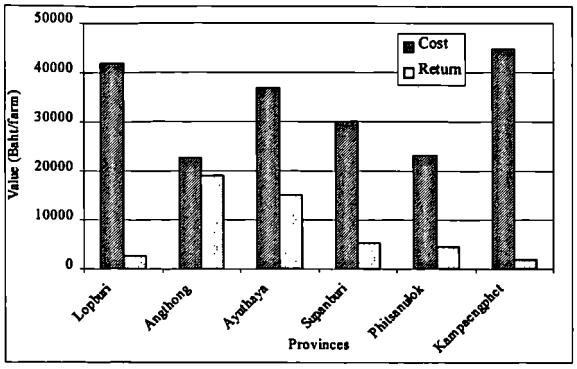
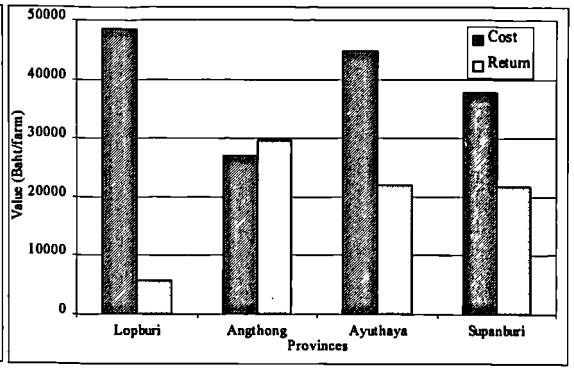


Figure 6.12 Comparison of marginal income from inter-crops to cost of orchard (2 years accumulated)



Source (both figures): Data derived from field survey, summarized from Tables I.5.2.7 – 26

6.7.3 Fish Culture for Home Consumption and for Sale

As discussed in section 5.5.3, fish were raised in both extensive and intensive systems. As the extensive culture dominated in the central plain, the farmers did not earn much from this source, because they mostly ate fish and only sold a limited surplus. So most of the farmers in the central plain received negative marginal incomes (but they had the benefit of better protein intakes from home consumption of fish). The situation was different in the north where there are a number of commercial-scale fish-farms developed within the diversification programme in this region. The negative marginal income from fish of the two provinces in the north is relatively high due to the cost of land modification for pond construction and high production cost involved.

6.7.4 Economic Analysis of the Integrated Package

The economic analysis is based on the complementary components of the diversification package, i.e. fruit trees, inter-crops and fish. The results of this calculation show that the returns in Angthong were the highest in year 1, at about 91% of the costs. The balance between returns and costs were lowest in

Lopburi (24%), Phitsanulok and Kampaengphet (both at 20%). Figure 6.13 shows the balances. The lower balances are explained by the high investments for larger plots of fruit tree in Lopburi and Kampaengphet, and the high input costs for fish in these three provinces (refer to sections 5.5.2 and 5.5.3). However, in the second year (which was only analyzed for the four central provinces), the proportion of return was much larger due to the lower production costs of fruit trees. Thus the accumulated return of these three components in Angthong was higher than the costs (about 5,000 Baht per farm, or equivalent to 109% of cost) while its relation was nearly at break-even point (97%) in Supanburi, at about 65% in Ayuthaya, and about 55% in Lopburi (Figure 6.14).

Figure 6.13 Comparison of cost and return of the complementary components of orchard, inter-crops and fish (year 1)

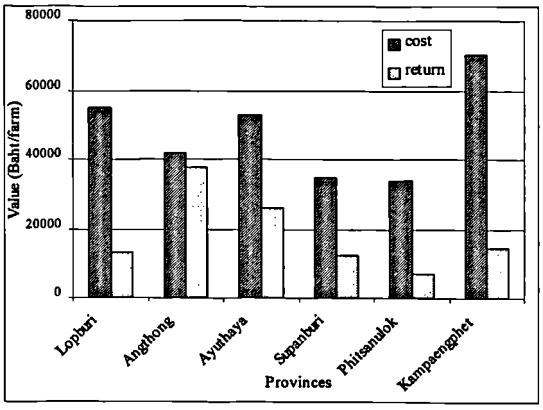
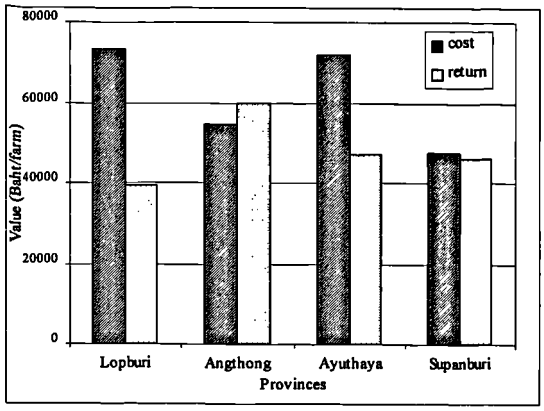


Figure 6.14 Comparison of cost and return of the complementary components of orchard, inter-crops and fish (2 years accumulated)



Source (both figures): Data derived from field survey, summarized from Tables I.5.2.7 – 26

The main point of this partial analysis of the integrated package is that the initial investment costs for diversification tended to be compensated within two years, except for larger-scale operations where it may take three years or more to break even.

6.7.5 Analysis of the Effects of the Project Across the Whole Farm

Since this integrated package is only one part of the whole farm, the effects should be analyzed across the whole farm too. As shown in the previous chapter (Tables I.5.2.40 – 42), the effects did not influence cash farm income very much, at least in the early year. But it was the opposite with regard to net farm cash income, particularly in the first year of the project which was highly influenced by the heavy investment for the fruit trees. Therefore the cash farm income of the project group was about 13% higher than for the non-project group at year 1, while the net cash farm income of the former was only a quarter of the latter in the same year (Figure 6.15). In year 2, both cash farm and

net cash farm income of the project group in the four provinces of the the central plain were respectively, 16% and 22% higher than those in the non-project group (Figure 6.16).

Figure 6.15 Comparison of whole farm income between the project and non-project groups (year 1)

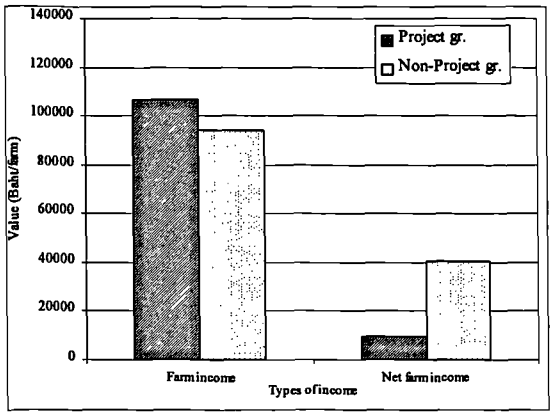
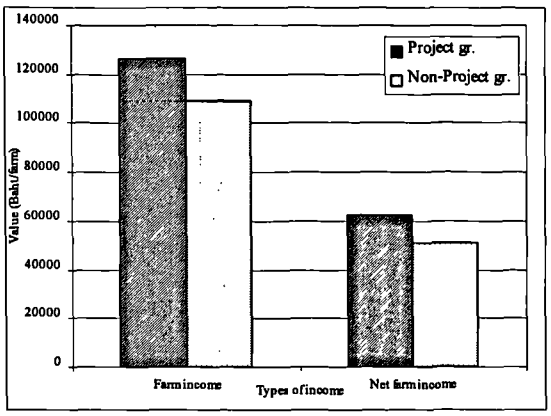


Figure 6.16 Comparison of whole farm income between the project and non-project groups (year 2)



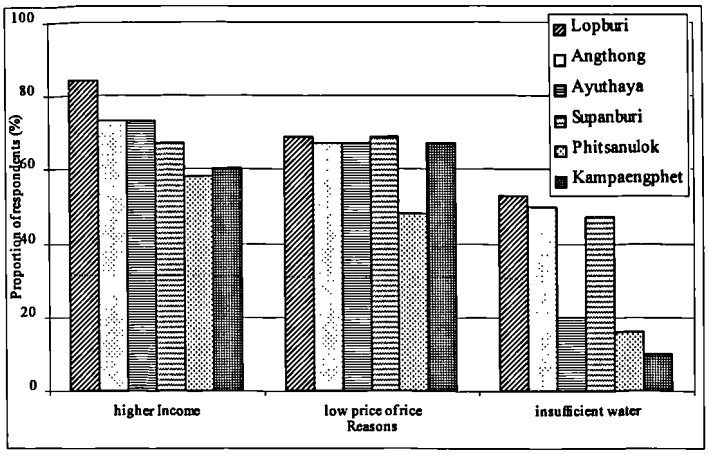
Source (both figures): Data derived from field survey, summarized from Tables I.5.2.40 – 42

6.7.6 Farmers' Expectations from the Project

It is unsurprising that people expected higher incomes from the new enterprise. Thus farmers who joined the project expected to benefit not only in terms of higher incomes but also to be protected from the problem of the unstable and low price of rice. These points were remarked on by the majority of the respondents in the project group of every province (about 60 – 85% noted the expectation of better income; and 50 – 70% on problem alleviation; see Tables III.A.13.1 and C.13.1). Besides these two major reasons, some of the farmers also expected the project to enable them to overcome the problem of insufficient water supply in the dry season. Although this problem was noted by a smaller proportion than the previous two, there was much greater local variation. Understandably, this reflected the farmers' experiences with insufficient water supply and irrigation facilities (see section 5.8.2). So only 10 – 20% of farmers in the two provinces in the north and Ayuthaya mentioned insufficient water, but about half of the respondents in the other three provinces of the central plain (Figure 6.17).

This review of farmers' motivations for joining the project clearly confirms that they are aware of their problems and constraints (as discussed in section 5.8), so their expectations from the project are realistic, and their decisions to join can be said to be logical.

Figure 6.17 Reasons for joining the programme (given by the project group)



Source: Data derived from field survey, summarized from Tables III.A.13.1 and C.13.1

6.8 Two Cases of Farmers Who Were Satisfied with the Support of the Project

As pointed out before, the timing of the field survey in the first two years of project implementation made it difficult to see whether the project was in any way 'successful', i.e. meeting its own objectives (as stated by DOAE and the BAAC), as well as meeting the farmers' own expectations. The follow-up group discussions in all six provinces (1997-1999) provided valuable qualitative, but not quantitative feedback, which was largely encouraging, as far as the effects of the project are concerned. It is too early, however, to say how far the farmers have reached their long-term objectives of income stability. Nonetheless the information gathered did indicate that most of the respondents were satisfied with the support of the project.

To examine this point in more detail, two particular case studies, again in Ayuthaya and Angthong (as were those presented in section 6.5), have been prepared as a result of the many follow-up interviews with project-group farmers. Both farmers' operations were monitored until year 5, which is a solid basis for undertaking an economic analysis and for reflecting on the experience of the project. The farmer in Ayuthaya appreciated the higher and better annual distribution of his income, and, as a further result, had stopped renting additional land. Prior to diversification the farmer in Angthong used to engage in a varieties of off-farm activities. He is generally satisfied with diversification even though he still faces problems connected with soil improvement for orchard cultivation. Although returns are still limited, he no longer needs to look for work outside his farm.

6.8.1 Case Study 3, Ayuthaya: Mr. Musor Boontha,

- **Objectives**

To demonstrate the satisfaction of a farmer who joined the project. The effectiveness of the project allowed him to stop renting land after a few years of diversification, and rely on his own land although it is a small plot.

- **Background**

Mr. Musor is 60 years old, was born at Phraya Bunlue Sub-District, Lard Bua Luang District, Ayuthaya Province. Although his family comprises of 5 members, only his wife and himself are working on the farm. The eldest son is 23 years old and helps on the farm only at the weekend. He works as a full time employee in a factory nearby. The other two children are still studying in school.

- **Land use, land tenure and diversification**

Mr. Musor owns only 6 rai of land, all now under orchard. This piece of land was allocated by ALRO in 1985, and the farmer still has to make an annual payment to ALRO until he finally fully owns the land. Because of the very small size of his land holding, in the past, he had to rent an additional 41 rai for rice cultivation in order to generate sufficient income to support his family. Then he converted all of his land into an orchard in 1993. As the young fruit trees did not require much work in the first year, he grew vegetables as an inter-crop in the fruit tree plot. As the labour resource available was still sufficient for managing 41 rai of paddy, he kept the paddy land in the first year. He stopped renting this plot a year later (1994), because he saw that the family could not manage 6 rai of orchard and 41 rai under paddy at the same time, especially because the orchard was maturing and required more intensive care. Furthermore he felt more secure with the income generating potential of the orchard, especially when he put more effort into management. To be on the safe side however, his son continued to work in the factory, earning around 42,000 Baht annually.

- **On farm income if not joining the project**

This 'do-nothing' analysis is made under the assumption that Mr. Musor did not join the project. Under conservation irrigation conditions, he would continue with double cropping of rice on an area of 47 rai of land (6 rai owned together with 41 rai rented). The farm analysis would be as follows:-

- **Cost/return of double cropping under the traditional system (rice on 47 rai)**

	Return (Baht)	Cost (Baht)	Marginal income (Baht)
First rice	125,174	65,303	59,871
Second rice	125,174	65,303	59,871
Total	250,348	130,606	119,742

This shows the marginal income generated from double cropping rice is about 120,000 Baht per year with farm gate price of 3.16 Baht/kg., which was the average rice price of 15 years (1982-1996). Although the price this farm received in crop year 1993/94 was lower (2.2 Bt./kg.), but the average price is not far from the price he received in crop year 1994/95 (3.2 Bt/kg.). With reasonable yield stability due to good water control under the ALRO project, the yield is set based on the primary data of this farm, as are production costs. The average cost of 1,389 Bt/rai consisted of cash expenses for material and hired power inputs (i.e. fuel, fertilizer, pesticide, harvesting cost, etc.), while family labour was excluded as a non-cash cost. This resultant figure is close to the average cost for the central region in crop year 1994/95 (1,713 Bt/rai; OAE (1996)).

- **Reasons for diversification**

The 6 rai of land was converted to fruit tree plots even though the excellent conservation irrigation system allows for double cropping of rice every year. However, the low and fluctuating price of rice had led Mr. Musor to consider diversification out of rice before the project was initiated. However, he could not realize the idea because of constraints in capital resources. The credit support connected with the project allowed him to implement his long-considered plan.

- **Diversification and its practice**

The major crops of Mr. Musor's 6 rai orchard plot are a mix of fruit trees, led by 4 varieties of mango followed by supplementary crops such as guava, lemon, coconut, banana and jack fruit. The first year's investment was even higher than the credit he received (73,700 Baht, with a credit

amount of 50,000 Baht) because of the high cost of land modification. He considered that plot modified by farm machines would be inferior so he paid for manual work. This cost him about 62,000 Baht. Moreover, he found that the fruit tree saplings provided by the extension officers were poor, so he purchased these himself. This cost him 8,500 Baht in the first year. Other than these costs, there were water fees, and the repayment fees to the ALRO for his land. Due to the late delivery of credit and saplings, the other inputs such as fertilizer, pesticide and herbicide for the fruit trees were only applied from year 2 onwards. With the space available in the first two years, Mr. Musor grew vegetables. Knowing the high demand for common types of kitchen greens, the vegetables grown in his farm were mixed types and sold for daily consumption. The supply of vegetable seed from the Agricultural Extension Office in the first year (crop year 1993/94) was poor again leading Mr. Musor to buy the vegetable seed himself a year later. This result was better yield and higher income in year 2 (crop year 1994/95). Despite the relatively high income with a good distribution generated by vegetables, he had to stop cultivation after year 2 because the expanding canopy of the fruit trees did not allow sufficient light and space.

All this shows the considerable experience of the farmer and his determination to succeed - buying vegetable seed on his own, replacing uneconomical fruit tress after a short while, and carefully choosing the mix of trees to be grown. It seems that his knowledge was superior to the advice he could get from the extension officers. Indeed, he might have failed without this determination and experience.

Aiming at maximizing land utilization, both early and late varieties of fruit trees were grown together. The primary trees are dominated by mangoes, followed by jack fruit and saton while the secondary trees consist of early types of fruit trees (e.g. guava and banana). The latter had been planted on the dike surrounding the plot and were expected to yield before the primary trees.

The farmer started to earn from the fruit trees from year 2 on. The income from this year was mainly from banana and guava while mango started to yield from year 3 onwards. Although the peak of the mango harvest is during March - April, the varieties he planted also gave off-season production. Harvesting fruits and selling then continuously during the fruiting season, gave the farmers a better cash flow than rice.

Despite yielding some production in year 2, guava required high labour costs for wrapping and harvesting. After Mr. Musor found that the sale of this crop was not commensurate with the labour cost involved, they just uprooted the trees in year 3 (crop year 1995/96) and replaced them with

lemon and coconut. Through using off-season treatment for lemon, Mr. Musor earned from this crop since February 1998. The yield was expected to be much higher in the dry season of the same year, at the time of peak price. Coconut was also expected to yield from mid-1998 on.

With water in the ditches on the orchard plot, Mr. Musor also raised herbicarps, mainly for home consumption. The small surplus was sold for cash. Comparison of costs and returns of the diversified plot against a same size of rice plot are as follows :

Costs and returns of diversification in a 6 rai plot

Year		Activities	Cost (Baht.)	Revenue (Baht.)	Benefit (Baht.)	Accumulated benefit (Baht.)
1	1993/94	Fruit	73,700	0	- 73,700	- 73,700
1	1993/94	Vegetables	1,840	14,200	12,360	- 61,340
1	1993/94	Fish	3,440	0	- 3,440	- 64,780
1	1993/94	All	78,980	14,200	- 64,780	- 64,780
2	1994/95	Fruit	11,440	7,470	- 3,970	- 68,750
2	1994/95	Vegetables	5,310	32,400	27,090	- 41,660
2	1994/95	Fish	520	0	- 520	- 42,180
2	1994/95	All	17,270	39,870	22,600	- 42,180
3	1995/96	Fruit	10,600	36,000	25,400	- 16,780
3	1995/96	Fish	300	3,000	2,700	- 14,080
3	1995/96	All	10,900	39,000	28,100	- 14,080
4	1996/97	Fruit	13,580	51,000	37,420	23,340
4	1996/97	Fish	500	5,000	4,500	27,840
4	1996/97	All	14,080	56,000	41,920	27,840

For comparison: Costs and returns of 6 rai of rice

	Return (Baht)	Cost (Baht)	Marginal income (Baht)
First rice	16,432	8,860	7,572
Second rice	16,432	8,860	7,572
Total	32,864	17,720	15,144

Note: The rice yield and cost of production are based on primary data of this particular farm, assuming that both variables are stable while rice price is an average of the farm gate price over 15 years (1982 – 1996; OAE).

Certainly, the accumulated benefit from fruit trees is still far behind the marginal income from the traditional system of rice cultivation on 47 rai (6 rai of his own land plus 41 rai rented). However basing the calculations on 6 rai of land under rice cultivation gives a 15,000 Baht marginal income annually. This is less than the marginal income from diversification in year 2 (about 22,000 Baht). Although the accumulated benefit from diversification is still lower than rice (from 6 rai) in year 4 (about 28,000 to 60,000 Baht over this period), the farmer expected to be much better off in year 5. Mango, as the main crop, provides higher yields in years 5-10, before declining. Moreover, lemon and coconut were expected to give a good yield from April 1998 (year 5) on.

- **Influence of credit support and off-farm income**

With the heavy investment necessary for diversification, marginal income in year 1 was about (negative) -65,000 Baht. The farmer was aware of this situation. So to compensate for the initial loss from the orchard, he still kept 41 rai rented for rice cultivation in this year. So, the marginal income of about 100,000 Baht from 41 rai of rice (based on the marginal income of 120,000 Baht from 47 rai of rice) plus 42,000 Baht from the off-farm income of Mr. Musor's son who still lived at home and commuted daily to work at a factory would give a total farm household net cash income of 78,000 Baht for this year. Although this amount was lower than the average farm household net cash income in crop year 1995/96 for the region (about 121,000 Baht per farm), it was supplemented by the 50,000 Baht received from credit connected with the project. Including the credit support, Mr. Musor's income was about 128,000 Baht which is slightly higher than the regional average.

- **An option for decision making**

The economic analysis shows that benefits from diversification in the first 4 years were lower than from the traditional system of 47 rai of rice cultivation. However, relying on his own land resources alone, benefits from diversification would be higher than rice from year 2 on. Although the accumulated benefit of the former is still lower then the latter in the first four years due to the heavy investment of the former, it is expected to be higher in the long run, when fruit trees start to enter full production from year 5 on. The farmer recognized the advantage of diversification as he can now market production throughout the year, smoothing his household income than from rice.

6.8.2 Case Study 4, Angthong: Mr. Prasert Chitanom,

- **Objectives**

To demonstrate the satisfaction of a farmer who was happy to join the project, because that enabled him to stop searching for off-farm work.

- **Background**

Mr. Prasert, aged 52, a farmer at Sao Rong Hai Sub-district in Angthong Province, used to migrate to work on a pineapple farm in Prachuab Kirikhan Province on the west coast of the Gulf of Thailand about 25 years ago. He initially went – some 25 years ago – there because of drought on his farm and the inadequacies of the irrigation project at that time. This caused him to stop second rice cultivation even though he had already invested in land leveling.

As a pineapple farmer, he also faced the problem of the low price of this crop. Its price dropped by about 50% in one year when he was in Prachuab Kirikhan. So he gave up farming and became a construction worker in Bangkok for a year. After that he was able to find a job as an unskilled labourer in a Middle Eastern country where he worked for three years. With the savings from working abroad, he came back home and started farming again in 1984. This time, with the improvement of the irrigation system, he was able to access irrigation water every other year, based on the rotation system (see section 6.5.2). He grew double rice in the year that his area received irrigation water and first rice followed by vegetables in the year when it did not. With this improved irrigation system, he concentrated on farm work, giving up his off-farm work.

- **Land use and income generation**

Mr. Prasert owns 3 plots of land with a total area of 12.5 rai. All was under rice cultivation in the past. Only first rice was cultivated here at the time the diversification project was initiated. Second rice in this area was stopped a few years before the project started (crop year 1993/94) due to a shortage of water. However with water available from a shallow well, this farm grew a few rai of vegetables after rice.

After he joined the project in crop year 1993/94, only 5 rai remained under rice cultivation while the other two plots of 2.5 and 5 rai were under orchard. But Mr. Prasert still cultivated vegetables,

mainly in the 5 rai plot of orchard as a means of maximizing his resources. The water can be utilized from the ditch dug for the fruit tree plot. Watering and fertilizer applied to vegetables can be utilized by fruit trees as well since vegetables were grown as an inter-crop. With a limited supply of irrigation water in the dry season, the farmer used the water from the shallow well for vegetable-growing and the fruit trees.

With the 57,000 Baht in credit he got from the project, he spent about 25,000 Baht on land modification and 5,000 Baht for mixed varieties of fruit saplings in the first year. These were in addition to the saplings supplied by the District Agricultural Office. However, with the late delivery of these supplies, he only finished planting at the end of the rainy season. Due to the small saplings, the fertilizer and pesticide applications were partly for the vegetables growing as an inter-crops. Vegetables were grown in the 5 rai plot of orchard until year 4 (crop year 1996/97). This was because of the poor soil quality of the plot, which retarded the growth of the fruit trees. Moreover, some trees died which Mr. Prasert replaced each year. There was no fruit yield from this plot until year 4. The farmer tried to improve the soil quality by applying cow manure, but this was not successful. However he later saw from a neighbouring farmer that the land could be improved by applying rice husk and chicken manure. This he did that in year 3 (crop year 1995/96), with improved results. Until year 4, the return from the orchard was from the smaller plot of 2.5 rai while the major proportion of income came from vegetables and rice.

The farm is managed by Mr. Prasert, his wife, and one daughter. The couple has three other children working off-farm away from home, and they received remittances from one child who worked in Bangkok.

Besides earning from the crop sub-system, Mr. Prasert also earned from cattle sales.

- **Analysis of farm income under diversification**

As described above, under diversification, the land use of this farm involved the cultivation of 5 rai of rice and 7.5 rai of fruit trees. There was no return from the fruit trees in the first three years while the cost from this crop was high during this time. This is because of the high initial cost of year 1 and the maintenance costs (fertilizer, pesticide, etc.) in the other years. Although he had to replant fruit trees every year due to the poor soil conditions, there was no cost involved because he propagated from the trees in his farm together with obtaining free saplings from friends and relatives. Therefore the major income during this period was from rice and vegetables.

The first yield of fruit trees was from the smaller plot in year 4, mainly from mango and some banana which were planted later. Maintenance costs in this year was higher too, partly from increasing the amount of fertilizer application due to the growth of the trees and partly from starting hormone treatment for off-season fruit. The comparative economic analysis of total land use under diversification and under the traditional system during the first four years is as follows:

- **Economic analysis under diversification:**
  7.5 rai of fruit trees, vegetables and 5 rai of rice

Source	Year 1 (1993/94)	Year 2 (1994/95)	Year 3 (1995/96)	Year 4 (1996/97)
Revenue (Baht)				
Rice (5 rai)	11,400	13,000	14,800	16,000
Vegetables	53,000	36,472	34,000	33,000
Fruit (7.5 rai)	0	0	0	49,700
Total revenue	64,400	49,472	48,000	98,700
Cost (Baht)				
Rice (5 rai)	5,286	5,840	6,200	7,100
Vegetables	4,625	12,205	13,500	19,000
Fruit (7.5 rai)	30,000	1,505	1,940	5,145
Total cost	39,911	19,550	21,640	31,245
Benefits (Baht)				
Rice (5 rai)	6,114	7,160	8,600	8,900
Vegetables	48,375	24,267	20,500	14,000
Fruit (7.5 rai)	- 30,000	- 1,505	- 1,940	44,555
Total benefits (Baht)	24,489	29,922	27,160	67,455
Accumulated benefits (Baht)	24,489	54,411	81,571	149,026

- **Economic analysis under traditional system: 12.5 rai of rice**

Source	Year 1 (1993/94)	Year 2 (1994/95)	Year 3 (1995/96)	Year 4 (1996/97)
Revenue (Baht)				
Rice (12.5 rai)	28,500	32,500	37,000	40,000
Vegetables	53,000	36,472	34,000	33,000
Total revenue	81,500	68,972	71,000	73,000
Cost (Baht)				
Rice (12.5 rai)	13,215	14,600	15,500	17,750
Vegetables	4,625	12,205	13,500	19,000
Total cost	17,840	26,805	29,000	36,750
Benefits (Baht)				
Rice (12.5 rai)	15,285	17,900	21,500	22,250
Vegetables	48,375	24,267	20,500	14,000
Total benefits (Baht)	63,660	42,167	42,000	36,250
Accumulated benefits (Baht)	63,660	105,827	147,827	184,077

This comparison assumes similar sized plots of land, but under the two different systems of fruit trees and rice. Therefore costs and returns of 5 rai of rice and 7.5 rai of fruit trees together with vegetables are based on the actual data of production and price received during these four years (crop year 1993/94 – 1996/97). The costs and returns of rice and vegetables are applied to the 'do-nothing' case of the traditional system for the entire area of 12.5 rai. This assumes a stable yield of the native variety of major rice grown on this farm together with a manageable area of vegetables after rice (in accordance with availability of family labour).

Although the benefit from diversification in year 4 is higher than under the traditional system (about 68,000 Baht to 36,000 Baht), the accumulated benefit of the former was still lower than the latter at this time (about 150,000 Baht to 184,000 Baht). However, this was the first year that the 2.5 rai plot of fruit trees produced a yield. The family expected a higher yield from this plot in later years together with the additional yield from the larger plot (5 rai). By improving the soil quality of the latter plot, they expected a sustainable income in the future. They hoped this would enable the head of family to stay and work on the farm, without needing to look for off-farm work again.

- **Whole farm analysis in comparison to the regional income data**

In order to compare this farm's performance to the national statistics, whole farm analysis under diversification included the livestock sub-system of this farm as follows:

Source	Year 1 (1993/94)	Year 2 (1994/95)	Year 3 (1995/96)	Year 4 (1996/97)
Revenue (Baht)				
Crop sub-system	64,400	49,472	48,000	98,700
Livestock sub-system	11,000	40,000	5,000	4,000
Total revenue	75,400	89,472	53,800	102,700
Cost (Baht)				
Crop sub-system	39,911	19,550	21,640	31,245
Livestock sub-system	300	4,000	300	300
Total cost	40,211	23,550	21,940	31,545
Benefits (Baht)				
Crop sub-system	24,489	29,922	27,160	67,455
Livestock sub-system	10,700	36,000	4,700	3,700
Total benefits (Baht)	35,189	65,922	31,860	71,155

The analysis shows that the net farm cash income of this farm in year 1 (crop year 1993/94) and year 3 (crop year 1995/96) was about 20,000 Baht and 24,000 Baht lower than the average for the

central region in crop year 1995/96 (which is about 56,000 Baht per farm) while it was about 10,500 Baht and 15,500 Baht higher in year 2 (crop year 1994/95) and year 4 (crop year 1996/97) respectively. This can be explained by the heavy investment in fruit trees in year 1 and the absence of any return from this crop in the first three years. Higher income in years 2 and 4 was influenced by the sale of livestock (cattle) in year 2 and the production of fruit trees in year 4.

Although the net farm cash income of this farm is higher than the regional figure in year 4, it is not in the case of farm household cash income. The latter is much lower than the regional figure. This is because this farm earned only 10,000 Baht annually from remittances while the average non-farm income of the region was about 66,000 Baht per farm (OAE, 1999a). This made net farm household cash income lower than the national figure for the region (about 81,000 Baht to 121,000 Baht). At this point, reference should be made to the importance of the qualitative analysis which provided more specific details and can be used to illustrate the effects of diversification on farmers' livelihoods (as mentioned in Chapter 4, section 4.3). This cannot be found from the quantitative analysis since it does not adequately cover the complexity and diversity of each farmer' circumstances.

- **Options**

Although farm household net cash income of this farm seems to be low in comparison to the region, net farm cash income was higher than the region in year 4 of diversification. This coincided with the time that the fruit trees started to yield in the small plot. The farm family expected to gain more production in later years, especially when the soil quality of larger plot had improved. With higher income and better distribution of income through the year, the family considered the benefits of the system to be superior to rice. Furthermore after diversification, they found that although fruit trees require labour distribution through the whole year, this could be managed by the family's own labour resources. This is different from rice which requires additional labour for some particular operations (e.g. transplanting and harvesting). With this situation, the head of the family said that he was happy to stay and carry on with farming and no longer needed to look for work off-farm.

6.9 Concluding Observations on Farmers' Attitudes and Project Effects

The four in-depth case studies illustrate rather different situations in small and modest family farms on irrigated land with relatively stable water conditions. The cases vividly show that the 'average' farm is a somewhat artificial statistical construct, and that reality is more varied and challenging.

The case studies also show that all these farmers made perfectly rational decisions, while they were learning from their own experiences. It is not easy to say how 'representative' (statistically and socially) the four different cases are for the different groups and sub-groups of farmers who were surveyed during the first two years, although these four cases might constitute some kind of tentative typology, albeit an incomplete one.

The first two cases illustrate the 'early innovators' or 'adopters' of a more diversified farming pattern, where the main enabling factor seems to have been the farmers' motivation and their experience from their own trial and error in the past. Because they were financially slightly better off than the farmers in case studies 3 and 4, they could opt for diversification before the government came up with this new policy.

The two other cases also show farmers who had been thinking about growing fruit trees for a long time. They also had a strong motivation to work on the farm, and to be more independent and stable in terms of their family income, but they needed the financial support of the project to be able to implement their long-considered plans, because otherwise their financial situation would not have allowed them to do so.

All of these cases prove that expert advice by the extension officers did not seem to be overly important (and in some cases, was not available anyway), because all four farmers had learned at least as much from their neighbours and their own experience, as they had from the officers. The various economic analyses in the case studies show that the critical financial situation of the first and second years tends to be cushioned by the returns from the intercropping with vegetables. So the case studies confirm that the challenges of the first two years were not overly difficult to master. One reason for this was that the low-interest loan covered that particular financial risk.

Table 6.1 provides an overview of the key data of the case study farms, to illustrate the breadth of variation within only two provinces in the central region.

Table 6.1: Summary of key facts on the four case study farms

	Case 1: Self-support and project support	Case 2: Self-support	Case 3: Project-support	Case 4: Project-support
Province	Ayuthaya	Angthong	Ayuthaya	Angthong
Type of farm	Older couple running a small traditional family farm	Young couple running a small family farm	Older couple running a traditional rice farm, mainly based on rented land	Older couple returning to their own land
Family composition	Both parents and one son working full time on the farm, two children in education	Both parents working full time, one small child	Both parents working full time, one son helping on weekends, two children at school	Both parents and one daughter working full time, limited remittances from one child, two other children away from home
Labour force	3	2	2 + 1 partial	3
Land holdings (rai): - owned - rented	 12 rai 20 rai (stopped renting after diversification)	 9.5 rai 18 rai (stopped renting after year 2)	 6 rai 41 rai (stopped renting one year after diversification)	 12.5 rai
Diversification started	1986	1992	1993	1993
Land under fruit trees (including intercrops for first two years)	5 rai (1986), self-support; 5 rai (1993) project support, both with mixed fruit trees	9.5 rai initially mix of fruit trees and teak, some fish	6 rai, mixed fruit trees, including off-season mango, fish off-farm income (son)	7.5 rai, fruit trees 5 rai, rice some cattle
Problems encountered	Learning from mistakes	Teak replaced by more profitable *makhamthet*	Saplings provided not good, input supplies late	Problems with soil quality and low yields
Prospects after 5 years	Confident of meeting the challenge of orchard cultivation and marketing	Confident of prospering, still continuing off-farm work for supplementary income, resource person for DOAE	Confident of prospering although the land basis is very limited	Happy to be on the farm without having to look for outside work, confident of developing further
Main characteristics	Self-motivated farmer, learning from other farmers and own experience	Self-motivated, entrepreneurial, learning from neighbours	Self-motivated, wanting to be independent from renting land	After years of work away from home and abroad, wanting to be a full-time farmer

One may state that the project was able to attract poor farmers who would otherwise not have made the change. 'Poor' refers to limited land holdings and weak financial resources, but not to skills. On

the contrary, the case studies strongly confirm the great importance of skills that are indispensable for being successful in horticulture, much more than in growing rice. (This point has been made by many experts, among them Haines, 1982.)

Another challenge arises about five years after the start, when the fruit trees reach their full yields. This requires both full availability of labour and skills, and especially, full exposure to the marketing risks that are always associated with fruits. Although the case studies are encouraging as far as this kind of challenges is concerned, there was not enough scope within this research to study these points on a broader basis.

Tables 6.2 and 6.3 provide summary data on the loans received by the project-group farmers in the six provinces. The mean values by province vary because of the differences in farm plans submitted and approved by the BAAC and DOAE, in comparison with the framework recommendations for implementing the pilot project. What varies even more than the mean values across the provinces, are the differences between minimum and maximum farm size in comparison with the loans (min./max.) provided. By and large, the mean values remained at the plot size of 5 to 6 rai which had been recommended by the DOAE guidelines for implementing the pilot project. This limit was set in view of labour constraints in typical small farms, and in view of limiting the risk of marketing the fruits when the orchard is in full operation. To some extent, the small size of fruit-tree plots was also determined by land suitability constraints. However, in each of the provinces, there was at least one case of a commercial-size operation of more than 10 rai in area, up to more than 20 rai. To manage this size of orchard, the family farmer turns into an entrepreneur who needs to hire labourers throughout the year, because there would be far too much work for a small family farm with only two or three persons available.

Table 6.4 shows the financial support by the project in relative terms, i.e. in Baht per rai. The ranges are considerable although values of around 10,000 Baht per rai seem to be typical. Greater amounts of money were needed for places with difficult soil conditions (Ayuthaya and preparation of large fish ponds in Phitsanulok), where the land modification tends to be particularly expensive. As shown in the overall economic analysis in section 6.7, the typical investment costs for land modification and inputs (fruit tree saplings and inter-crop seed) were lower than the loans paid to the farmers. This enabled the farmers to cover some of the unforeseen extra expenses, like replacement saplings or additional soil improvements, without having to dig too deeply into their own savings. This also meant that paying back the loan was not too difficult, especially because the

interest rate was kept at only 5%. (For comparison, the going rate of other BAAC loans at the same time was about 12.5%.).

Table 6.2: Amount of credit received for diversification from project sources (Baht)

	Project-group farms in six provinces					
	Lp-P	An-P	Ay-P	Su-P	Ph-P	Km-P
Mean	63,650	46,700	70,170	41,755	75,452	99,207
Minimum	30,000	20,000	6,500	14,000	10,000	13,000
Maximum	150,000	114,000	180,000	180,000	200,000	220,000

Table 6.3: Area diversified (*rai*)

	Project-group farms in six provinces					
	Lp-P	An-P	Ay-P	Su-P	Ph-P	Km-P
Mean	5.97	4.23	5	4.86	3.85	6
Minimum	3	2	1	3	1	2
Maximum	20	10	10	16	14	22

Table 6.4: Financial support by project loan relative to plot size (Baht per rai)

Province	Lp-P	An-P	Ay-P	Su-P	Ph-P	Km-P
Mean	10,661	11,040	14,020	8,591	19,598	16,534

Mean loan size per rai derived from the figures in Tables 6.2 and 6.3

CHAPTER VII Factors Influencing Farmers' Decision Making

As the third and final chapter in Part B, this chapter takes a broader view of the effects of the diversification pilot project on farmers. The four case studies presented in Chapter VI illustrate the range of farmers' conditions as far as their basic resources are concerned, i.e. capital, land and labour. The case studies show that the farmers who joined the diversification project, or diversified beforehand on their own, have essentially made rational decisions, consciously or intuitively evaluating their options. The same may be said about those farmers who did not opt for diversification.

The analysis in this chapter, which is based on the survey data of 1994 and 1995, looks mainly at farmers who had joined the project but includes those who diversified by themselves, without joining the pilot project. As will be shown, the number of successful diversifiers among the non-project farmers is considerable. This implies that there must be a number of factors inducing farmers to diversify, besides the incentives offered by the pilot project.

An objective of the project was to increase the household income of the villagers by means of crop diversification, converting a portion of land from rice to orchard. This supposes that the farmers who joined the project would have more suitable land, and better incomes afterwards, than those who did not join the project. How far does this reflect the real situation? Has the project really made a difference? And, with regard to those farmers who did not move away from growing rice only, why did they not want to change?

These are the general questions to be answered in this chapter. It is structured into six sections, beginning with an assessment of those innovative farmers who ventured into diversification, with or without project support – because these two groups of farmers may have something in common. Sections 7.2 and 7.3 present the methodology and the results of the statistical tests that were applied to identify significant differences among the different groups of farmers. Section 7.4 interprets the results of the statistical analysis in the conceptual framework of the farming systems approach. Section 7.5 links the results of the analysis with the conceptual framework, by confirming the main factors influencing farmers' decision-making. Section 7.6 presents the conclusions of the analysis in the chapter.

7.1 Focus on the Innovative Farmers

The first step in the analysis in this chapter is a focus on the innovative farmers who diversified from rice to other crops, especially fruit trees.

7.1.1 Similar Land Use Patterns in Both Groups

As mentioned in Chapter V (section 5.3.5: Change of land Use Influenced by the Project), there was not a very large change in the land use pattern from rice to fruit trees in the project group. The land use under fruit trees of the project group was 12% larger than for the non-project group in the initial year of the project (18% and 6% of total land use respectively). Most land of both groups remained under rice. Thus the land use patterns of the two groups are similar, dominated by rice, followed by fruit trees, while sugar cane, others and rented out represented only a small proportion of total land. The difference of the proportion of rice area is only 7%, i.e. 75% in the project group and 82% in the non-project group, respectively (refer to Figure 5.11 in Chapter V).

7.1.2 Diversification by Farmers Themselves

The 12% difference of land use under fruit trees, however, is a combination of orchard areas before and during the initial year of the project. There are a number of farmers in both groups who had developed orchards before the beginning of the project. Furthermore, the number of those in the non-project group was larger than in the project group (31% in the former and 19% in the latter) as shown in Figure 7.1, Tables III.A.12.1 and III. C.12.1 of Annex III.

The proportion in the project group is much larger than in the non-project group in Lopburi (25% and 5 % respectively), but this was the exception. In all other provinces, the non-project group had larger numbers of farmers who had diversified before the pilot project was launched. The proportion of the 'early diversifiers' in the non-project group vis a vis the project group in Angthong, Ayuthaya, Supanburi, Phitsanulok and Kampaengphet was (in percentages of both groups) 30:20, 20:13, 65:20, 25:6, and 30:17, respectively (Figure 7.2). This shows the high rate of adoption of diversification without the project incentives.

Figure 7.1 The establishment of orchards before programme launch (all provinces)

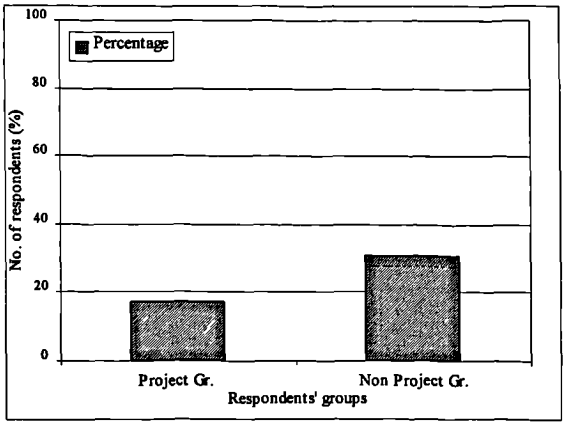
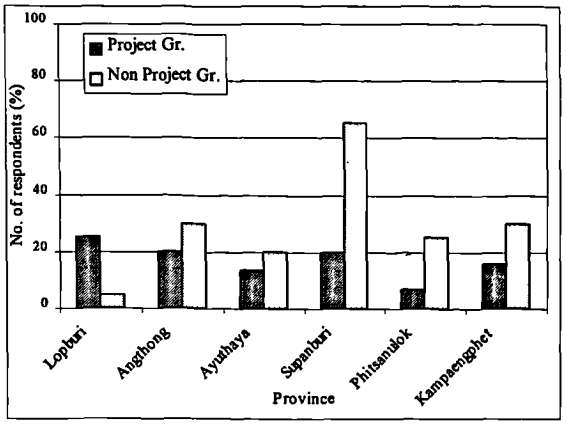


Figure 7.2 The establishment of orchards before programme launch (by provinces and groups)



Source (both figures) : Data derived from field survey,summarized from Tables III.A.12.1 and III. C.12.1

Despite the programme launch in crop year 1993/94 in four provinces in the central plain and in 1994/95 in the other provinces in the country, a number of farmers in the non-project group still continued to develop the orchards by themselves, without the support of the project. In these years, although no household in Lopburi developed orchards, 5% did so in Phitsanulok, 10% – 15% in Angthong, Ayuthaya and Kampaengphet , and nearly one third in Supanburi (Figure 7.3). When this figure is summed up with the respondents in the same group who had developed orchards before project initiation, the result still shows that the extreme cases are in Lopburi and Supanburi (5% and 66%, respectively) while the middle groups are in Angthong, Ayuthaya, Phitsanulok and Kampaengphet (in the range of 21% – 30%, Figure 7.4).

Figure 7.3 Non-project group respondents starting orchards in the year of programme launch

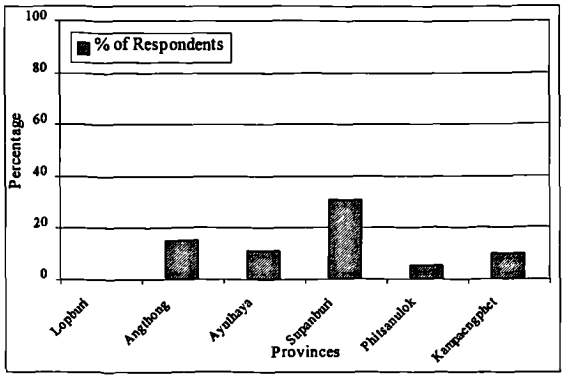
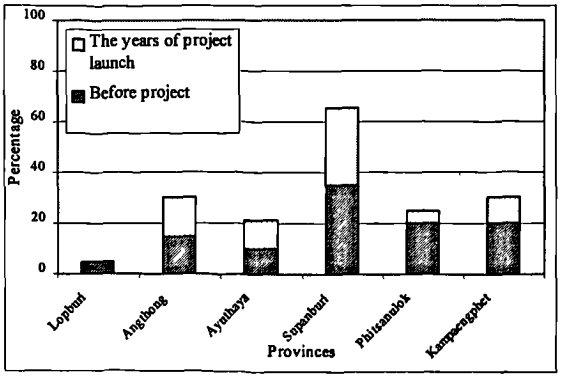


Figure 7.4 Respondents in non-project group who developed orchards without support from the project



Source (both figures): Data derived from field survey, summarized from Tables III.A.12.2 and III. C.12.2

Although most of the respondents in the non-project group in Lopburi considered that diversification was good in terms of better income in the long run (about 90% of them, Tables III.A.14.3 – 4 and III.B.14.10 – 11), they could not engage in the process because their tenant status meant there was no available land (quoted by two thirds of them; Table III.B.14.15). This reason relates to the high tenancy rate of this group (about 75% of total area while only about 20% is owned). This is also the case in Ayuthaya, where about 60% of total land holdings of the non-project group was rented (Table III.A.3). Although about half of these respondents were interested in joining the project, they could not do so due to their tenant status and the constraint this imposed (quoted by 63% of them; Table III.B.14.15). Normally, rental agreements are negotiated on a yearly basis, which is suitable for annual crops like rice. So landlords prefer to keep to this type of land use rather than transforming to perennial crops like fruit trees, which have a much longer life and require a change to the rental agreement.

Not enough labour to work in the orchard was identified as a constraint by the second largest proportion of respondents. This varied from none of the respondents in the non-project groups of Ayuthaya and Phitsanulok to 15 – 25% of those in Lopburi and Kampaengphet, to the highest range of 43 – 50% in Supanburi and Angthong. This reflects the problem of labour resource allocation and the farmers' thinking as to how to allocate their own labour most efficiently in order to achieve an acceptable level (and stability) of household income. Since they realized that intensive work is required for orchard cultivation and it takes a few years before trees reach their productive stage, this made about 10% of the respondents in this group in all six provinces reluctant to cultivate them.

The case of the non-project group in Supanburi is rather different. Not only do household here have the lowest tenancy rate of all groups and areas (about 17%), but they are also market oriented. Besides sugar cane, which developed in response to the construction of a sugar mill located in the same district, other enterprises such as fish, vegetables and flower cultivation and handicraft production (which is associated with flower cultivation), were also developed. In view of these factors, it is easy to understand why a large number of non-project farmers in Supanburi continued to develop orchards by themselves, without requesting any support from the project.

7.2 Setting out the Method of Analysis

7.2.1 Three Groups of Farmers

The group of farmers, who made the decision to diversify on their own without any support, can be considered the most dynamic. In order to find out whether these farmers are more advanced and how different they are from the others in terms of decision making and resource profile, the data was rearranged by pulling these farmers from the project and non-project groups and setting them up as separate groups as follows:-

(a) The group of farmers who initiated diversification independently, titled here the "self-support group". In a way, this group was only "discovered" in the course of the field work, and it may not have been considered an important group without the structured survey.
(b) The "project-support group" who diversified relying on project support. This group also included a few farmers from the four provinces in the central plain who did not join the project in the initial year (crop year 1993/94), but joined a year later.
(c) The "non-diversifying group" who did not diversify.

Table 7.1 shows how the initial two groups (project and non-project or control groups) were re-shuffled into three groups for further analysis. It soon turned out that this arrangement was much more meaningful than the original division into two groups.

Table 7.1: Formation of three new groups for further statistical and qualitative analysis

Separating both project/non-project groups into 'early adopters' (diversified before the project), policy adopters (with project support), and non-diversifiers (in the non-project group)	**A. Project group: 182**		**B. Non-project group: 128**	Total 310
	157 farmers joined the project 25 had diversified earlier but also joined the project		45 had started to diversify 83 would / could not do it, for various reasons	
	1. Project-support group: 157	**2. Self-support group: 70**	**3. Non-diversifiers: 83**	**Total 310**

7.2.2 Factors Influencing Decision Making

Table 7.2 shows the three groups of farmers in comparison. In order to identify possible factors that might influence the decision to diversify, the groups selected above were tested for statistically

significant differences. However, this was under the condition that any identified difference should be independent from the project process. Since the data collected is derived from the structured survey carried out when the project had already started, there are not many independent factors that can be tested. Most of them were already affected by the project establishment. For example, on-farm income is already affected by the adoption of diversification in two groups of farmers, which created differences in land use, farm investment and production of farm enterprises.

As rice is a major crop in the region, its production was considered as one of the factors that might be influencing decisions. However, this factor was not possible to test because the rice yields in the study areas differed considerably due to the different types of rice varieties in use. Photosensitive varieties always have lower average yields (other things being equal) than non-photosensitive varieties [1], but the precise distribution of rice varieties in use was not known for the study areas. Moreover, the income from rice production has effects on on-farm income, and, finally, total household income.

Table 7.2 Three groups of farmers: innovators vs. non-innovators

Category	Groups	Definition	Number of households							
			Provinces						Total	
			Lp	Ag	Ay	Su	Ph	Ka	No.	%
Innovators	1. Self-support Group	Farmers who initiated diversification independently	9	12	8	23	7	11	70	22.6
	2. Project-support Group	Farmers who diversified with the help from the project (credits and advisory services)	26	26	27	24	29	25	157	50.6
Non-innovators	3. Non-diversifying Group	Farmers who did not take any initiative towards diversification (although the projects were available in the district)	18	12	15	9	15	14	83	26.8
Total	All	All	53	50	50	56	51	50	310	100

Lp – Lopburi, Ag – Angthong
Ay – Ayuthaya Su – Supanburi
Ph – Phitsanulok Ka - Kampaengphet

The attitudes of farmers towards diversification as expressed in the interviews probably reflect significant differences among the farmers' groups due to the influence of the time when the

[1] Refer to explanation in Chapter VI, section 6.4.

interviews were conducted. Their attitudes were expressed in the year of project implementation, so all of those interviewed knew about the project and their response may have been biased by that knowledge.

Farmers' decisions are influenced by many independent factors. The decision of farmers to diversify is influenced by a highly individual mix of motives, which are often extremely difficult to quantify. For example: entrepreneurial spirit, preparedness to take the economic risk of diversification, managerial ability, and experience from previous changes in agricultural practice (such as planting sugar cane or flowers in Supanburi). In addition to the individual attitudes of the farmers, the study areas in the six provinces may be associated with a specific context of factors, such as location in relation to major market outlets, microclimatic conditions, and prevailing land tenure situations. It appears to be next to impossible to address such composite socio-economic contexts by a straightforward statistical analysis. Therefore, a mix of a wider qualitative discussion and a more limited quantitative analysis is the mode chosen for this assessment.

To begin with, below, an attempt is made at a statistical analysis of factors that can be quantified from the survey data materials. These factors must be independent from the income data which would have been influenced by diversification. As the example of rice production above showed, it is not easy to find the factors that meet the two conditions, of being readily available and independent from income-related data.

Therefore, there were only a few factors that could be tested. These consist of (a) Personal characteristics of the household heads (age and education), (b) land-related data (land holdings and land tenure), and (c) labour-related data (labour force and labour structure). Although workforce and occupation are associated with income generation, their structure is more independent. Table 7.3 presents the definitions of the factors that were used for the statistical analysis.

Table 7.3 Definition of factors selected for statistical analysis

Variables		Statistical Analysis Technique
Short name	Definition	
1. Age	Age of household head (years); mean value for each of the three groups	Analysis of Variance (ANOVA) of mean values for three groups
2. Education	*Household heads by education background, as percentage of total number of household heads*	*Chi - Square test of proportion of education level for three groups*
3. Land holdings	Mean value of farm size (owned and rented) per household	ANOVA, mean values for three groups
4. Land tenure	*Percentage of land ownership (owned, rented and others) of farm land to total farm area*	*Chi – Square test of proportion of individual status for three groups*
5. Labour force	Mean value of labour force per household (persons in full time farming, plus persons in farming with additional outside employment)	ANOVA, mean values for three groups
6. Labour structure	*Percentage of persons involved in different structures of labour use; i.e. full time farming, farming with additional outside employment* and not working	*Chi – Square test of proportion of individual structure for three groups*

Definition: Numerical data tested by means of ANOVA; *non-parametric factors tested by Chi-Square method*

7.3 Statistical Test of Selected Factors: Methodology and Findings

7.3.1 Methodology

The three different groups of farmers were tested with each factor one at a time. The software package SPSS 7.0 running under Windows95 was utilized for the analysis. In order to test the difference among the three groups, "Analysis of Variance" was applied with numerical data (age, landholdings and labour force factors) while "Chi Square" was applied with non-parametric (education, labour structure and land tenure) factors.

For each test, the null hypothesis was set against the alternative at .05 significance level or 95% confidence. Both ANOVA and Chi Square are able to give the results in form of a p value which is referred to as the observed level of significance, the smallest level at which the null hypothesis can be rejected for a given data set right away. This can be interpreted as :-

- If the p value is greater than or equal to α, the null hypothesis is not rejected.
- If the p value is smaller than α, the null hypothesis is rejected.

Details of the test are attached in Annex I.7.1 while a summary is presented in Table 7.4.

Table 7.4 Results of hypothesis testing

Sector	Variables	Hypothesis set	*p* value	Results
Personal characteristics	Age	*H_0 :There is no difference in the mean value of farmers' age in these three groups* Against alternative *H_1: Not all of age means in these three groups are equal*	.199	H_0 is accepted
	Education	*H_0 : There is no difference in proportion of education level in these three groups* Against alternative *H_1: The proportions of education level in these three groups are not equal*	.887	H_0 is accepted
Land criteria	Land Holdings	*H_0 : There is no difference in mean of farm size in these three groups* Against alternative *H_1: Not all of means of farm size in these three groups are equal*	.780	H_0 is accepted
	Land tenure	*H_0 :There is no difference in proportion of land ownership status in these three groups* Against alternative *H_1: The proportion of land ownership status in these three groups is not equal*	.000	H_0 is rejected, H_1 is accepted
Labour-related data	Labour force	*H_0 : There is no difference in mean of family labour available for farm work in these three groups* Against alternative *H_1: Mean of family labour available for farm work in these three groups is not equal*	.575	H_0 is accepted
	Labour structure	*H_0 : There is no difference in the proportion of labour structure in these 3 groups* Against alternative *H_1: The proportions of labour structure in these three groups are not equal*	.000	H_0 is rejected, H_1 is accepted

The findings of the statistical tests are discussed in the following three sections, each of which links two of the six factors tested. The links are shown within the three sectors (a), (b) and (c) in the table above.

7.3.2 Age and Education

A number of studies argue that age and education level significantly influence farmers' decision making. It has often been suggested either young or more highly educated farmers normally adopt innovations faster than older or less educated farmers. However, some studies challenge this association [2], a position which is borne out by the findings from this study, which show that there is no significant age or education level difference among these three groups of farmers. The age of household heads in the self-support group is a little higher than for the other groups. Their average age was 49 years while the average of the other two groups was 46 years. Similarly, the highest maximum and minimum ages were in the self-support group, followed by project-support and non-diversifying groups respectively (71, and 69, 67 and 27, and 26 and 22 years old). However, according to the one-way ANOVA test, there is no significantly difference in the mean age of household heads in these three farmers' groups. Therefore, age is not a factor influencing decision making towards diversification in the study areas.

Education levels of heads of households were tested to see if this has a bearing on innovation. They were organized into three categories, namely lower primary school and no education, upper lower school and secondary school, and higher education. The former group includes no education because there were less than 5 cases in this category, which is a constraint of the chi square test. For the same reason, secondary school and higher education were combined.

The findings show that most of the farmers had attended lower primary level [3], about three quarters of the self support group, and about 80% in the other two groups. As to secondary-school attainment, the self-support group scored slightly higher (13%) than the two other groups. Nevertheless, as the chi square test shows, there is no statistically significant difference in the education level among the three groups.

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[2] These are mostly thesis studies by master degree students at Kasetsart University, in Thailand. These studies, carried out by Somchai (1983), Rungthip (1992), Chukiat (1997) and Watcharintra (1997), confirmed the belief that younger and more highly educated farmers adopted innovations faster than older and less educated farmers. This confirmed the theory of "Principles of Agricultural Extension" written by Direk (1979), whose work is still used as a reference study at the Department of Agricultural Extension at Kasetsart University. However, other studies challenge the assumptions and results of Direk's work. Ketsuda (1996), Krongkaew (1996) and Kamnueng (1996) found there is no significant relationship between farmers' age and (lower) education levels and their decision-making in adopting innovations.

[3] The present compulsory education level is up to upper primary level, or 6 years of education, which was introduced in the early 1980s (previously it had been 4 years of primary level education).

7.3.3 Landholdings and Land Tenure

Land is a key resource of small-scale farms. It is a source of food, production, security and survival and directly effects the economic situation of the farmers (Chudleigh, 1987). Better off farmer are viewed as more advanced and more likely to adopt innovations than poorer farmers (Chookiat 1997, Rungthip, 1992 and Song, 1997). With this in mind, farm size is used to test the homogeneity of these three groups. Farm size is thus used as a measure of wealth (Ellis, 1992). [4] Findings show that these three groups have a similarly wide range of size of landholdings (4 – 117, 3 – 160 and 3 – 172 rai in self-support, project-support and non-diversifying groups, respectively), with nearly equivalent mean farm sizes (36 rai in both self-support and non-project groups and 34 rai in the project group). Moreover, the observed significance level is .780, which means there is no difference in mean farm size among these three groups. This shows that farm size is not a factor influencing the decision towards diversification.

Farm size does not necessarily mean that the people own all of the land, especially in the central plain where there is a high tenancy rate. This is a serious constraint in changing land use, as mentioned earlier. A cross tabulation of land tenure status shows the direct relationship between land ownership and ability to diversify (Table 7.5).

Table 7.5 Land tenure status by group

Land Tenure Status	Group 1 Self-support farmers	Group 2 Project-support farmers	Group 3 Non-diversifying farmers
Proportion of land owned (as percentage of total farmland)	80	64	47
Proportion of land rented (as percentage of total farmland)	15	25	44
Others (rented out and wasteland)	5	11	9

[4] In many studies on rural development, the size of land holdings has been used as a proxy for wealth. There are two points to be made in this connection : (1) Land was very different value depending on factors such as fertility, access to water, and access to market. Therefore, only land within the same agro-ecological zone can be compared by size of land holdings, and then be used as a surrogate variable for wealth. (2) Other farm resources, especially labour force (and their skills), and capital are increasing more important than land alone. This is especially true for areas that are closely associated with the urban-industrial sphere of growth and change – as many of the study areas show.

The degree of difference was tested using the chi square technique. The significant level of .000 means that the null hypothesis is rejected. This means there is indeed a significant relationship between land tenure status and farmers' decisions for diversification.

7.3.4 Labour Force and Labour Structure

Labour is another important farm resource (Chudleigh, 1987), which can be viewed as influencing decision making. Farm operations rely on the availability of family labour because hired labour is relatively scarce and expensive [5]. Thus the labour force available for farming normally consists of contributions of the heads of the household and other members of the family.

As already discussed in Chapter V (section 5.6.1), farmers do not rely only on farm work; a number of people were also employed outside their own farms and generated a considerable amount of household income. [6] With this in mind, non-farm employment might be interpreted as a factor influencing decision-making towards diversification due to limitations of the labour resource in the farm household. For example, if labour is utilized mainly for farming activities, the farmers probably do not have surplus labour to undertake other work. Alternatively, if the farmers already utilize their labour resources to some extent in non-farm work, they probably have no labour left for other farm activities.

Following the above, the types of occupations of all family members were tested among the three farmers' groups. These types were organized into four categories according to the labour structure:

a) full-time farming
b) full-time employed (outside the farm work)
c) full-time farming and part-time employed (in non-farm work)
d) not in employment, (which also includes studying).

The difference between (a) and (c) was discussed in Chapter V (section 5.4.1). Although farmers in both categories give priority to farm work, the latter also worked outside the farm when they could

[5] With rapid development of the industrial sector in the central plain since the 1980s (section 5.6.1), many people, especially the young, migrated to work in this sector. This contributed to a scarcity of labour in agriculture. Most hired labourers are farmers in the same areas who can allocate some of their time for working on other farms. Although the wage rate in the agricultural sector is lower than in the industrial sector (about 100 Baht/day, compared to 125 Baht/day during 1993 – 1995), this is still a high rate for the agriculture sector.

[6] This suggested that land resource only cannot be used as a proxy for income.

manage to do so. In this chapter, "full-time employed" (category b) consists of officials and employees in both public and private sectors while old and young people who are not working are in the same category (d) as are students who are classified here as having no occupation.

Therefore, the "labour force" as discussed in this section consists of contributions to farming under categories (a) and (c) above although they have a different structure of occupation. An overview of this situation is shown in Table 7.6.

Table 7.6 Labour force and labour structure

Labour Structure	Group 1 Self-support farmers	Group 2 Project-support farmers	Group 3 Non-diversified farmers
Full-time farming	51%	47%	35%
Farming with part-time employment	13%	12%	28%
Others (outside work and not working)	36%	41%	37%
Labour force per household (persons)	2.6	2.5	2.5

The two variables "land tenure" and "labour structure" are closely related, as a comparison of Tables 7.5 and 7.6 shows. Group 3, the non-diversifiers, show much higher percentages on both accounts than the two innovator groups. While the two innovator groups can be said to be fully farm-oriented, with only small percentages in part-time employment and relatively small portions of rented land (25%, 15%), the non-diversifying households are constrained by the fact that almost half of their land (mean value 44%) is rented and they are thus not able to diversify within the current annual contracts for much of their land. Moreover, for tenants, capital is more difficult to borrow where there is no land to offer as security (Haines, 1982, and Feder, 1988).

Although the Bank of Agriculture and Agricultural Co-operatives allows farmers to borrow funds under the group guarantee scheme, farmers do not feel comfortable about the system. They do not like the condition of paying for others if one in the group fails to repay to the bank. This could then be the reason for the group's unusually high proportion of outside employment (28% compared with only 12% and 13% in the other groups) in which households in the non-diversifying group engage in order to balance low incomes from rice cultivation. The household conditions behind the two related figures may also be slightly different in a sense that households with low incomes from rented land may prefer to make active use of non-farm job opportunities that are now available in

many provinces. Such households may be more inclined to take up such employment than households that are fully devoted to farming on largely owned land.

The labour force per household ranges from 1 to 6 persons, accounting for both categories (a) and (c) above. However, the mean values of the three groups are nearly identical at 2.6, 2.5 and 2.5 respectively (Table 7.6). Unsurprisingly, therefore, the ANOVA test results reveal that there is no significant difference among the three groups.

By implication, one might expect the non-farm income in the three groups would differ considerably, especially if farmers in the central plain provinces were compared with those in the central north area, which is generally poorer than the central plain. However, this can not be subjected to a statistical test because the self-support groups in the central north only has 18 cases, i.e. a sample which is too small for statistical testing.

7.4 Management of Farm Resources by the Three Groups

Land, labour and capital are viewed as key farm resources, classified as on-farm elements that make up farming systems, in the context of the overall agricultural system. The farming systems perspective is used here as a frame of reference for the discussion in the last two sections of this chapter. Normally these three resources are limited in small-scale farms. That means there are always likely to be insufficient resources for the farmers to establish the objectives that they would like to pursue (Chudleigh, 1986). In other words, even though most farmers in the three groups were interested in diversifying, not all of them were able to do so. For example, to be able to diversify requires a certain minimum of owned land and sufficient labour to maintain the fruit tree plots, in addition to a minimum level of investment capital. If all of these resources are severely limited, farmers do not have much of a choice but to stick with the system they already have, i.e. rice cultivation (plus, where available, some off-farm employment).

Generalizing on this point, small-scale farmers have to operate within the narrow constraints of their own resources (as a set of endogenous factors), set within a wider framework of exogenous factors. These are, among others, natural factors such as climate and soil, government policies, and the market. This seems to be consistent with the results from the statistical test for the three groups of farmers in the study areas. The next three sub-sections present the findings on each of the three analysis groups, beginning with the most constrained group of the non-diversifying farmers.

7.4.1 Land and Labour Constraints of the Non-Diversifying Group

The farmers in the non-diversifying group are not able to diversify – even though most of them (about 80%) thought that diversification would give them economic benefits – due to their constraints in terms of land and labour resources. Not only do the statistical tests, as analysed above, confirm this, but so too do the findings from the structured survey, which revealed the main reasons for not adopting diversification in this group (Table 7.7).

Table 7. 7 Reasons for not adopting diversification (by non-diversified group) (Multiple choice, n = 83)

Main reasons	Percentage
Constraint of land	54
Constraint of labour	34
Prefer existing system	23
Constraint of capital	14

Source: Data derived from field survey

Land was a constraint of the largest proportion of farmers in this group (more than half of them). This, however, was closely followed by tenancy (nearly 40%) rather than unsuitable topography (quoted by 9% of them) or too small farm size, which is difficult to convert into plots for orchards (8%). Labour constraints were cited by the second largest proportion of farmers in this group (about one third of them). They simply indicated there was not enough labour to undertake orchard cultivation, which requires more intensive work than rice. This is the same view as expressed by Haines (1982, p. 60) who suggested that "The most labour-intensive farming systems are fruit-growing and horticulture, which also demand higher skills than many other farm jobs".

Constraints caused by the combination of land and labour resources, seemed to encourage the farmers to think that the existing system probably suited their situation, i.e. mainly rice cultivation and doing non-farm work in the slack season (as mentioned in Chapter V, section 5.4.1). They can hire farm machines for land preparation and harvesting and also hire casual labour to spray pesticide for rice cultivation. However, this is not the case with orchards. Although tractors can help in basic land preparation, bedding still requires considerable manual work. While there may not be much maintenance work for the first years of orchards, there is a lot of work on vegetables which are grown as an inter-crop. And maintenance work for fruit trees requires more labour in the later years. Technical work, such as fertilizer application, spraying, pruning etc., requires different

techniques than rice, and cannot be operated by casual workers who are not familiar with the activities. This forces farmers to do the work by themselves. With these constraints, therefore, a number of farmers in this group (about a quarter of them) remarked that they thought that it was too complicated for them to undertake orchard cultivation. They preferred to continue practicing the existing rice-based system.

Although capital is one of the most important resources, and often a constraint on the activities of farmers (especially when there is an investment for new enterprises), it was identified as a constraint by only 15% of respondents in the non-diversifying group. It seems that since land and labour constraints are so strong already, diversification is not a practical possibility. In other words, and further interpreting the survey findings, the farmers' constraints may be ranked in the following sequence:

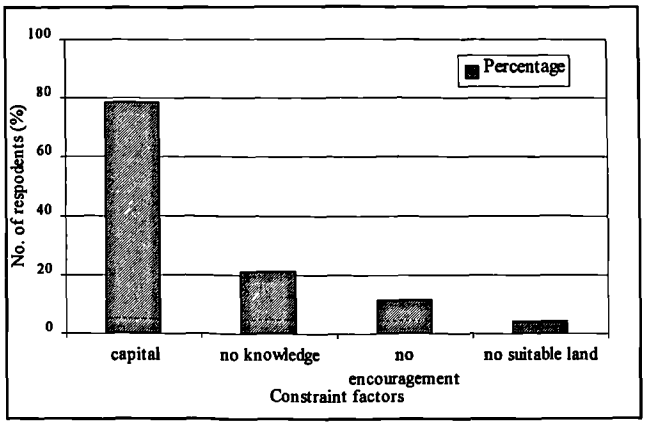
- Land – status imposes real constraints on farmers' ability to modify land from rice to orchards.
- Labour – imposes significant constraints on labour-short households.
- Capital – imposes minor constraints on capital-poor households because of the credit facilities available from the BAAC, and because of dominant role played by the other two factors (land and labour).

This finding may be in contrast with research results from Latin America and Africa [7], where access to capital and credit may be the most serious constraint (rather than land and labour).

7.4.2 Capital Constraints of the Project-Support Group

Capital requirements for orchard cultivation were, however, noted as a constraint by farmers in the project-support group. Results from the structured survey show that most farmers in this group (about 90%) had considered diversification beforehand, but did not have enough capital to invest. It was only when they received credit support from the project that they could diversify (quoted by about 80% of them, Figure 7.5). There is a small but significant difference between the project-support group and the non-diversifying group in a sense that both needed capital (or low-interest credit) as an incentive, but the project-support group had sufficient land resources, while the non-diversifiers were also constrained in that respect.

Figure 7.5 Factors preventing diversification in the past (identified by the project-support group)



Source: Data derived from field survey

7.4.3 Resource Management by the Self-Support Group

The capital situation is also different in the self-support group. Those farmers were able to find the capital on their own for orchard investment, without project support. Their own capital resources (mainly savings) would have been supplemented by loans at the normal going rates, i.e. 12.5% per annum provided by the BAAC or co-operatives, or 15% from commercial banks.

This analysis shows that farmers in general know how to manage their available resources to meet the objectives set for their farms. Diversification in agriculture is just one alternative in a range from which farmers can choose. Some farmers are sufficiently resource rich to choose to diversify. This is the case of farmers in the self-support (group 1) and project-support groups (group 2). But there are also farmers who cannot diversify due to limited farm resources, which is the case of the non-diversified group (group 3). This confirms Chudleigh's view (1987, p. 4) that "The amount of farm resources available usually limits production and forces the farmer to choose between alternative uses of his resources". This applied to the three groups of farmers in the study areas as illustrated in Table 7.8.

Table 7.8 Arrangement of farm resources of the three groups

Farm resources	Group 1 (self-support)	Group 2 (project-support)	Group 3 (non-diversifiers)
1. Labour	Sufficient	Sufficient	Partly employed outside the farm
2. Land	Sufficient	Sufficient	Limited: partly rented
3. Capital	Sufficient	Not sufficient. Therefore, credit support required	The land /labour constraints are so strong that low interest rate for credit does not act as incentive

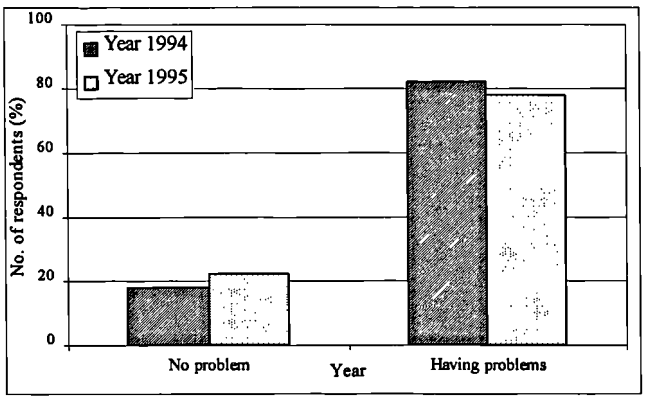
[7] See Berry (1993) and Carolyn (1983) pp. 41 – 63.

Following the Chudleigh argument, groups 1 and 2 (self-support and project-support groups) have been able to utilize alternatives offered by the project, while group 3 (non-diversifiers) were not.

7.5 Exogenous Factors Influencing the Farming Environment

The discussion above shows that farmers can manage the endogenous resources of land, labour and capital effectively; however the question is what other elements influence the farm environment, over which farmers have little or no control. Normally these elements are classed as exogenous factors, associated with the regional, national or international contexts. Although about 20% of the farmers in the study areas stated that they could manage the problems on their farms, a majority of 80% could not do so. Therefore they required government support and intervention. (Figure 7.6 provides a graphical summary of the points discussed in section 5.8 (Chapter V).)

Figure 7.6 Problems identified by respondents in the study areas



Source: Data derived from field survey, summarized from Tables III.A.9.1, B.9.1 and C.9.1

The issues identified by the respondents are presented in Figures 7.7 and 7.8. Both of these sets of figures to some extent repeat the more general discussion on farmers' problems in Chapter V, section 5.8. In this context, the emphasis is especially on the exogenous factors of the farming environment. In terms of problem identification, marketing and water constraints were the major issues while capital seems not to be a constraint of many farmers in these regions. However the problem that seems to be highlighted by a steady number of farmers in both years was pests, i.e. insect attack and plant diseases (Figure 7.7).

As well as identifying these problems, farmers were keen to suggest ways of alleviating the problems by asking for additional support from the government. A number of intervention strategies

such as setting up co-operatives and price support were suggested in order to increase the farm gate price of agro-commodities. Farmers also suggested that the government should improve irrigation systems in order to facilitate adequate water supply in the dry season, cheap credit support together with technical advice regarding pest control (Figure 7.8). There is a relationship between problem identification and support requested although the proportion of farmers who requested support is smaller than the proportion highlighting those particular problems. This does not mean that they did not want the support; many of them simply knew that they would not get what they asked for.

Figure 7.7 Causes of Problems identified by respondents in the study areas

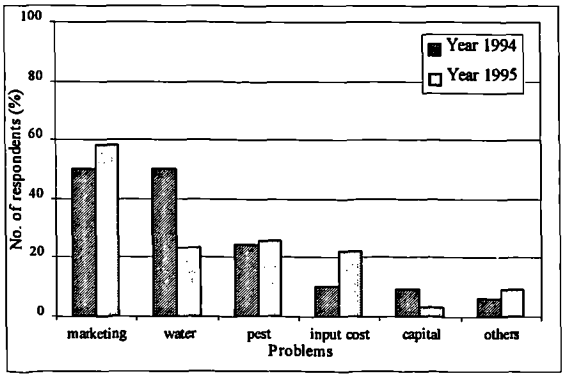
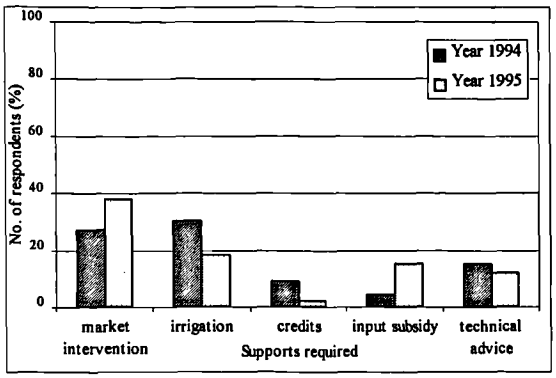


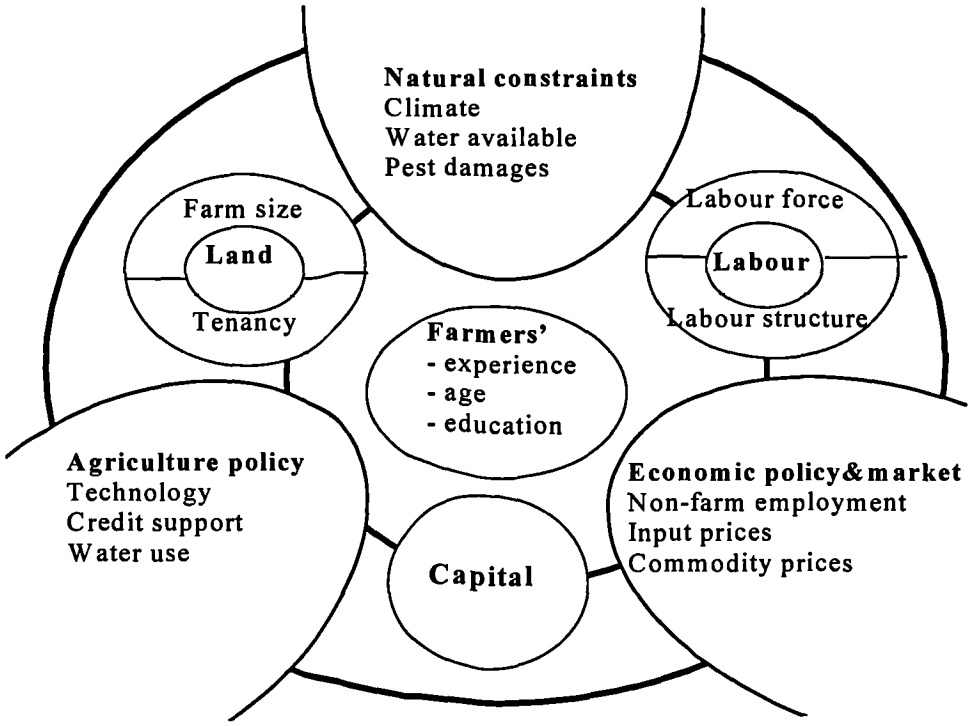
Figure 7.8 Support requested by respondents in the study areas



Source (both figures): Data derived from field survey, summarized from Tables III. A.9.2-3, B.9.2 – 3 and C.9.2 - 3

The problems identified and requests for support however are inter-related as shown in Figure 7.9, which depicts the conceptual framework of the farming systems approach. The findings are confirmed by Haines's view (1982, p. 64) that "farmers" enterprise decisions [however] are limited by natural constraints, the availability of land, labour, capital, the farmers' experience and government policy". Shortage of water and pest damage can be classified as natural constraints, while government policy can influence such issues as marketing of farm products, input price, control of water use (to some extent only, and not in rainfed areas), and resource allocation and employment outside the agricultural sector.

Figure 7.9: Conceptual diagram of the farming systems approach



7.6 Some Conclusions

The discussion and analysis in this chapter show that diversification is not a new thing for the farmers; it already existed in the study areas with a number of farmers having opted for diversification prior to the onset of the project. Although some others wanted to diversify, they faced capital constraints. These farmers could only start to diversify when credit support from the project became available. However, this did not apply to those who had the most serious constraints in terms of land and labour resources, even though they also thought that fruit trees would be profitable. This group of farmers were consigned to continuing with their existing system. There is therefore evidence that farmers were managing the resources at their disposal in order to achieve their own objectives, which are sometimes not solely concerned with maximizing income in the short run (Chudleigh, 1987). This means that each of the three groups managed their resources in such a way that income would be stabilized over time, while keeping the economic risk from unknown activities under control.

Although the farmers are able to manage their on-farm resources effectively, they are still influenced by exogenous variables. Availability of water, price and marketing of farm products

were identified as major problems, followed by pests and capital respectively. Although capital is counted as an endogenous factor, it is often a constraint on activities that farmers (particular small-scale farmers) would like to carry out. Therefore they have to seek for credit, which is viewed here as an exogenous factor that can facilitate farm investment (Chudleigh 1986, p. 22, and Chudleigh 1987, p. 13). Such issues are outside the farm boundary and associated with the wider context, which is largely outside the farmer's control. They depend, to some extent, on government intervention.

The policy response to the major problems of scarce water and the low price of rice, led to the crop diversification project, which did break the capital deadlock for some farmers. However, this was not possible for everyone, due to constraints in terms of other farm resources. Therefore, the question arises : how can the policy be restructured and reshaped so that, it can benefit the largest number of farmers in the region? This is the point of departure for the analysis regarding policy implications arising from the crop diversification project, which are addressed in the last two chapters.

CHAPTER VIII The Agricultural Restructuring Programme in Perspective, 1993-2000

The last part of the study (presented in two chapters) is designed to cover much more than merely conclusions and recommendations on the basis of the main field study carried out in 1994 and 1995. Instead, an effort is made in this chapter at relating this research study on the diversification pilot project and its main results to a review of the implementation of the main phase of the diversification programme, which is still on going. Furthermore, it is intended to conclude this research with an open discussion of critical dimensions implied in long-term restructuring in agriculture, which is presented in a separate last chapter, IX. As a result of the long period needed to complete this research, these two chapters together are more complex than a summary of conclusions and recommendations that could have been written four or five years ago, when the experience with the diversification programme was still too fresh to be fully evaluated.

This chapter is divided into five sections, beginning with a review of the officially available evaluation reports on the implementation of the main phase of the programme. Section 8.2 provides a review of the "lessons learnt", or the main results pertaining to designing, launching, testing and implementing the restructuring programme, on the basis of the pilot phase. Section 8.3 then adds the results of the follow-up surveys that were carried out from 1996 to 1999. Although those surveys were much less intensive than the surveys carried out in the first two years, they reflect the main changes in the conditions as well as farmers' decisions in a medium- to long-term perspective. In this way, some important policy implications can be drawn on the basis of the field studies.

On the basis of these three sections, section 8.4 briefly discusses the differences between the official evaluation studies and the objectives and methods of this research. The last section (8.5) presents those points that have been critical in implementing the diversification programme so far, which are also critical for future programme implementation. The concluding part of this section presents a tabulated synopsis, which links the critical issues arising from the evaluation to directions for improved programme implementation.

8.1 Official Evaluations of the Main Phase of the Programme

As of the end of the year 2000, there are only three principal official sources of information on the implementation of (the first part of) the main phase of the agriculture diversification programme. One more evaluation study may be mentioned in this context – a study prepared by the Thailand Development Research Institute (TDRI) for FAO in 1995. Although its title suggests a wider coverage ("Agricultural Diversification / Restructuring of Agricultural Production Systems in Thailand"), the study only includes data for the first year, 1993, of the pilot project on diversification. This point, and the fact that the TDRI report is very general in its coverage of agricultural restructuring possibilities and attempts in Thailand, means that it will not be referred to in detail the context of this chapter.

The purpose of this section is to review the three official evaluation reports and to compile their main points. The three reports are, in their chronological sequence of completion,

1. Chula Unisearch, Chulalongkorn University: *Final Report on the Agricultural Restructuring Programme*, submitted to the Budget Bureau Office, Bangkok, 1996. (Short reference used in this chapter "Chula, 1996")
2. Applied Economic Research Centre, Kasetsart University: *Final Report on an Evaluation of the Agricultural Production Restructuring Programme,* submitted to the Bank of Agriculture and Agricultural Co-operatives, Bangkok, 1996. (Short reference used in this chapter "KU, 1996")
3. Office of Agricultural Economics (OAE): *Evaluation of the Agricultural Production Restructuring Programme, Phase I (1994-1996),* Bangkok, 1999. (Short reference used in this chapter "OAE, 1999c")

The three reports were written for specific purposes and for different agencies. Their temporal coverage is limited, namely two years only (1994-1995, Chula and KU), and three years (1994-1996, OAE); so none of them includes what may be called the "maturation period" of the agricultural restructuring programme. Furthermore, these three reports share the following characteristics:

- Highly aggregate statistics on the whole country, broken down by macro-region and by province (in Chula, 1996), but lacking specific information about programme planning and implementation at the provincial or local levels, and without differentiating between irrigated and rainfed areas;
- Highly aggregate evaluation of agricultural restructuring with regard to rice and cassava (and, to some extent, other crops), but no distinction as to the specific problems associated with the main crops of rice and cassava;

- Evaluation methods based on agency statistics, in combination with some field-level research in the form of limited sample surveys.

Owing to these limitations, it is difficult to relate the three official evaluation documents and their results to the much more specific analysis and results in this study. Unfortunately, however, at the time of completing this study, no other evaluation or monitoring reports were available on the long-term effects of the agricultural restructuring programme, which has been in operation since 1993 (when the pilot project began). So even now, seven years into one of the largest agricultural programmes ever in Thailand, it is difficult, or nearly impossible, to assess the overall performance of the programme, by relying on official reports.

The three reports differ considerably in terms of objectives, emphasis and breadth of the analytical approach, and level of detail. This makes it difficult to compare their contents and results. Nonetheless, a systematic approach for presenting the summaries of these reports has been attempted, using the following general sub-headings for compiling the most important points of the three reports:

- Factual information
- Key issues and problems
- Recommendations for improvement

In some instances, these general sub-headings do not cover certain interesting statements from the evaluation reports; in such cases, specific sub-headings are used in addition. To avoid overlap, the summaries of the three reports do not include those points that are similar. Instead, the emphasis is on bringing out the differences in methods and results.

8.1.1 Chula Unisearch, Chulalongkorn University, *Final Report on the Agricultural Restructuring Programme*, submitted to the Budget Bureau Office, Bangkok, 1996

This report was written for the Budget Bureau Office of the Ministry of Finance. The emphasis, therefore, is on aspects of effectiveness of allocating and spending considerable budget resources on the national programme for agricultural restructuring. In view of the fact that several agencies are involved in programme implementation, the report underlines the importance of a consistent framework for monitoring and evaluation.

- **Factual information**

The Chula evaluation includes useful information on the overall budget that had been allocated for the agricultural restructuring programme, adding up to a staggering 65,800 million Baht over a period of five years – the largest budget ever allocated to an agricultural development programme. It should also be noted that despite this very large budget, the areas targeted for the first two years of the programme only amounted to about 1.9% of the total agricultural area of the country. The main points are summarized in Table 8.1. The initial budget allocation was later revised, as reported in OAE, 1999c (see section 8.1.3 below).

Table 8.1 Budget allocation of the diversification project (in million Baht)

Items	Budget year				Total
	1994	1995	1996	1997-2010*	
Credit (revolving fund)	6,900	7,497	11,433	7,926	33,756
Support for inputs and water resource (grant fund)	2,650	2,940	3,570	-	9,162
Operating budget	180	270	330	-	780
Compensation for low interest rate and operating cost of the BAAC	540	1,013	1,605	18,968	22,126
Total	10,270	11,720	16,940	26,894	65,824

* It is not very clear how this last year of the programme is determined, which was supposed to cover five budget years, 1994 - 1998. The long period until 2010 would include most of the 15 pay-back years for the special credit extended under the programme.

Source: Compiled from Chula, 1996

In general, Chula (1996) rated the implementation until 15 Oct 1995 (since 1993) as not successful. This was measured from the fact that less than 30% of farmers who joined the project could implement their plans, while the remaining ones were still waiting for credit approval. Therefore, the Chula report argues that the procedures for credit and input delivery should be faster.

- **Key issues and problems**

Project implementation: Although many agencies are involved, only five main agencies are directly responsible, namely DOAE, BAAC, RID, Livestock Department and RFD. Although they had the same main objectives, they had different working tasks. The DOAE, for example, emphasized persuading farmers to join the project to achieve the targets set, while the BAAC emphasized credit delivery and follow-up on credit disbursements. Among these five agencies, the DOAE seemed to be only agency that made this project one of its major tasks, while the others gave it much less importance. This included the BAAC, which was solely concerned

about loans given to farmers and about their payment ability. This not only made the views of the implementing agencies differ considerably with regard to targets achieved, but also led to very different points of view of problems. Furthermore, with many necessary adjustments regarding target areas (which decreased over time), criteria of recruitment (allowing unqualified farmers to join the project) and accepting "plastic cattle" [1] as alternatives due to local political influences, the project objectives were distorted and caused problems with implementation.

Interaction between implementing agencies and farmers: There was not much on the progress reported by the implementing agencies, as they very rarely surveyed the attitudes of the farmers after implementing the farm-level projects. The report also points out that there was a lack of co-ordination within and between agencies. Moreover, there was a lack of communication with the project farmers. The effects are spread on both official and farmers sides. Officials did not try to understand each other and most continued to operate "in their own sweet way". Because of this, the criteria for farmers' recruitment and credit support were set differently according to individual agencies. Among the farmers, this also resulted in a lack of real understanding about the project.

Adoption of alternatives: The adoption of alternatives offered by the project was low at less than 30% achievement rate (measured in terms of credit delivery, which was only 27% of the allocation). Constraints can be summarized as: (a) Land tenancy was stated as a major obstacle for farmers to join the project. They could not use their land as collateral because it was either located in a forest reserve or rented. In this respect, the farmers were unclear about the project requirements. (b) Farmers did not have enough labour and were not really willing to work with the alternatives offered by the project. (e) Some were already in debt. In this regard, it was reported by the Bank of Thailand that many non-project farmers were interested in joining the project. Other farmers, however, were not interested because they did not want to have more debt (especially coffee farmers), because of labour constraints, and because they had no confidence in the project. Some farmers stated that they were not interested in farming anymore due to higher income earned from the non-farm sector.

Implementation by officials: The report's remarks centred on: (a) Complicated procedure of recruiting farmers in the target areas. (b) Late delivery of input supplies, which were poor in quality and not consistent with farmers' requirements. (c) Some officials got personal profits from purchasing inputs. (d) Officials did not have enough technical knowledge to advise farmers.

[1] "Plastic cattle" is the jocular term used to refer to inferior-quality cattle with low or no milk production and other deficiencies, that appear to be used in many government-sponsored livestock projects

Income effects: Net farm household income after project implementation was higher than before, especially when dairying was adopted as an alternative. Labour utilization after the project was more efficient than before (measured from the more intensive use of labour for alternatives).

Sustainability: This term is used to assess the expected performance of the programme in the medium to long run, mainly based on the numbers of adopters minus those who give up ("drop outs"). So the performance of the project was ranked as "medium", because of the slow increase in numbers of farmers in the programme. The increasing market prices of rice and cassava from 1994/95 onwards made some farmers withdraw their farm plan proposals (exactly as experienced in the present research study). In addition, the increasing commodity prices are seen in the report as the main reason for farmers hesitating to go ahead with diversification. Some other factors challenging the sustainability of the project are flooding, and over-production from alternative crops leading to low prices.

- **Recommendations for improvement**

Guidelines to improve project efficiency

1. Adjust the project principles and strategies
2. Increase efficiency of implementation
3. Establish strong and specifically tailored monitoring and evaluation systems

1. **Adjust the project principles and strategy:** The project should leave the farmers to choose alternatives (especially crop types) on their own. However, the knowledge about these alternative crops should be well prepared and cover a complete cycle, including land preparation, planting, maintenance, harvesting, transportation, marketing, preservation and value added products. So Chula (1996) suggests limiting the number of alternatives, but providing complete technical information for each alternative. Also the officials should adopt the role of technical advisors. Chula criticized the fact that the more alternatives that were offered, the more difficult it was to provide adequate technical support. (This is in contrast with the OAE evaluation summarized in section 8.1.3 below.)

2. **Increasing efficiency of implementation:** (a) Clear information about the project, credit facilities and conditions have to be given to farmers and officials, especially at the local level. If the officials clearly understand the project, they will be able to provide accurate information to farmers. (b) A rapid survey of each area has to be made in order to assess farmers' conditions before determining the target acreage. Associated with this recommendation is the one for **increasing the efficiency of co-ordination:** More co-

ordination, more meetings, and guidelines are required at every level, in order to focus on the same general policy but decentralize implementation practice.

3. **Strong and specifically designed monitoring and evaluation systems:** (a) Every agency concerned should collaborate in reporting, monitoring and evaluation. In this regard, targets and indicators should include both quantitative and qualitative analysis, and not only in terms of achieving project objectives. Impacts on income, labour utilization, and living conditions have to be included. (b) Information collection should be managed in the same system, so it can be exchanged and used across agencies. (c) Regular co-ordination meetings should be held.

In summary, Chula (1996) concluded that the project has clear and correct targets and good principles. However, it also concluded that some issues had to be revised and reconsidered. Most of the implementation strategies were suitable in general, but some issues were not sufficiently clear for smooth implementation.

8.1.2 Applied Economic Research Centre, Kasetsart University, *Final Report on the Evaluation of the Agricultural Production Restructuring Programme,* submitted to the Bank of Agriculture and Agricultural Co-operatives, 1996

The evaluation report by Kasetsart University was written specifically for the BAAC, which explains why it is primarily concerned with the allocation of credit and repayment by farmers. As with Chula (1996), this report only covers the first two years of programme implementation. An updated evaluation report by or for the BAAC was due to be available during the year 2000, but it had not been completed at the time of completing this research study.

Although most of the results and recommendations given in this report appear to be correct and useful, it is difficult to pinpoint which areas are referred to and how results and recommendations should be prioritized in different areas. The samples for interviews with farmers were limited to a few provinces only, but the statistics presented are highly aggregated. Furthermore, there are no separate statistical figures on rice and cassava-growing areas and their relative progress related to diversification. However, this report is stronger than the ones by Chula and OAE in terms of its attention to the importance of non-farm income and impacts on farmers.

- **Factual information**

The **data** are derived from interviews with selected farmers, but the percentages reported cannot be traced to specific areas. So they are only indicators of general trends. 50% of diversified farmers are quoted as saying that they would have diversified anyway even without project support. In theory, that means cheap credit pushed the remaining 50% of them to diversify. However, about 36% of the farmers interviewed stated that without low-interest credit, they would not join the project while another 38% said even if there was no low-interest credit, they would have still joined the project. Only about 37% of diversified farmers had experience with alternative farming systems.

In terms of **recruitment**, some areas did not reach their pre-determined area targets while others exceeded their targets. Owing to this situation, the extension officers in the latter areas restricted the numbers of farm plan proposals accepted and the credit given, while the officers in the "under-performing" areas tried to push un-qualified farmers to join the project.

- **Key issues and problems**

Farm plans: Most farm plans had been written by tambol agricultural extension officers. Therefore, they were sometimes not based on the real needs of farmers or their ability to manage alternatives. Many farm plans had been written without seeing the location of the farms to which they related. This made the plans unsuitable for the physical environment.

Credit approval: There was no standard for approving credit. So farmers with the same qualification might receive credit or not, or the loan size might be different. Loans were disbursed late in some areas. It was also found that BAAC officers gave credit with *refinance* characteristics which distorted the objectives of the project.

Input support problems: Inputs which are under the responsibility of the provincial level offices were subject to long delays in delivery due to complicated procedures. So some inputs were in poor condition when received. This is consistent with the results of the focus survey of this research study. Many farmers stated that saplings were very poor and came late. They also suggested decentralizing budget responsibility, or giving the money to farmers direct (as part of the credit) to buy saplings. In general, farmers thought highly of the project in nearly every aspect, except for input supplies, which they ranked as only fair.

Poor follow-up work: Regular advice for maintenance after diversification was lacking. There was also no marketing support from the project, so the local market was the main place for selling fruits, but there prices are set by the buyers, and not farmers. This made prices too low to compensate for the cost of production.

Impact on income: Comparisons of incomes between project and non-project farmers revealed that the net farm household income of the project farmers was about 93,760 Bt. which was higher than that of the non-project farmers by 13,069 Bt. or about 16%. However, this is not rated as an impact of the project. The higher amount was influenced by non-farm income and, initially, the project farmers had lower net farm income than the non-project farmers. After two years of implementation, the project did not have any impact on increasing net farm income due to the early stage of diversification activities (i.e. integrated farm, fruit tree, cattle) which had not reached their full production stages.

Low-interest loans: At the first year of the project, the project caused confusion for other clients of the BAAC due to the low interest rate of the project.

Impact on the fruit market: KU (1996) pointed out that there would be impacts on the fruit market, especially mango, because production was mainly for local consumption and not for export. So it would be difficult to expand the market. This conclusion was based on the low prices of mango in 1996, when there was some over-production while export growth was low (at about 600 tonnes per year). Market constraints of this crop will become more serious due to expansion of the planted area. However this would not occur with other varieties of fruit, because of lower production figures and limitations in terms of climatic and topographical factors.

- **Recommendations for improvement**

Target areas and preparatory surveys: The target areas should not be in irrigated rice areas because that is the best area for paddy, but be limited to rainfed areas which are unsuitable for rice. The target areas should not be scattered. This is for convenience in follow-up work and monitoring of the diversified areas. In-depth surveys of the physical environment should be undertaken (especially with regard to area suitability, as this would help avoid flood-prone areas).

Implementing officers: Many officers who undertook field work still did not fully understand the project. Therefore their field advice given to farmers caused confusion. Technical assistance should be regularly provided to the DOAE officials involved in project implementation.

Project information given to the farmers was still inadequate. Farmers should realize the necessity and importance of restructuring in accordance with environmental change, including limited availability of irrigation water. This should be fully supported by the government.

Recruitment of farmers should be carried out jointly by extension officials and BAAC staff. This would solve the problem of farmers who were recruited by extension officials, but disqualified for loan disbursement. The emphasis should be on farmers who are not only qualified for the loan, but also willing to diversify. If the farmers are willing to diversify but not qualified for the loan, the committee must find some ways to help them.

Better farm plans: The officials and BAAC staff have to undertake site surveys, investigating the proposed areas, and not writing the plan for farmers or talking to farmers at other places (school, temple, etc.). This will help make farm plans more accurate, and more suitable for the local conditions, the alternative farm enterprises and the loan size. Avoiding refinance characteristics; farmers took this money to repay other loans.

Input improvements: Since most inputs supplied by the government are poor quality, insufficient, or delayed due to the long purchasing procedures of the government, the system should be improved. On the one hand, emphasis should be on better and much earlier preparation in order to deliver inputs in time, and on the other, on providing loans to farmers to buy inputs by themselves.

Monitoring is lacking: This includes both extension and BAAC activities. After loan delivery, there was no further support. The government and BAAC should provide the budget and some incentives for visiting and monitoring. Officers involved in the project should not be transferred, because the new ones might not fully understand the project.

Marketing information regarding problems and prices of rice, cassava, coffee, pepper and substitute crops should be provided to farmers. The marketing situation of the recommended enterprises should be studied and provided to farmers. This should be included in the annual statistics of planting areas or stock of existing enterprises and alternatives in order to manage the market in the future. Advice on value added commodities should also be provided.

8.1.3 Office of Agricultural Economics (OAE), *Evaluation on Agricultural Production Restructuring Programme: Phase I (1994 – 1996)*, 1999

This report was written as an "in-house" evaluation for the Ministry of Agriculture and Agricultural Cooperatives, for the purpose of improving project performance of the implementing agencies. The report covers the first three years of project implementation (until the end of 1996) but was only published in 1999. In comparison with the figures reported in Chula (1996), some of the basic budget and area figures appear to be different, but it was not possible to verify from the reports what the underlying differences in definition actually are. This report is particularly valuable for its statistics reflecting overall achievements after three years. Some of these statistics are presented in outline, without further comment (Tables 8.2 – 8.8).

- **Factual information**

Table 8.2: Target areas for diversification (in 1,000 rai)

Crops	Year 1994	Year 1995	Year 1996	Total
Rice	546.68	662.53	1,088.00	2,297.21
Cassava	323.32	527.66	400.00	1,250.98
Coffee	70.00	10.00	35.00	115.00
Pepper	2.00	0.50	0.80	3.30
Total	942.00	1,200.69	1,523.80	3,666.49

Table 8.3: Targets for farming system alternatives (in 1,000 rai)

Alternatives	Year 1994	Year 1995	Year 1996	Total
Integrated farm	317.00	345.00	598.00	1,260.00
Fruit trees	279.40	170.00	262.80	712.20
Vegetables/flowers	25.60	25.00	25.00	75.60
Economic trees (for oil etc.)	150.00	330.69	250.00	730.69
Fast growing trees (for wood/pulp)	100.00	250.00	328.00	678.00
Dairy/beef cattle	70.00	80.00	60.00	210.00
Total	942.00	1,200.69	1,523.80	3,666.49

Notes:
- Target areas were adjusted in accordance to the real situation from year 2 onwards.
- Target areas set for year 1997 were only 840,000 rai, and 800,000 rai per year for 1998 – 2000 (because of lower budget allocation)

Table 8.4: Target achievement by area

Crops	Target areas (1,000 rai)	Implemented areas (1,000 rai)	% to target areas
Second rice and unsuitable rice areas	2,297.21	2,149.11	93.55
Cassava	1,250.98	1,167.37	93.22
Coffee	115.00	41.78	36.33
Pepper	3.30	1.41	42.73
Total	3,666.49	3,359.67	91.63

Notes:

- Implemented area during 1994 – 96 was 3.36 mln. rai out of 3.67 mln. rai targeted (92%), which is equal to only 1.9% of the agricultural area of Thailand

Table 8.5: Alternatives during 1994 – 1996

Alternatives **(total area: 3.36 million rai implemented)**	%
Integrated farm	39.91
Fruit trees	22.69
Vegetables/flowers	7.85
Economic trees	0.48
Fast growing trees	20.10
Dairy/beef cattle	8.97
Total	100.00

Table 8.6: Budget overview, 1994 - 1996

Items	Target (mln. Bt.)	Spent (mln. Bt.)	%
Inputs	7,865	7,432	94.49
Compensation for interest and credit administration	2,034	966.42	47.51
Farm ponds	2,500	2,358.00	94.32
Credit	16,730	9,453.00	56.50
Total	29,129.28	20,209.42	69.38

Table 8.7: Target achievements, 1994-1996

Crops	Target achievements by year (%)							
	1994		1995		1996		1994-1996	
	No. of farmers	Areas	No. of farmers	Areas	No. of farmers	Areas	No. of farmers	Areas
Rice	70.10	47.42	83.20	54.94	76.40	58.41	73.70	54.57
Cassava	84.60	66.87	84.80	70.28	82.50	72.12	83.50	68.85
Total	78.64	58.12	83.52	66.55	77.81	59.58	79.83	61.75

Table 8.8: Selected indicators of performance

Three-year overview on "continuing diversifiers" after three years: Farmers who had received a loan, continuing in diversification: 74.54% Farmers who had received input supplies (but no credit), continuing: 55.02%
Performance assessment of alternative farm enterprises after 3 years : Good = 43.60%, fair = 37.0%, poor = 18.80%
Farmers' opinions on the returns from diversification: 70% = good, 21% = mediocre, while 10% = lower than under the traditional system
About 92% of farmers were confident about being able to pay back their loan. This is consistent with the BAAC report of September 1998 that 90% of farmers had met their repayments to date (they have a 15 year period to pay with a fixed amount each year)
Net income from alternatives reported to be 534 Baht/rai higher than in the existing system. So farmers had about 4,600 Baht per farm, more than in the existing system

- **Key issues and problems**

1. It is a new project. It needs co-operation from many agencies, which will require a long time until full understanding between agencies is achieved. Therefore, the implementation of farm plans was delayed (e.g. at the end of the rainy season).
2. After three years, the project had achieved 80% of the target set in terms of farmers and 62% in terms of area. However, the report does not say how many farmers withdrew from the project, mainly because of natural disasters like lack of water and flooding.
3. Information about the project was disseminated among the farmers by many agencies without any co-ordination (especially in 1997, when the economy crashed). This made farmers confused about the project, leading to misunderstandings. Although the situation was better in 1998, public relations still emphasized low interest rates of credit with long term repayment, rather than other benefits from diversification.
4. A comparison between farmers who received credit support and those who received only input supplies shows that the former group remained with the project to a larger degree than the latter. This is an indication of the importance of the credit support.
5. It is necessary to provide technical support to farmers who still continued to diversify.
6. Income generation from integrated farms gives a better distribution than the existing system. A core objective of diversification is to provide regular incomes and production for home consumption (e.g. vegetables, fish).
7. Reasons for stopping diversification: Flooding together with no additional capital for rehabilitation; farmers themselves not really committed to diversification; lack of experience and no commercial skills.

- **Recommendations for improvement**

1. Better preparation and advice about fruit tree cultivation (especially maintenance) and marketing channels for fruit.
2. Other agencies which have expertise in production and marketing of alternatives should be recruited to participate in the proposed phase II of the project.
3. Recruitment of farmers should be done more carefully; only active and willing farmers should be recruited. They should have some knowledge of marketing and should not be too far from the extension office so that they can go for regular advice.

8.2 The "Lessons Learnt" from the Pilot Phase of the Diversification Programme

Turning from the official evaluation reports of the pilot phase, to the findings of this research, this section is structured into several subsections, covering the main phases of project design and implementation. The purpose of this section is to derive the "lessons learnt", or perhaps more aptly, the "lessons to be learnt" – because the government did not seem to integrate those lessons from the pilot phase into the implementation of the full-scale programme. The previous section which summarized the three official evaluation studies available has already confirmed that there are more lessons to be learnt.

8.2.1 Project Formulation

Project formulation and planning took place at three levels, national, then provincial, and local, where the planning function was limited to the immediate preparation of project implementation, and the implementation process itself.

- **Planning at the national level**

With reference to the project documents presented in Chapter III, the policy of crop diversification in the Chao Praya River Basin was formulated by the DOAE , which has a major role in improving villagers' livelihoods under the agricultural development and extension programme. The project was formulated as a response to the major problems of insufficiency of water resource allocation in the area and the low price of rice, aiming simultaneously to boost income and lower water demand by encouraging the cultivation of orchard crops in place of rice.

The DOAE expected that the project would encourage farmers to modify small pieces of their land from rice to orchard. However, the DOAE realized that the investment needed for land modification was considerable and a major constraint for capital-poor farmers. Therefore, the DOAE arranged for credit with a low interest rate to be provided to the farmers who joined the project and who asked for such credit support. However, the credit operation was arranged to be supplied through the BAAC which has its branches down to the sub-district level all over the country.

One part of the budget was reserved for the administration and operation costs of the DOAE while another portion was allocated to fund the extension of credit to farmers who wanted to diversify under this project. The target areas were calculated based on total amount available, and on farm budgets which were estimated for the orchard base. The target areas of each province were set particularly in accordance with land suitability and water resource factors. On this basis, budgets for credit disbursement were allocated to the provincial branches of the BAAC. This process was clearly a top-down approach to planning and implementation.

Recognizing the labour constraints of many farmers, the DOAE estimated that about 3 – 5 rai per farm would be an appropriate size for diversification. This figure was used to calculate the farm budget for diversification and guided the BAAC in calculating the amount of credit necessary to support farmers in this project. A low interest rate (5% per annum) was used as an incentive for the farmers who wanted to diversify.

- **Planning and implementation at the provincial level**

At this level, the provincial agricultural offices were informed about the project together with the target areas as designated from above. It was their duty to encourage the farmers to join the project in order to achieve the targets. The form of diversification, credit available and target areas were raised in meetings with the district agricultural officers. After checking the potential areas for diversification of each district, rough figures for target areas were distributed to districts accordingly. This information was also transmitted to the BAAC, so they could prepare the credit and arrange for it to be transferred to the district branches.

- **Implementation at the local level**

Each district agricultural officer organized a meeting with the tambol (sub-district) extension officers who work at the farm level, with a view to identifying the potential project areas and farmers. These tambol extension officers were given the task of encouraging farmers to

diversify. They held meetings with farmers, explaining the project objectives, outlining the benefits that farmers might receive, and setting out the conditions for receiving the credit, repayment rates and so on. When any wanted to join the project, they had to work on a farm plan together with the tambol extension officer(s). This consisted of proposed area for diversification and its location, types of activities, (i.e. types of fruit trees, vegetables or fish required) together with proposed farm budget, requested as credit. Total land use area and the tenurial status of land holdings together with the amount of family labour were also identified in the farm plan.

This information and proposals were screened at the district level. Farmers who met the requirements of the BAAC and who were considered to have enough labour were eligible for recruitment. They were then investigated by the BAAC officers. The farmers could start to develop the orchard plot after final approval for the credit.

The detailed planning and implementation at the local level did include bottom-up elements, combined with a top-down format for planning.

8.2.2 Overview of the Situation in the Study Areas Prior to Project Launch

The existing situation of the farmers in the six selected provinces was described in Chapter V. This is based on information derived from the structured survey, conducted after the project had been implemented for about half a year. The analysis compared project and non-project groups. These surveys included household structure, education, land tenure and holdings, farming systems and practices, sources of income, marketing systems, and various agricultural and non-agricultural problems and constraints. The analysis showed that both groups in the same areas had similar household structures, land holdings, income sources and faced the same problems, mainly the low price of farm products and insufficient water supplies for farming in the dry season. Exceptions to the general picture of the difference between project and non-project groups were the cases of Lopburi and Ayuthaya where the tenancy rate of the project group was higher than that of the non-project group. Normally there is a high percentage of tenant farmers in these two provinces. But some of them had been assisted to own land through the implementation of the Agricultural Land Reform Programme.

In terms of income, the analysis showed that household income of the respondents was higher than average household income in the regions, and this applied to both on-farm and off-farm sources. Among these six provinces, farmers in Ayuthaya earned the highest farm income, because they are situated in the conservation irrigation system, which is never short of water. Not only did households in this province benefit from high income from the farm sector, the

people here also earned significant amounts from the industrial sector due to the factories located nearby, recruiting unskilled labour locally. This is similar to Lopburi where there is a large Japanese factory located in the area, contributing to a buoyancy of income from off-farm sources. Moreover, the cottage industries such as gem cutting, cloth weaving and bonsai growing also contributed to the comparatively high incomes of household in this province. Development of the industrial sector, however is more concentrated in the central region than any other part of the country. Therefore the off-farm income of respondents in the four provinces in the central plain was higher than in the two provinces in the central north (Phitsanulok and Kampaengphet).

Although off-farm income contributed significantly to household income, the largest share was still from on-farm sources, especially rice, due to the presence of irrigation facilities in the project areas. Despite some areas of land being modified to becoming orchard plots under the project, the major land use and cropping systems of the farmers in both groups were still similar and dominated by rice. Moreover, orchards were not new in the areas. Some farmers had already modified their land into orchards without project support. In general, about 80% of the total area was under paddy. It was found that the paddy area of the non-project group was only 7% larger than the project group, while the orchard area of the former was about 12% smaller than the latter (compared to the total land use of both groups). This discrepancy created a large difference in farm income between the two groups due to the heavy investment in the orchards in the first year of cultivation. The exception to this case was in Supanburi where a number of farmers in the non-project group also grew fruit trees and had a similar heavy investment as the project group.

The farmers of the project group got almost no return from their orchard investment in the first year. This was similar to the non-project group, because many of those who grew fruit trees did not start much earlier. The exception was again in the non-project group in Supanburi who earned the highest income from fruit trees due to the relatively larger number of diversifiers in earlier years. However, the farmers in this province grew more varieties of crops, such as flowers and sugar cane. These also generated significant income.

The income from supplementary crops of vegetables was significant in some places. Its value in the first two years in Angthong and Ayuthaya provinces was sufficient to cover the initial cost of creating the orchard. Although this was not the case in Supanburi, earnings from flowers in this province were also sufficient to cover the initial cost of the orchard in the first two years. This was different in Lopburi and Kampaengphet. Respondents in the former province did not have the necessary skills for vegetable growing (an important source of supplementary income

during the early years of fruit tree establishment) while vegetables could not be grown in the latter province due to high temperatures and low moisture.

In general, the low price of agro-commodities, especially rice as the main crop, and insufficient water for farming, in the dry season, were identified as major problems. The respondents realized that it was beyond their ability to solve these problems. Thus they requested intervention from the government to support higher prices of agro-commodities and improvements to irrigation facilities and management.

8.2.3 Analysis of Case Studies

Carefully selected cases of farmers from both the project and non-project groups were drawn to analyze the effects of diversification in detail. Since the main reason for diversifying is to minimize the effect of the low and fluctuating price of rice, the farmers expected to earn higher income from the orchards, with better distribution through the year at the same time. However, some farmers began to diversify before the project started. They learned from the success of others, usually their neighbours, then adopted and invested on their own.

As fruit trees are the main component of diversification, partial analysis of costs and returns of fruit trees was compared to rice in the same area in order to show the difference between these two crops. Then whole farm analysis was undertaken. It was found that returns from fruit trees in the first few years were low while the initial and operating costs were high, especially investment for land modification and seedlings in the first year. Although returns from the supplementary crop of vegetables was sufficient to cover this cost in the first two years in some cases, vegetables could not be grown in the third year due to growth of the fruit trees. Although fruit trees started to yield in year 4 and gave a higher return than rice, their accumulated benefits were still lower than the marginal income from rice over this period. This is the most critical period for diversification. The farmers still need income from other sources to bridge the gap while they are waiting for the fruit trees to mature in year 4.

Having converted their whole holdings, two small-scale farmers (Mr. Musor and Mr. Salitra who owned 6 and 9.5 rai of land respectively) continued to rent a piece of land for paddy cultivation during this initial period. They stopped renting later when the fruit trees had matured. This was due to two main reasons. One was the higher labour requirement for maintenance of fruit trees and the other was the growing income from selling fruit. This allowed these two farmers to withdraw from renting after year 2 and 3 and cultivate their own land only.

The larger land holding of Mr. Prasert (who owned 20 rai of land) in Angthong kept him busy with vegetable growing in the first two years of diversification. He was satisfied with the income generated from the combination of vegetables, rice and fruit during these initial years. For him, the advantage of labour utilization for vegetables growing and more intensive work for fruit trees especially from year 3 onwards led him to concentrate on farm work. While Mr. Musor and Mr. Salitra could withdraw from renting, Mr. Prasert no longer needed to search for off-farm work as he had done in the past.

The case of Mr. Thonglor in Ayuthaya illustrated how much farmers have to learn to cope with the requirements of growing fruit trees. He had started to diversify his first plot seven years before the project started. He grew particular varieties of mango (Kiew Savoey) which were in demand. He found that this variety of mango is not easy to cultivate. Many farmers tried to treat them with hormones to induce off-season fruiting thus gaining from the higher prices, but found that the use of such treatment was very costly, and not commensurate with the yield. The accumulated benefits of this plot in these seven years were less than the marginal income from rice over the same period. Learning from this experience, Mr. Thonglor decided to give up on the "Kiew Saveoy" mango and requested credit from the project to improve his fruit trees by growing other varieties which have a sustainable market without sophisticated treatment. After this learning experience, he was confident that he would be able to earn more in the future.

8.2.4 Farmers' Decision-Making as Determined by Farm Resource Patterns

Most of the respondents (both the project and non-project farmers) regarded the project positively and believed that it would facilitate the farmer who diversified to earn a higher income than from rice. However some farmers did not want to diversify even though it seemed a good means to improve their economic situation, through avoiding the low and fluctuating price of rice and having access to subsidised credit support.

For agricultural development and planning, it is important to know the factors influencing the decision-making of farmers in solving their problems, especially by adopting the solutions offered by the project. To this end, further analysis was carried out in Chapter VII on a number of independent factors which might be important in influencing farmers' decisions:

- Demographic variables consisting of age and education;
- Land variables consisting of land holding size and land tenure; and
- Labour variables consisting of labour force and labour structure (occupational patterns among household members).

In order to understand why some farmers did not embrace the project while others did and some diversified by themselves without support from the project, the respondents were categorized into three different groups that were called "self-support group", "project-support group", and "non-diversifying group".

- From the statistical analysis, it was found that there was no significant difference in the demographic variables of age and education among the three groups of farmers.
- There was no difference in land holding size among these three groups, but there is a significant difference in land tenure patterns.
- Although labour force (working members per household) and labour structure are related, the former turned out to be non-significant, while the latter was significant. The explanation is that non-diversifying farmers had already taken on more non-farm work than the other two groups, in order to compensate for their resource constraints in land and capital.

The statistical tests confirmed the existence of three principally different groups of farm households who are constrained to different degrees, with regard to the basic resources of land, capital, and labour. The analysis showed that the combination of high tenancy rates and the influence of off-farm work are the major constraints inhibiting diversification and uptake of this project. The non-diversifying group found that the existing system (i.e. mainly rice cultivation supplemented by off-farm work in the slack season) suited their situation. There was thus no need to diversify, even though there was capital support from the project.

This led to the conclusion that the farmers' decision-making relies on perceived needs in combination with resource management ability. Farmers have their own way to solve problems and alleviate constraints according to their needs and objectives. Diversification in agriculture is just one alternative in a range of possibilities from which farmers can choose. On the one hand, farmers can opt for diversification if they are able (or enabled by the government support system) to manage it. This is the case of farmers in the self-support and project-support groups. They have land available for modification together with sufficient labour to allocate to farm work. But on the other hand, not everybody can meet the demands of diversification. The case of the non-diversifying group showed that since their existing activities already generated sufficient income and, since they were able to manage their limited farm resources without any difficulties, there was no need for them to diversify.

8.2.5 Influences of the Two Main Exogenous Factors

Although the endogenous resources of land, labour and capital can be managed effectively, the analyses showed that the farmers have little or no control over exogenous factors, associated with the regional, national or international contexts. Availability of water, price and marketing of farm products, mainly of rice, were identified as major problems followed by pest damage and insufficient capital respectively. Although capital is classified as an endogenous resource, it is always a constraint for small-scale farmers. They often have little left for the next crop season. So meeting the problem of insufficient capital through credit support in this case is viewed as an important complementary exogenous resource. It can be in the form of grant or credit support either from formal or informal sources.

The major problems identified were linked to marketing and water resources. However the seriousness of problems was identified differently during the two years of the field survey. With low rainfall in crop year 1993/1994, insufficiency of water was identified as a serious problem by a half of total respondents in 1994. But in 1995 only by a quarter did so, because of much higher rainfall in that year. This is the opposite to marketing problems. The low price of farm products was identified by about a half of respondents in 1994 while the proportion was slightly larger in 1995 (about 60% of them). This was associated with the higher cost of farm inputs in that year. So in both cases, the farmers' perceptions of problems reflected the changing conditions of the wider physical and economic environment.

These two major problems not only vary from year to year, but also from place to place. This is an effect of the local patterns of physical geography. Farmers who had access to better irrigation facilities considered that the low price of rice was more serious than insufficient water, while farmers with access to poorer irrigation facilities had the opposite view. This was reflected in the comments of respondents in the study areas. Farmers in the two provinces of Ayuthaya and Phitsanulok considered that the problem of rice price was more serious than water because they get water anyway. This is because the former province is situated within the conservation irrigation area while the latter is in the land consolidation area of the Chao Phraya phase II project. From a geograpical point of view, farmers in Kampaengphet who relied on the gravity feed irrigation system from the Ping River would seem to face greater problems, but it was not so serious as they had access to wells. The farmers who faced this problem most seriously were in Lopburi and Angthong. They are at a higher elevation than Ayuthaya, and receive water supply in the dry season on a rotation basis. Moreover, there was no irrigation water supplied in the drought year of 1993. However, this condition allowed them to grow photo sensitive rice which gave a higher price than the non-photo sensitive varieties grown in other provinces. So, water is a more serious problem than rice price in Lopburi and Angthong.

These two external factors, are highly influential in the agricultural environment of the country. Most farm products, including rice, rely on the world market. This means that farmers have faced long term and serious problems of price fluctuation (as shown in Figure 1.2). Despite many periods of intervention by the government, these attempts have been unsuccessful in stabilizing prices (as shown in Chapter VI and Annex I.6.1).

Water is one of the most critical inputs for wet rice agriculture especially in the dry season. Since the main water supply is from seasonal rainfall, the strategy of the government has been to try and capture water by means of constructing dams, reservoirs and other similar facilities. The two large Bhumibol and Sirikit storage dams were constructed to supply water for use in the central plains. However, as the decision by the Royal Irrigation Department in 1994 showed, water resources are limited, and competition for water is high. So in the long run, the share of water for agriculture is likely to be constrained by the increasing demand from the urban and industrial sectors.

8.3 The Results of the Follow-up Surveys, 1999

By diversifying, farmers embrace different and new farm practices due to the different enterprises chosen. Fruit trees especially require much more intensive care and knowledge than rice, and their cultivation is something the farmers have never practiced before. Therefore, it is not difficult to understand why some farmers hesitated to continue with diversification, and some of them even reverted back to rice. The main reason for this is that only one year after the diversification policy had been implemented, the underlying problem facing rice cultivation changed for the better, as prices increased and there were no water shortages.

The advantage of an extended time period of study was that the original survey groups that had been studied during the first two years of project implementation could be revisited over a much longer period of time, when the conditions had changed. This had already been reported in Chapter IV, which included observations up to the group discussions in 1997. However, some focus group discussions and observations were conducted as late as the end of 1999, more than five years after the first survey in the central region provinces.

A meeting with a focus group of six to nine farmers was organized at every site of the study areas in late 1999. Emphasis was on checking the situation after 4 – 5 years of implementation before completing the last chapters of this study. The group discussions were arranged with some of the farmers who had joined the project at the beginning and it was found that while many farmers continued with fruit tree cultivation, there were also a significant number who had reverted back to rice. Reverting back to rice implied digging up the fruit trees and

converting the land back to paddy, which is a very significant change, given the considerable initial investment associated with land modification.

Although the change back to rice was a rather drastic measure, it was not very surprising in the light of the analysis of farmers' decision-making in response to external factors and constraints (as discussed above). Unfortunately, however, it was not possible to quantify in any way how the farmers in the three groups in each of the study areas had decided and performed over time. The reasons for this are simple – it would have been far too time-consuming to trace all those farmers who had been interviewed five years earlier, and the local extension officers had no interest in supporting such a search. Moreover, some of them were even afraid to face the farmers who had given up on diversification, although they still had to re-pay the loans they had taken. Farmers felt that the extension officers had given them the wrong advice, and they had embarked on an expensive – and ultimately disappointing – adventure.

So it is a matter of conjecture, rather than quantitative analysis, if it is stated here that across the three analysed groups, and across the localities, a considerable number of farmers had given up on diversification, while many still continued with their diversified crops. The most important point here is that the mixture is found even at the sub-district and village levels. Even without the possibility of quantifying exactly how many farmers had been doing what over the past six years or so, it became clear that the mix of farmers deciding in different ways was found even at the village level, due to local differences in technologies used. This is also a response to the specific conditions of each farm household, especially variations in farm size, land quality, availability of capital and labour, and family conditions.

One might even go further in interpreting the follow-up discussions with the focus groups. The group discussions revealed a pattern of segregation of strong and adaptive full-time farmers and weaker part-time farmers, including those who might leave agriculture altogether as soon as the non-farm opportunities permit them to do this (see Section 8.3.4 below).

Table 8.9 provides a summary of the longer-term trends that emerged from the focus-group discussions.

Table 8.9: The conditions after five to six years of programme implementation

1. Self-support group 70 farmers initially	2. Project-support group 157 adopters initially	3. Non-diversifiers 83 farmers initially
After 1997: Some farmers had stopped growing fruit trees and converted some of their land back to rice	After 1997: Many farmers in this group stopped growing fruit trees, and several of them converted the land back to rice	After 1997: Some farmers may have gone for some farm restructuring, and some may have left farming altogether

Note: No detailed figures are available to confirm such conjectures after the focus group interviews of 1999, as there has not been any systematic monitoring of the three groups by the DOAE.

8.3.1 Stopping the Diversification Experiment and Reverting back to Rice

Reasons for stopping the diversification and reverting back to rice are associated not only with the market incentive for rice, but also with the different nature of rice and fruit trees. After experimentation, farmers found that fruit tree cultivation is not easy and very different than their familiar crop of rice. Moreover, the development of farm machinery for rice is playing an important role too. It is well known that the labour input per rai of rice in the central region has continuously decreased, as activities such as land preparation, spraying for pest control and harvesting have been mechanized. (In this respect, refer to the interesting new research results based on empirical work in Supanburi, by Somporn and Hossain, 2000.) In comparison, maintenance of fruit trees requires attention throughout the year, and offers only limited scope for mechanization. So, it is not surprising that some people stopped diversification and reverted back to rice. The major reasons for this particular decision, summarized from the focus group surveys in 1997 – 1999, are presented as follows:

1. **Farmers responded to the high price of rice and sufficient water** in the years after 1996, especially in comparison with the conditions during the years when the project was launched (refer to Boxes 1.1 and 1.2)
2. **Low price of fruit:** Prices of orchard products dropped from 1997 on. The farmers thought that this was not only because of over-production during the years after diversification had started, but also because of the effects of the economic crisis, which made people spend less on fruit.
3. **Flooding:** As a so-called "fifty-year event", the exceptionally bad flooding in the lower central region in August 1995 was unexpected. It damaged some parts of the diversified areas. This affected one whole tambol of every province in the study areas. They were Bangpung in Lopburi, Lardbualuang in Ayuthaya, Paiwong in Angthong, Ban Sra in Supanburi, Ban Rai in Phitsanulok and Thaputsra in Kampaengphet. As a result of the

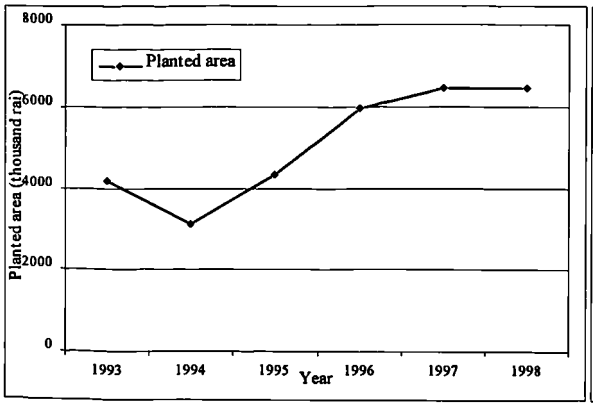
flooding, most farmers in these tambols reverted back to rice, a crop that can adjust rather well to flood conditions.

4. **Not obtaining the right variety and quality of mango stocks:** A number of farmers thought that stocks of seedlings provided by the extension officers were of poor quality and some of them did not get what they had requested. Therefore some of them had to buy new seedlings in addition. For example, the farmers in Tambol Tha Makhua of Kampaengpet said that they had requested sweet mango because the fruits can be sold at a good price, but they were supplied sour mango which can not be sold.
5. **Wrong advice given by extension officers:** Some farmers blamed the extension officers for giving them the wrong recommendations, leaving them in debt.
6. **Difficulties with growing Kiew Savoey mangos:** Farmers found that one variety of mango (Kiew Savoey), which most farmers had asked for, was not easy to cultivate. This variety obtains a good price at market, but it is hard to produce the fruit. Moreover this variety requires hormone treatment for production. The hormone treatment was not only costly, but also requires considerable skill to apply effectively. This made some farmers hesitate whether they should keep this variety, or cut the trees down and change to other crops, or revert back to paddy.
7. **Labour constraints:** Many farmers found that they could not cope with the problem of the intensive care required in orchard cultivation. It was not so much with regard to insufficient labour, but rather that fruit trees require different skills than rice. Even though the economic crisis would have freed up some urban labour, that was not the kind of skilled labour needed in the orchards. This constraint made some farmers who even wanted to continue with their orchards revert back to rice.
8. **No more intercropping:** There was no more inter-cropping in the orchard plots as the growing trees covered the space. Vegetables and flowers could be grown in between the maturing fruit trees for only 2 years.
9. **Comparative economic advantage of growing rice again:** The low price of orchard products, in conjunction with the good price of rice and sufficient supply of water in the dry season, made the farmers recalculate the opportunity cost of orchards. Some thought that they could gain more if they grew rice.
10. **Sugar cane as an attractive crop:** Some farmers converted to sugar cane rather than rice, mostly in early 1997. For them, sugar cane had become a good additional alternative to orchards. So it was not only the rice price that had become attractive again, but also the relatively shorter time required from planting to obtaining a return from sugar cane, rather than orchards. This crop has to be replanted every three years and does not require as much water as rice. Some farmers even changed back to rice when this option once more became more profitable than sugar cane.

The rise in rice prices and fall in fruit prices are associated with the economic crisis which can be dated from mid-1997. The peak rice price was reached in early 1998, at the same time as the highest devaluation of the Thai Baht. This made the rice price about 6,000 Baht/ton at that time. In fact it was not very high when compared to the exchange rate (the exchange rate fell to 52 Bt. for $US 1 at that time, compared to 26 Bt. against $US 1 in the first five months of 1997). But the windfall profit from the favourable exchange rate was strongly felt by the farmers, in comparison with the price of 2,300 – 2,600 Baht/ton they had got in 1993 – 1994. Farmers also felt that people consumed less fruit than before the economic crisis and this lowered the fruit price.

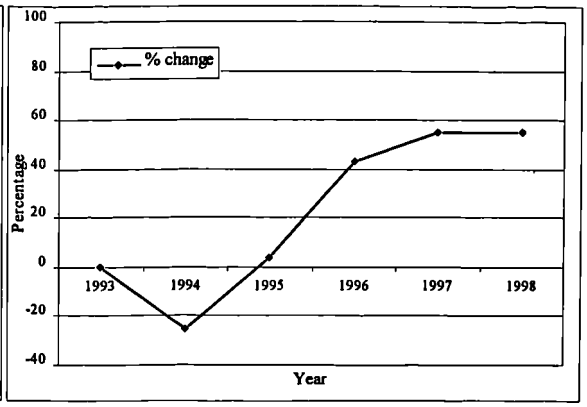
These two factors together with the better water situation therefore encouraged farmers to grow second rice again. Statistics from the OAE show that after the planted areas of second rice dropped by about 25% in 1994 (based on 1993, the year that the pilot project started), the expansion was remarkably high thereafter. This made the accumulated expansion rate from 1993 to 1998 about 55% and the planted area in 1998 more than double that in 1994 (Figures 8.1 and 8.2).

Figure 8.1 Planted Area of Second Rice during 1993 – 1998 (rai)



Source: Office of Agricultural Economics

Figure 8.2 Changing Rate of Second Rice during 1993 – 1998 (%)



Source: Office of Agricultural Economics

8.3.2 Learning from Experience: Continuing with Fruit Tree Cultivation

While many farmers gave up on diversification, others continued and learned from experience. The reasons why some farmers still kept fruit trees, summarizing points derived from the group focus surveys in 1997 – 1999, are presented as follows:

1. **Good yields from mature fruit trees:** Many farmers still preferred to keep their orchards. They felt they were earning more from inter-cropping plus orchard than from rice alone. They could also expect a better distribution of income due to a longer time frame during

each fruiting season and being able to harvest several times a year. Since the orchards started to yield in year 3, farmers waited for full production from year 4 onward. These farmers felt that having orchards was more secure than rice, with its fluctuating price.

2. **More stable profits from fruit trees:** Some of them noticed that income distribution from fruit is better and more frequent than from rice. Rice production is varied from single, double or 5 cycles in 2 years duration, depending on the water situation. The return from each cycle of rice came only once after harvesting. This is different from the fruit trees which yield 3 – 4 times a year or even all year round. Furthermore, each harvest is spread over a longer period, enabling a longer time to sell. Farmers can sell either everyday or every other day over 1 – 3 weeks with the peak in the middle. Although earnings from rice with the present price seemed to be high, some noticed that a large proportion went to the landlords or to merchants from whom farmers received credits in kind at the beginning of the cultivation season. Once they received money from the sale, they had to pay back to various merchants for fertilizer, pesticide, rice-mill business and even for their pleasure (e.g. drinking, social hospitality). So, most of the money just passed through farmers' hands. This was different from the return from fruit which generated smaller amounts of profit per time, with better distribution over the year. Moreover, with a small plot operation, they did not need credits in kind as for rice.
3. **By-products from orchards:** After complaining about dropping prices for orchard products, some farmers felt that it is worth while having an orchard, because they could also harvest the by-products for home consumption, such as vegetables and fish. Moreover, there is less risk earning on income from several products than being dependent on rice only.
4. **Adapting to more profitable fruit-tree varieties:** Many farmers did not worry much about difficulties with the Kiew Savoey variety of mango. Some of them cut the top and changed the scion by either budding or grafting other varieties such as Chok Anand or Nam Dokmai which are easier to reproduce. Some other farmers changed the stocks to other types of fruit trees such as rose apple, coconut, jack fruit and so on. These farmers still had a positive opinion regarding diversification. They also argued that they earned more from diversification than rice, on the same size of land.
5. **Less water consumed:** The farmers observed that orchards consumed less water than rice. Moreover, the orchard canopy helped to maintain proper soil moisture. Therefore they believed that in the long term, orchards consumed only half the amount of water consumed by rice over an equivalent area. This made them not too worried about water shortages in the dry season.
6. **Local differences in access to water:** Despite better water supply in the dry season from 1994 onwards, some farmers did not have good access to water especially those who were far from irrigation canals or a bit higher in terms of topography. This situation can be found in the same village where some farmers have good access to irrigation canals, and others

not. They felt it safer to maintain their orchards, while limiting rice cultivation especially in a rather dry year such as 1998/99.

The results of the group discussions showed that the farmers could find solutions suited to their circumstances. They did not make their decisions based only on maximizing economic achievement in the short-term, but on a weighted assessment of available farm resources and their management and the influence of external factors. The mix of practices and the different farmers' opinions at the micro level refer to their specific situation. This requires a more participatory approach for project planing and implementation. So the focus survey confirmed the need for a more participatory approach to agricultural extension, and a careful analysis of alternative farm plans.

8.3.3 Generalizing from the Surveys: "Continuing Diversifiers" and "Drop-Outs"

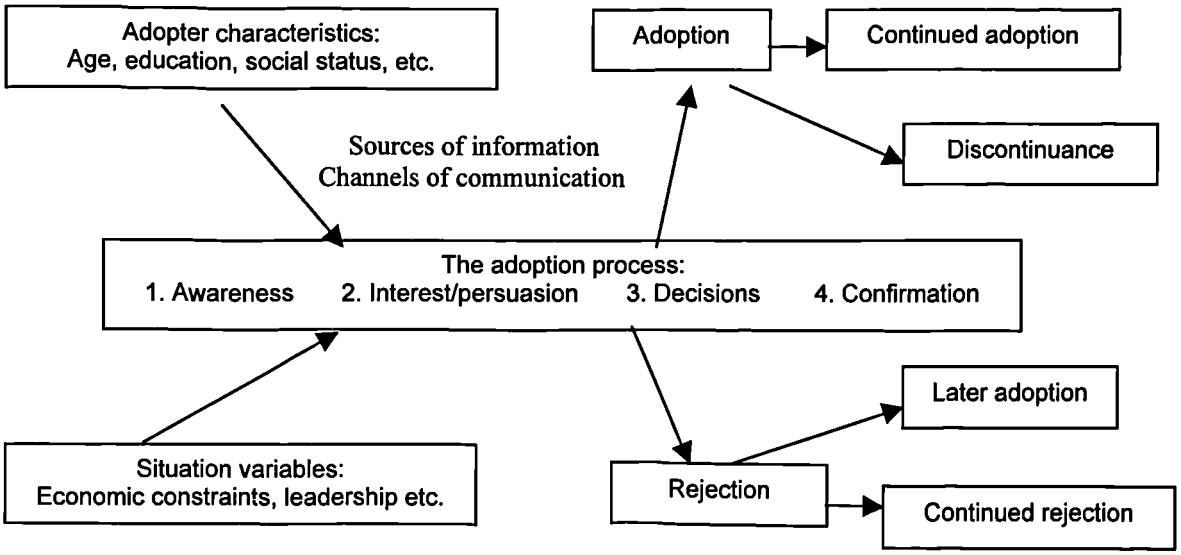
Further to the summary in Table 8.9 and the details in the sections above, it may be possible to generalize on the differences between the diversifiers who continued and those who gave up after several years of experimenting with diversification. Their characteristics have been compiled in Table 8.10. For this summary, the short terms of "continuing diversifiers" and "drop-outs" are used for these new groups, to emphasize the observed longer-term developments among the two groups of diversifiers analysed previously (self-support and project-support groups).

Underlying this distinction between continuing diversifiers and drop-outs is a free interpretation of the theory of the adoption of innovations in agriculture, such as mechanization, or diversification. The theory essentially states that the process of adoption takes place in typical stages over time, which may be plotted as an S-curve for the cumulative numbers of adopters over time, or as a bell-shaped curve for the numbers of adopters in each time segment. Expressed in simple terms, the process is not linear. So innovations are adopted by relatively few "early adopters" at the beginning, while during the next period, there is a rather large number constituting the "majority", and finally, there are relatively few "late adopters", until the total number of adopters is reached. This also implies that there are also some farmers who never adopt innovations, but their number is supposed to be relatively small. Figures 8.3 and 8.4 illustrate the concept (based on Lionberger, 1960, Rogers, 1962, and Hough, 1975).

Table 8.10: Differences between "continuing diversifiers" and "drop-outs"

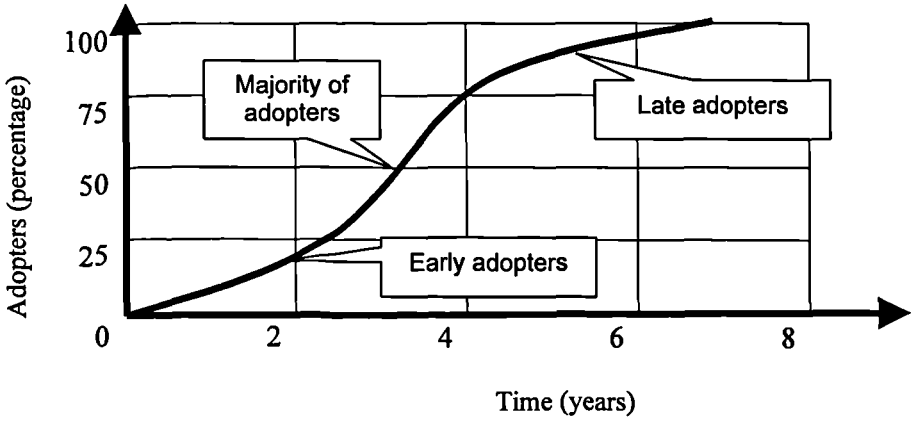
Factors	Farmers who continued with diversification	Farmers who reverted back to rice since 1997
Topography and water resources	The diversified plots are mainly taken from areas which do not have access to good irrigation every year. Thus these plots can not grow second rice in poor years while this is not the case with orchards.	Some farmers owned low land. Their diversified plots were damaged by flooding in 1995 and 1996 (although these plots had not been flooded for more than 30 – 40 years). This made them feel that rice is the most appropriate crop in these areas.
Price	Although not yet reaching their full production potential, and with the price of rice high again, farmers still felt that this was compensated by income generated from inter-cropping and the better income distribution from fruit.	Rice price was high during 1996 – 1998. Together with sufficient water, and the low price of fruit following the economic crisis, especially 1998 – 1999, this stimulated farmers to revert back to rice.
Labour use	Intensive work in orchards requires more labour; so only those farmers who already have (or can develop) the appropriate labour resources can undertake it.	Even with limited labour resources, rice cultivation can still continue. Hired labour and farm machinery are available at affordable prices.
Expertise	Although they do not have much expertise in growing orchards, they learned and adapted quickly.	These farmers have no expertise in orchards, and are unwilling to experiment further.
Kiew Savoey variety	Kiew Savoey price is always high. This encouraged most farmers to cultivate this variety. However they never fully recognized that it requires sophisticated treatment with costly inputs. After being unsuccessful, some farmers diversified further, with better success.	Faced with the same difficulty as the farmers who continue with diversification, these farmers reverted back to rice.

Figure 8.3: The conceptual framework of the adoption of innovations



Source: Compiled on the basis of Rogers (1962) and Hough (1975)

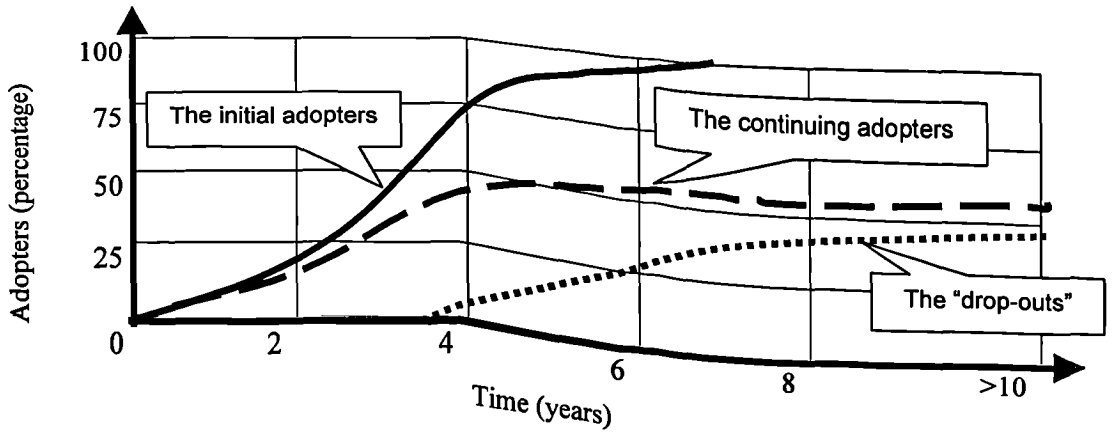
Figure 8.4: The S-curve of the cumulative rate of adoption over time



Note: This shows rough percentages of adopters only, not all farmers.
Source: Based on Lionberger (1960)

The S-curve as a conceptual pattern implies an adoption or absorption process over time, in a way implying that the innovations offered and adopted are better than the technology used before that innovation. The conceptual adoption curve does not show those farmers who adopt and abandon an innovation, after some time of unsuccessful experimentation. While there are no statistics available on the "drop-outs" of the diversification programme, they would probably add up to a considerable number. Therefore, the S-curve diagram would have to be modified as shown in Figure 8.5, in order to depict the complete process of adoption of an innovation in the case of the diversification programme, making a distinction between permanent innovators and temporary ones. The focus-group surveys in 1997-1999 provided enough qualitative evidence to say that most probably, the longer-term effects of the diversification programme resemble the diagram in Figure 8.5, where there is a second curve for the drop-outs, and a third curve for the final adoption rate. So the resulting "learning curve" is a relatively flat one, showing a much slower adoption rate than the one which is suggested by the theoretical model suggested by Figure 8.4. This view becomes even more convincing if it is combined with the fact that agricultural employment in Thailand is decreasing over time, an aspect to be discussed in the next section.

Figure 8.5: Adapting the theoretical concept to the actual experience with the diversification programme: Initial adoption of innovations, discontinuance after experimentation, and resulting final rate of adoption



Note: The percentages and the time frame suggested by this conceptual diagram are indicative and not based on any statistical figures

8.3.4 Patterns of Changing and Decreasing Agricultural Employment in Thailand

The differences among the three groups of farmers, and their expected future behaviour, may be related to the patterns of ability and behaviour among the various types of farmers in the whole country. As pointed out in the discussion of rural development in Chapters II and III, the official statistics on the agricultural labour force are based on a particular definition of farming as a main job, or secondary job, as far as time spent on the job is concerned, and in terms of income derived from farming and other economic activities. The statistical agricultural labour force includes very different types of farmers, ranging from full-time to half-time and part-time patterns that are not further distinguished in the statistics.

So the current size of the agricultural labour force, of about 50% of total employment, includes those millions of farmers who may still plant and harvest rice or cassava in the home villages where they are registered, while their main income-gaining activities are non-agricultural jobs in industries, in construction or in the service sector, either at home (in those instances where there are industrial jobs in commuting distance), or – more typically - far away from home. The excellent transport facilities and relatively low fares in public transport enable those part-time farmers to commute on a regular basis, between their urban jobs and their home villages. To some extent, this has been the pattern for decades, but it may change in the long term. This change should also be reflected in the national statistics, in the sense that a segregation of full and part-time farmers should be possible so as to reflect the actual socio-economic conditions in the rural areas more adequately than hitherto. Moreover, it is also likely that, as soon as the economic conditions allow this, more and more part-time farmers will leave agriculture for

good, changing to fully urban employment, and eventually selling their land. These trends, which are presently impossible to quantify, have also been stated by Rigg (2001, pp. 117 – 121).

On the other hand, many able and entrepreneurial full-time farmers who are now constrained by limited land resources, are likely to expand and diversify, adding more land to their own land holdings, and mechanizing and specializing more than they have been able to do so far. In between, there would be several other patterns of transition and segregation, and part-time farming is likely to continue for another generation.

The self-support group of farmers in this study may resemble the relatively small group of innovative full-time farmers who are likely to stay in farming. The non-diversifying group may resemble those farmers who can still stay in part-time farming for another decade or two, but most would eventually change to urban employment, while the project-support group would resemble the many possible patterns in between.

The focus-group surveys in 1999 did not provide any statistical material in order to confirm the kind of segregation and transition processes that appear to be taking place in the agricultural labour force in the country. However, the qualitative observations among the various groups of farmers after the initial field surveys can be interpreted in this way, and thus pointed to longer-term trends in employment change.

8.4 Differences Between the Research Study and the Three Official Reports

As described in the previous sections, the three official evaluation reports and this research study differ in many respects. The main differences can be summarized as follows.

8.4.1 Concentration on Pilot Phase vs. Longer-term Perspective

The three official evaluation reports had a time frame of study that was limited to the pilot phase and its implementation during the first 2 – 3 years only. In contrast, the research study has a longer time frame, initially focused on the pilot phase, but then also assessing the medium-term implementation (of some 7 years), aiming at a longer-term perspective beyond the actual evaluation period. While the three reports are limited to field surveys by a single visit, the research study carried out structured field surveys of the first two years and follow-up surveys on the focus groups during 1997 – 1999.

8.4.2 Use of Statistics for Analysis

As pointed out earlier, the use of statistics for analysis in the three evaluation reports was highly aggregate in terms of both target farmers and areas. This makes it impossible to distinguish specific problems associated with project implementation in different areas and among different farmer groups. So the key issue of diverse and specific-locations is missing. In line with this aggregate statistical treatment, the recommendations of the three reports only permits a broad view, which is not a sufficient basis for adjusting the programme implementation to the diverse and specific situations across the country. However, as will be shown below, a national programme of this size and importance, should have been monitored and evaluated in a much more detailed manner.

The picture of diverse and location-specific situations of farmers was more clearly explained by a sharper quantitative as well as more qualitative analysis of disaggregate data, as in the research study. The approach included applications of both quantitative and qualitative analysis. Therefore, the farmers' socio-economic conditions together with other major factors influencing their livelihoods were examined. This covers endogenous and exogenous factors within the specific locations, rather than in general terms only, as in the three official evaluations. This approach also emphasized the importance of understanding the factors in the farmers' own decision-making in response to government policies.

8.4.3 Main Directions of Analysis

The focal point of evaluation of the three reports was the effectiveness of allocating and spending considerable budget resources on the national programme for agricultural restructuring, and the measurement of success was limited to the allocation of credit and repayment by farmers. The characteristics of such an evaluation show that the main emphasis was on the performance of the government-initiated process and the implementation by government agencies, while the three evaluation reports are rather limited in their understanding of the farmers' side. Therefore the success of the project was measured mainly by the credit delivery to farmers (Chula, 1996 and OAE, 1999). Although the KU (1996) report emphasized the social aspect more than the former two studies, especially with regard to implementation at the local level, the process of farmers' decision making was dismissed.

With more emphasis on the farmers' roles, this study pays attention to the policy formulation and implementation in a wider frame, with a more detailed and deeper analysis. This covers all levels of the hierarchy, with the greatest emphasis on the local level, where the interaction between government and farmers mainly take place. As farmers are the target group, their responses are

considered as important evidences in judging the efficiency of the project and its impact on farmers.

This led to different conclusions. The research study does not only aim at process evaluation, as the three official studies, but rather at impact analysis. The degrees of success in the three reports is measured mainly in terms of credit allocation and repayment rates, without sufficient differentiation by area. This study, however, puts much weight on an understanding of the mix of continuing and 'drop-out' farmers at the village level, as a key issue reflecting the interaction between government policy and farmers' actions. This difference between the evaluation approaches was also described by Pretty (1995, p.268): "As long as agricultural policies show one common pattern where technical prescriptions are derived from controlled and uniform settings, and applied widely with little regard for diverse local needs and conditions, these often make the technologies unworkable and unacceptable."

8.5 Critical Points of Past and Future Project Implementation

From the discussion of the differences in approach in evaluating the pilot phase and the subsequent implementation, it is possible to draw conclusions in terms of the most critical points for project implementation. Based on the three official evaluation studies, in combination with the findings of this study, four major aspects appear to be important:

- Despite the rhetoric in government announcements, the diversification programme has been implemented in a highly centralized manner;
- The coordination among the implementing agencies was poor;
- The quality of continued technical assistance by DOAE was not satisfactory; and
- The lack of a properly developed and tested monitoring and evaluation system is felt to be a strong drawback.

These points are elaborated in some more detail, along with possible improvements.

8.5.1 Highly Centralized Manner of Programme Implementation

The centralized implementation style is clearly stated by the Chula (1996) and KU (1996) reports, and this research study also emphasizes this point, but from a different angle. The Chula report strongly supported the strategy of setting target areas from the top because it is argued that in this way clear guidelines could be drawn for tambol extension officers. In contrast, the KU report suggested that target areas should be limited to the rainfed areas, but not including irrigated areas because that is the best land for paddy.

In this regard, the research study views are totally different. Emphasis is put on the farmers who will be recruited rather than on the method of area targeting from the top. Joining the project or not should be a decision of farmers, not one based on decisions taken at higher levels, because farmers have their own ways to solve problems and alleviate constraints according to their needs and objectives. And diversification is just one alternative in a range of possibilities from which they can choose.

The centralized project implementation approach included three critical points (as shown in the evaluation reports, and – to some extent – confirmed by this study):

(a) Complicated procedure of recruiting farmers;
(b) Late delivery of input supplies, which were poor in quality and not consistent with farmers' requirements; and
(c) Some officials got personal profits from purchasing inputs.

Inputs which were under the responsibility of the provincial level offices were subject to long delays in delivery due to complicated procedures. So some inputs were in poor condition when received. This is consistent with the results of the focus survey of this research study. Many farmers stated that saplings were very poor and came late. They also suggested decentralizing budget responsibility, or giving the money to farmers directly (as part of the credit) to buy saplings. In general, farmers thought highly of the project in nearly every respect, except for input supplies, which they ranked as only fair (KU).

This centralized manner also affected the farmers at the implementation stage. The purchasing of material inputs which was carried out at the provincial level caused poor quality and late delivery of the inputs (as stated by the Chula and Kasetsart reports), because of the overcomplicated purchasing procedures in government and the corruption of some officers. Since most inputs supplied by the government were of poor quality, insufficient, or delayed due to the long purchasing procedures of the government, the system should be improved. On the one hand, emphasis should be on better and much earlier preparation in order to deliver inputs in time, and on the other, on providing loans to farmers to buy inputs by themselves. Hence this study agrees with the KU report, which pointed out that the inappropriate project implementation method pushed some tambol extension officers (a) to recruit un-qualified farmers to join the project in order to fulfill their quotas; and (b) to write farm plans without paying attention to farmers' views. Both factors together make the diversification programme unsustainable, because the recruitment of un-qualified farmers in combination with bogus farm plans (written by extension officers without consultation with farmers) would soon result in large numbers of 'drop-out' farmers. Instead, as pointed out in section 8.3.2, farmers were able to find solutions suited to their

circumstances. Therefore, they would also be able to contribute to more meaningful farm plans than those that were written by the extension officers to meet their area targets.

8.5.2 Poor Coordination among Implementing Agencies

Although the project design aimed at close co-operation among various agencies, its implementation was not in line with this. As Chula stated, only five main agencies were directly responsible. Furthermore, these agencies had different working tasks. So, they carried out their tasks differently with regard to targets achieved. Since the conditions of farmers' recruitment, credit facilities and the alternatives offered, were quite new in this project, it took some time for the officials to understand the procedures, and many of them never understood the project clearly. Moreover their understandings are different with regard to different agencies (e.g. the DOAE, RID and BAAC staff). The poor-coordination however was not implied only among agencies, but also within agencies. This was pointed out strongly by all three evaluation reports which noted that it resulted in a lot of confusion, especially at the local level, not only between officers and farmers, but also among the officers themselves. This partly caused complications in proceeding for farm plan formulation and submission, to loan application and approval. As a result, the loan disbursement was often delayed.

The evaluation studies recommended more meetings among the implementing officers at all levels, and clearer guidelines for better co-ordination. In view of the strong vertical structure of the government, however, it can be argued that it will take a long time for the government to improve in terms of the close and smooth horizontal and vertical co-ordination suggested by these reports. In the course of implementing the decentralization policies under the Constitution, the planning process at the local level has to be integrated into a coherent framework, which will take a long time to mature.

8.5.3 Lack of Continuing Technical Assistance

Despite the DOAE's success in encouraging farmers to diversify (as stated by the OAE), there has only been limited success in implementation. This is partly because fruit trees are a perennial crop, presenting new challenges that are totally different from those associated with the annual cultivation of rice that farmers are familiar with. This problem was strongly addressed by the Kasetsart study (KU, 1996) and the OAE (1999) reports and confirmed by the feedback from farmers during the focus survey (see section 8.3.1) that most farmers did not get any technical support after the first two years, which was the time of increasingly demanding maintenance of fruit trees. In this context, there is a link to the assistance with the marketing of

the new products, which was felt to be missing by many farmers (as pointed out in Chapters VI and VII).

The view emerging from the interviews with farmers in this study is even wider than the ones taken by KU and OAE. Not only should the accompanying technical assistance cover cultivation techniques and marketing, but also, the general approach of the extension officers would have to change. They should act as process facilitators rather than mentors.

8.5.4 Lack of Monitoring and Evaluation Sytems

The monitoring of the pilot phase as well as of the country-wide implementation has not been well organized. This was strongly pointed out by the Chula and Kasetsart reports (see Sections 8.1.1 – 2). As stated by the latter source, implementation and monitoring were focused on the initial extension and BAAC activities, but there was no further support, nor monitoring, after the loan had been delivered. The same finding emerged from the focus-group surveys (see section 8.3.2). Some farmers pointed out at the DOAE 'gave' them the project fully formed, handing over the loans and leaving them alone to cope with unfamiliar crops like fruit trees.

Since the official evaluation was only carried out by the OAE as a kind of in-house evaluation (section 8.1.3), it did not provide much useful information besides the – highly aggregated – statistics on overall achievements after three years. Although this evaluation provides some information for improving the project in future, it is too general and not sufficient to turn the experience into truly improved programme implementation.

Process evaluation, as reflected by the three official evaluation reports, is important, and statistics are needed to cover processes such as recruitment of farmers, areas covered, loans disbursed and paid back. However, what would be more important to have in addition, would be impact evaluation and a strong linkage between policy goals, area targets and actual impacts on both target groups of farmers and target areas. None of this is visible from the existing records on the diversification policy and its implementation over the past seven years.

The conceptual 'model' shown in Figure 8.5 above could be developed further with the kind of data that a good monitoring system would yield. So the emphasis suggested by this research study is on those farmers who would continue to practice the diversified farming system in the long term, which was initially introduced to them by means of the crop diversification programme. Equally, the monitoring system would provide empirical information about farmers who 'dropped out' after a relatively brief period of experimentation, while they are still in debt from the initial loan. Feeding the characteristics of such farmers back into the recruitment

procedures would avoid the waste of money that has been part of the diversification programme (unfortunately without any possibility to quantify this point). It may be argued that both the government and the farmers would greatly benefit from the suggested linkage between system performance during the first five or seven years, and the recruitment of new farmers or the inclusion of new areas into a continuing diversification programme.

8.5.5 Synopsis of Critical Points and Necessary Improvements

To conclude the discussion of critical points of programme implementation in this section, a synopsis of the evaluations of the diversification programme is offered in the form of a summary table (Table 8.11).

The method applied for this comparison is as follows: In order to integrate the main points of the three evaluation reports with the results from this study, the framework for evaluation and necessary improvements is based on the findings of this study (especially as presented in section 8.3). In column 1, there are thus three relatively detailed sections (rows in the table) on planning and implementation at national, provincial and local levels. After that, the table contains specific points such as delivery of inputs, credit approval, and the need for marketing assistance (rows 4 to 6). Further to this, the table includes major system components like better technical preparation of the implementing officers and the need for an overall monitoring and evaluation system (rows 7 and 8). Finally, in row 9, the table includes some additional specific points mentioned by the three evaluation reports.

The second column includes a simple rating system indicating relative importance (++ for "very important" and + for "important") which is generally based on the study findings in combination with a certain degree of subjective assessment. In other words, as it was not possible to explicitly refer to the respondents' views as expressed in the focus-group surveys, it was still possible to include the main points arising from such interviews. The respective critique and the recommendations from the three reports are then added in the briefest possible notation form. The last column of Table 8.11 provides further comments wherever it was felt to be necessary.

Table 8.11: Synopsis of critical points and necessary improvements for programme implementation, based on different sources

Aspects	Points arising from this study, and rating of importance (+, ++)		Chula, 1996	KU, 1996	OAE, 1999	Comments
1. Planning and implementation at national level:						
1.1 Overall importance of the programme	1.1 Very important large programme	++	1.1 A very important national programme	1.1 A very important national programme	1.1 A programme of *great 'potential'* importance – although the area covered during the first three years was only 1.9% of the agricultural area of the country	1.1 Agreement on importance throughout, but the limited area covered is a point to be further examined
1.2 Coordination among participating agencies	1.2 Inter-agency coordination not convincing	+	1.2 Coordination relatively unclear	1.2 As in Chula, 1996	1.2 As in Chula, 1996	1.2 All reports agree that coordination is still problematic
1.3 Long-term planning objectives	1.3 Not very consistent	+	1.3 Adaptation of principles and strategies recommended	1.3 Not emphasized	1.3 Similar to Chula, 1996	1.3 Long-term policy formation requires further work
1.4 Decentralized implementation	1.4 Potential not fully utilized – semi-decentralized	++	1.4 Decentralization not emphasized	1.4 Local committees emphasized (see 4.3 below)	1.4 As in Chula, 1996	1.4 Decentralization very important
1.5 Overall rating of success	1.5 To be determined after further research - not enough evidence at this stage	n.a.	1.5 Implementation so far: Limited success	1.5 Mixed success	1.5 Relatively positive rating	1.5 Rating of success only possible with clearcut monitoring and evaluation system

Notes:
Rating + = important, ++ = very important, n.a. = not applicable

2. Planning and implementation at provincial level:						
2.1 Local environmental differences are important	2.1 Local socio-economic and environmental differences very important	++	2.1 Local differences not emphasized	2.1 Main attraction for farmers: Low-interest credit, but not diversification itself	2.1 As in Chula, 1996	2.1 Findings of this study essentially confirmed by the evaluation reports
2.2 Coordination of provincial-level agencies (BAAC and DOAE) in recruitment of farmers for the programme	2.2 Division of responsibilities between agencies in recruitment of farmers not very clear	+	2.2 Joint local planning required	2.2 Uneven application of criteria for recruiting farmers led to imbalances in implementation; therefore, joint local planning by DOAE and BAAC especially required	2.2 As in Chula, 1996	2.2 Clearer division of responsibilities and co-operatives among agencies confirmed
3. Planning at local level (*amphoe, tambol*, village):						
3.1 Targeting of areas, numbers of farmers to be selected	3.1 Methods of area targeting not clear, but this aspect was not so important at the pilot stage	+	3.1 Set clear area targets for crop replacement for each province	3.1 Mechanical attention to targets (in area or number of farms) not sufficient; in-depth assessment of local physical environment required	3.1 Local targetting method not much emphasized	3.1 Keep the programme flexible in line with local conditions
3.2 Motivation of farmers versus credit-worthiness	3.2 Motivation of farmers more important than formal credit worthiness	+	3.2 Not much emphasis on this point	3.2 Easy credit facilities can attract 50% of farmers, but the other 50% can diversify on their own	3.2 Only 30% of the farmers had some experience with diversification	3.2 The three analysis groups and their characteristics have been implicitly confirmed by the other reports

3.3 Preparation of farm plans with assistance by extension officers	3.3 Preparation of farm plans with assistance by extension officers	+	3.3 Limit alternatives to a few standard types	3.3 Farm plans often written without farmers' participation	3.3 Farm plans delayed because procedures not clear	3.3 Keep the options open for individual farm plans – marketing and environmental constraints already act as limiting factors, which are understood by the farmers
3.4 Factors causing farmers to revert back to rice	3.4 Unpredictable reasons: Flooding, attractive rice price; predictable reasons: inexperience with orchards, labour constraints	+	3.4 Not explicitly mentioned	3.4 Not explicit	3.4 Factors: Flooding, lack of experience	3.4 Unpredictable factors confirmed
4. Delivery of inputs (saplings, fertilizer etc.):						
4.1 Input quality low	4.1 In many cases, input quality was low	+	4.1 Input quality low	4.1 Similar to Chula, 1996	4.1 Similar to Chula, 1996	4.1 This study's results confirmed
4.2 Input delivery late	4.2 Input delivery often late, leading to delays in programme implementation	++	4.2 Free inputs recommended	4.2 Inputs late	4.2 Similar to KU, 1996	4.2 Free inputs not a good idea, but flexible local procurement important
4.3 Insufficient participation of farmers in input procurement	4.3 This aspect was covered only indirectly during the early implementation stage	+	4.3 Some local officers obtained profits from purchasing inputs	4.3 Local committees or farmers themselves to purchase inputs	4.3 Not specifically mentioned	4.3 Decentralize procurement to local level
5. Loan applications and disbursement to farmers	Loan applications handled slowly, leading to delays in loan disbursement in some cases	++	Delays in loan approval procedures	4.1 Similar to Chula, 1996	4.1 Similar to Chula, 1996	Faster and better processing needed

6. Marketing assistance for new crops (especially fruits)	Marketing is one of the main problems in all agro-products	++	Marketing assistance an important issue	Danger of overproduction and low prices for fruits; marketing dominated by local merchants	Other agencies with marketing experience to be included	Views on marketing assistance confirmed
7. Preparation and technical training of extension officers	Some extension officers did not seem to be clear about the project possibilities; they are also not interested *in* long-term attention to such programmes	++	Officials confused about project objectives	Local officers not clear about the project	Similar views, but not explicitly emphasized	Lack of experience among extension officers confirmed; therefore, need for better preparation
8. Monitoring and evaluation system to ensure long-term programme sustainability	It is surprising that in this respect, the national agencies did not seem to make better preparations, given the great importance of the programme	++	Strong monitoring and evaluation system needed	• Officers still fixed on T&V model • Monitoring system lacking	Simple in-house evaluation; not much emphasis on monitoring system	Need for M&E confirmed for a policy of this importance
9. Other aspects raised in the three evaluation reports	n.a.	n.a.	Bank of Thailand finding: Higher non-farm incomes make any restructuring programme un-attractive for marginal farmers	Use of project funds for re-financing old debts inappropriate Non-farm income emphasized as a factor of project farmers' income	n.a.	Importance of non-farm income as one of the decision factors confirmed

Chapter IX: Recommendations for Future Policy Development

This last chapter of the study aims at broad recommendations, as a reflection of the discussion of critical points presented in the previous chapter and indeed throughout the study. Such recommendations are not limited to the continuing diversification programme itself, but meant to include the wider context of future policy development for effective decentralized agricultural development.

The documentation of implementing the diversification project over the past seven years suggests that it has not been a failure, as also pointed out in the evaluation reports by Chula Unisearch (1996) and Kasetsart University (1996). On the contrary, as this research has shown, there is evidence of great potential, even though the mix of continued diversification and discontinuance at the local levels has not been documented in sufficient detail by the official evaluation efforts. The experiences discussed in considerable detail and breadth in this research suggest that there are many important lessons which should be utilized for similar future projects and programmes. So there is a relatively firm basis for broad policy recommendations to be covered by this last chapter.

The key phrases for the near and medium-term future in the development of Thailand are "sustainable agricultural and rural development", which implies a balanced response to urban-industrial development. Further agricultural development must be formulated in a macro-regional (and even global) context of development opportunities and constraints. And, within the country, this will only be viable if it is based on a decentralized institutional framework and a truly participatory approach – both of which are mandated by the Constitution of 1997.

With this overall development perspective, Thailand is not alone in Southeast Asia. So what the Thai Government has to try to achieve in the near future should be similar to what other Asian countries are trying to do. An expert consultation held by the Regional Office of the FAO in Bangkok in July 2000 concluded, on the basis of situation reports from ten Asian countries, that crop diversification "needs to be turned into an effective strategy, to forge congruence of enhanced productivity, sustainability and profitability". The experts concluded (FAO, 2000) that diversification from staple crops like rice and maize to high-value crops like fruits, vegetables and flowers had been successful in many countries of the region. However, in turning diversification programmes into sustainable production systems, *far greater emphasis should be put on farmers' participation in adopting and implementing new technologies.*

The two main factors that had triggered the diversification pilot project in 1993 were the need to buffer farmers from the fluctuations of the world market prices of rice as a single crop, and to better meet the unpredictable rainfall and water consumption patterns in the Central Region. Even though the emergency situation in these two respects fortunately disappeared soon after the beginning of the project, it is obvious that both factors will continue to be important determinants of agricultural development in Thailand. Rice prices have already begun to come down from their three-year peak [1], and the rainfall cycle is likely to bring another dry year again. So the rationale for diversification may repeat itself in a scenario similar to the conditions in the early 1990s.

Conditions for other cash crops (maize, cassava, coffee, but also fruits and vegetables) will fluctuate as before, and the overall trend of urbanization will affect the rural sphere even more than before. There are thus other important factors that require an effective diversification and development policy for and with the farmers as the ultimate decision-makers. The keywords in the FAO statement referred to above may be repeated here to underline the complex mix of goals – enhanced productivity, sustainability, and profitability, in a framework of participation and decentralization.

Aiming at such goals and responding to the long list of critical issues discussed in Chapter VIII, this last chapter is structured into four thematic sections, namely on (1) the requirements for more and better managed decentralization; (2) improved extension techniques and their implementation; (3) proper monitoring and evaluation; and (4) the scenario of a future decentralized planning and management system and the role of the – restructured - Department of Agricultural Extension (DOAE).

9.1 Requirements for More and Better Managed Decentralization in the DOAE

Although major decisions must be made at the top to avoid duplication, and to give sufficient attention to serious problems such as the fluctuating and low price of rice and insufficient water, the intervention by means of a simple technology (the fruit tree scheme) offered, or perhaps imposed, by the DOAE seemed to miss local complexity and diversity. There was no recognition of specific local conditions such as the differences among and within irrigation systems and the differences in market accessibility, labour structure and land tenure constraints and the influences of industrial and urban development.

[1] The rice price started to decrease from the middle of the year 2000 and will drop further in 2001. This is not only because of the large stocks still remaining in the world market, but also because of the situation of Indonesia as one of the most significant buyers in Asia. The OAE (2000) forecasts that this will affect the rice market of some countries, especially Thailand, Vietnam and China.

This was in part a result of the internal organization of the DOAE, which is not geared to the decentralized and participatory style of planning that was required in this kind of programme. The participatory approach is needed especially at the planning stage. It seems undesirable to take either an extreme stance such as "Everything must be run from the top", or "Everything must grow up from the grass roots". Therefore, an extension organization has to try to make all decisions at the top in tune with local needs. That means the current planning process has to be adapted.

9.1.1 Planning for Properly Identified Target Areas

Within an overall national budget frame, the potential regional and provincial areas for diversification should be estimated on the basis of secondary data as had been done before. However, the local (sub-provincial, and sub-district) target areas should not be set for each province from the top of the DOAE or any other national agency. Such local target areas are much more effectively identified by the provincial offices of the DOAE and other agencies. So responsibility for local targetting and decision-making should be transferred down to that level so as to design and implement provincial and district-level plans in a more participatory way. (In this context, "participation" explicitly also refers to the role of the local officers, apart from that of the farmers themselves.)

The officers at the provincial level should assess the potential diversification areas, based on the database they already have. This step would also include the possibility of excluding certain areas because of their unsuitable physical or socio-economic environments. However, the actual target areas should be determined at the district and tambol levels. Since the tambol extension officers are working closely with the farmers, they should be the key persons to identify the best potential areas to diversify. Before doing this, the higher-up offices (national and provincial levels) have to provide support to the local officers with regard to:

- Clear information about the project to enable them to transfer this message to farmers.
- To avoid confusion, the information given to farmers has to be exactly the same as the other agencies who are also involved in this project (e.g. the BAAC and RID staff).

9.1.2 Launching Projects at the Local Level

Conditions of obtaining project support from government, i.e project objectives, alternatives offered, credit facilities .... etc., must be clearly described to farmers. The officers from at least the three major agencies of the DOAE, BAAC and RID should organize information meetings

with farmers. All relevant officers should be present to provide information and answers to clarify and discuss procedures and specific points before launching a diversification project in the locality.

9.1.3 Decision-Making Support for Farm Plans

When farmers come back and show their interest in joining the project, at this stage the extension officers have to assist farmers in making decisions towards diversification and formulating farm plans. The decisions should be a combination of technical information provided by the extension officers with regard to the alternatives considered and a careful analysis of the conditions of the farm families, especially their resources. An integrated approach is needed in order to develop the most productive farming systems options for each farming family. That means at the same time the tambol extension officers have to listen carefully to the farmers and help them to think about the consequences of any decisions in a systematic way.

That means the extension officers should have the knowledge of fruit trees both for cultivation and marketing, since fruit tree cultivation is a new departure for many farmers and they have not had any experience in this respect. To facilitate this procedure, a checklist of key indicators should be prepared before talking with farmers. For example, farm size with ownership status, expected area for diversification, quantity of family labour available, together with their present types of work should be requested. More intensive work, different topographic requirements and tenancy constraints for fruit trees have to be clarified in case the officers observe that those resources may not permit diversification. In cases where farm resources are promising and if farmers are willing to go for the demanding variety of Kiew Savoey mango, the officers have to explain about the complicated and costly hormone treatment of this variety, along with the difficulties of fruiting and limited local market demand.

The officers have to be aware that they must not persuade the farmers to make the same decision they would have made if they themselves were farmers. The final decisions must be made by the farmers. The extension officers should realize that *many extension programmes fail because the extension agents assume at the outset that farmers wish to change, whereas the farmers may be perfectly content with their present opinions and behaviour* (van den Ban and Hawkins, 1996, p. 198); otherwise the mistakes made during the pilot project will be repeated again.

This kind of careful formulation of farm plans will not only screen out un-qualified farmers, but also avoid problems of exceeding a quota in case of limited financial resources. The most

important point at this stage is that the farmers have a clear understanding about the project and its conditions. If the demand for project support really exceeded the tambol or district budget frame, this problem can be solved in other ways, which will be discussed later.

9.1.4 Credit Support

The farm plans should be transferred to the relevant BAAC branch for loan application. During the assessment of the plans, the BAAC staff should give clear information about procedures and conditions with regard to disbursement and repayment. It is very important that the message from the BAAC and extension officers is consistent. They must also ensure that the farmers should not obtain the loan for refinance, as happened before.

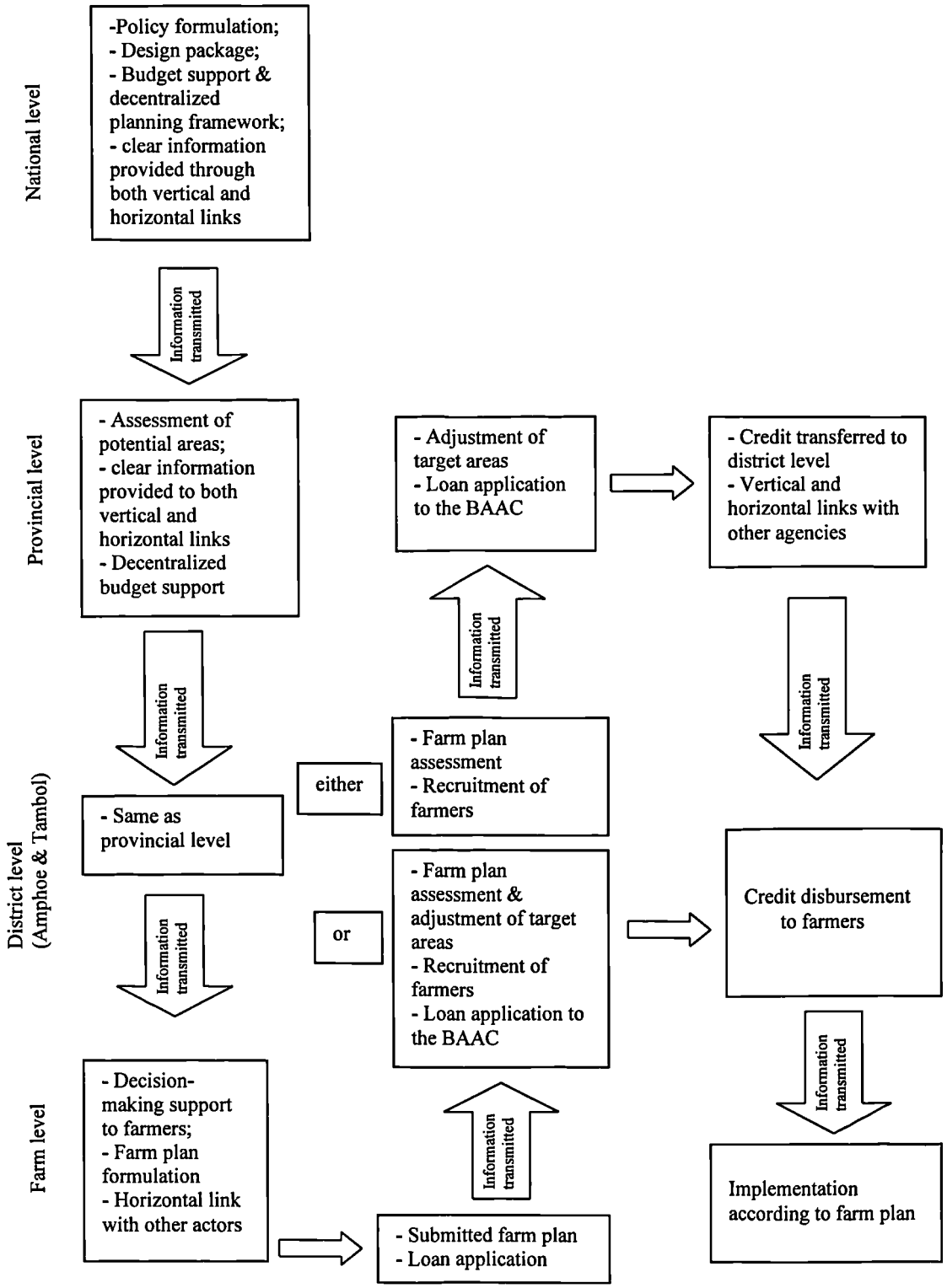
Methods for allocating loans would preferably differ from the present centralized approach. It would be ideal if the budget responsibility is decentralized down to the district level (at the BAAC district branch which exists in every district). In that case, it is a duty of the BAAC staff at this level to approve loans and disbursements after proper assessment. However, if the budget allocation continues to be handled as before, all farm plans with approval from the local BAAC staff would be compiled and submitted to the district, province and finally, to the national office. Then the overall final budget of loans is requested from the BAAC by the DOAE at this level and channeled down to the provincial and local levels again.

If the financial support is decentralized down to the local level, the procedure of loan application, investigation and disbursement would be shorter and farmers would receive their loans faster. If this is not yet acceptable in the Thai Government system, the submission of the farm plan together with the loan application should at least be sorted out at the provincial level, where the officers know the local situation better than at the national level. Although this procedure would take longer than in the suggested radically decentralized way, it might be advantageous in terms of area adjustment in accordance with the total budget available. At the provincial level, it is possible to prioritize the various local areas on a broader set of points of view than at the district level.

Area prioritization should also include those farmers who have already gone into diversification on their own, or would do so in the near future. With reference to Chapter VII and the KU (1996) report, the number of farmers who are able and willing to diversify by themselves is considerable in some places. Such potentially diversifying farmers are not impossible to identify if farmers' circumstances are proper diagnosed at the time of farm plan formulation. Such self-supported farmers should be considered as recipients of technical assistance only, without the loan package.

Figure 9.1 demonstrates the recommended planning approach, which differs in some significant respects from the present organization of the project (shown in Figure 3.2).

Figure 9.1 The suggested organization of the local planning process



9.1.5 Input Support

Similarly to the credit support, input support responsibility should be also be delegated. In this case, it is recommended that authority should be delegated down to the local level, not the provincial level. This budget line should be integrated into the loan as recommended by KU, 1996. This will help the farmers to get the right varieties of trees with better quality from the open market of saplings, which is mostly operated by the private sector together with good transportation facilities. Furthermore, if some farmers decide to act as a group, they will find a way to access the best possible quality and to obtain lower transportation cost.

9.1.6 Participatory Planning

The delegation of decision-making to the lowest possible levels and to the persons immediately concerned will increase overall efficiency as these persons are more knowledgeable about local circumstances. This approach requires a structure that enables decentralized and democratic decision making. Hence, participatory planning demands that all units are willing to cooperate. In line with the project principles, the decisions on an individual farm plan would be the result of appropriate information provided from above, and a clear analysis of local farm resources. This would require the involvement of the DOAE at the local, provincial and department levels respectively, horizontally linked with other relevant agencies, especially the BAAC and RID.

9.2 Requirements for an Improved Technical Support System

This section provides an outline of the required modifications of the technical support system, which would essentially be under the responsibility of the extension services.

9.2.1 Improved Extension Techniques

The style of extension assistance has to be adapted to an increasingly participatory framework where extension officers and farmers work in partnership. This is similar to the FAO statement that "no single system of agricultural extension is suitable for all situations and, therefore, extension approach and methodology should be developed according to the specific situation" (Qamar, 1999). Hence, this study does not propose to add any new methods to the existing and well-established ones, but to concentrate on their application in a participatory manner. Probably the situation in Thailand is similar to the one in India as stated by van den Ban and Hawkins (1996, p. 262) that "India still uses T&V but serious proposals have been made there to switch to a more participatory approach". In reality, Thailand has a long history of extension by means of transfer technology under the Training and Visit (T&V) system dating back to the

late 1970s (Garforth and Suthsupa, 1996). Properly implemented, the T&V model has its strong points, but a more participatory approach is both needed and feasible. At this stage, it should be taken into an account that competent technical assistance is still needed in any event, both in a purely T&V type approach and in a more participatory environment.

Feedback from farmers showed that they needed technical support in fruit tree cultivation because this was a new venture for many of them. Technical support is not only required at the planning stage to support farmers' decision-making as mentioned above, but also required at the implementation stage. This will help farmers make the right decisions and maintain sustainable diversification. Technical assistance with regard to maintenance and specific skills for this new crop is needed, especially for complicated techniques such as thinning, pruning, fertilizer application, including treatment for off-season yield. The technical assistance in this case however covers both cultivation of fruit trees and marketing of fruit products.

9.2.2 Sources of Knowledge for Technical Support

Information and technical assistance can be tapped from already existing sources, such as the Subject Matter Specialists (SMS) of the horticulture section of the DOAE, and the horticulture institute of the DOA. Furthermore, additional advice concerning the dynamic changes of fruit tree plots and marketing, especially for mango, can be sourced from relevant institutes like the OAE, the Ministry of Commerce, and some experienced local traders.

Another source of knowledge that should not be forgotten is the farmers themselves. As mentioned earlier, fruit trees have already been cultivated by some self-support farmers in the project areas. So learning from fellow farmers was successful to some extent (Chapter VI, section 6.5.1 – 2). Similarly, the experienced farmers should be used as a good source of information by the extension officers, especially if there is no difference in the local physical and biological environment. Extension officers should learn from these farmers, both successful and not successful, and pass on this knowledge to other farmers. This can be done by means of transferring messages via extension officers or bringing a group of new 'apprentice' farmers who joined the project and visit the farms of their more experienced colleagues. Thus they can discuss and observe the benefits and costs with farmers who have already diversified. This is essentially the model of "Farmers' Field Schools."

Extension officers in this case might play the role of bringing interested groups together and facilitating the process of information exchange. During the visit, farmers should be stimulated by the discussions and observations, and provoked into trying the technologies for themselves. This strategy might be the most practical one, as stated by Jintrawet et al., 1987 (quoted in

Pretty, 1995): "For farmers 'seeing is believing', and the best educators of farmers are other farmers themselves. This is a result from the spread of peanuts after rice and sesame before rice in the Northeast of Thailand."

9.2.3 Different Skills Required

Although giving technical advice by tapping the knowledge from a research institute is not different from the teaching manner of the T&V approach, learning from farmers and facilitating them in the process of information exchange is. In conjunction with the essential ability of stimulating farmers to form opinions and make decisions for the most productive farm plans, it requires skills that are different from the T&V approach. To understand farmers' circumstances means that the extension officers must become dialogue-oriented in place of their usual one-way communication style. But at the same time, they should be diagnostic. The extension officers must have the social competence to be able to practice a participatory style of leadership and two-way communication in their daily work. They have to understand the realities and complexities of the field base. Thus it needs agricultural professionals willing and able to learn from farmers. With better dialogue, farmers can learn more about the uses and necessary adaptations of technology. Scientists and extension officers should also learn more about farmers' conditions. Of course, the learning environment should focus on problem solving, and be interactive and field based.

At this stage, extension officers are now seen more as facilitators, aiming to transmit knowledge and enable ways of learning, rather than teaching from a technical manual. Hence, it is necessary to change the extension approach, from the transfer of new technologies to providing farmers with solutions for their problems, towards facilitating and guiding a process in which farmers and extension agents jointly develop these solutions and learn from their experience.

9.2.4 Requirements of Retraining

It is not easy to change the extension approach in the short run, especially in Thailand where the T&V approach has been employed for so long. Experience from the empirical study of the diversification project shows that the tambol extension officers are still following the T&V manner even though the agricultural development plan was designed on an alternative approach, which requires more participation from farmers. This changing role of extension then requires a massive retraining programme of the whole extension staff with a different training style which is no longer limited to passing on messages, but which tries to develop creativity.

Such changes in the contents and methods of staff development however cannot be achieved overnight, partly because of lack of trainers who are able to give this kind of training (van den Ban and Hawkins, 1996, p. 244). Although staff development can be supported by educational institutes that play a role in the training of agricultural professionals for both government and non-government sectors, they seem to be rather theoretical. They focus on teaching rather than learning from the real world situation. Since there was the widespread failure of the formal education sector to provide the necessary learning environments, training is suggested to be organized in a practical way, in the field rather than in a classroom.

This type of training should be incorporated with NGOs, as it is increasingly recognized that the government agencies can not go it alone in agricultural and rural development. Although there are both advantages and disadvantages to working with NGOs, there are more advantages than disadvantages, when compared with government agencies which perform similar tasks. Many NGOs are locally-based and have long experience as support organizations at the grassroots. Being small organizations and not being too bureaucratic as large government bodies, NGOs have flexibility to choose the subject area and sources of information. With the freedom to develop their own professionals, this promotes their ability to question, puzzle, learn and change at the local level. A number of strong cases for encouraging better collaboration between NGOs and the public sector are summarized by Pretty (1995, p. 254), including the case of India, where NGOs have been at the forefront of training government officials in participatory approaches (Pretty, 1995, pp. 253 – 254 and van den Ban and Hawkins, 1996, pp. 230 – 231).

9.2.5 Trial Training on the New Approach

As new participatory methods and approaches in the context of agricultural development have been rapidly expanded in many countries, Thailand has begun to adopt such new directions in training. This approach is employed in the pilot project of "Capacity Building for Sustainable Agriculture" under the "Rural Poverty Alleviation Programme" with bilateral assistance from the UNDP. It is probably the most important effort at redirecting local-level agricultural development planning and training. This section briefly describes the "new approach" as an example of what is recommended to be adopted as a general framework for participatory local-level planning and management.

With the focus on capacity building rather than resources delivery (as through the existing system), the two main objectives of the project are (a) strengthening the capacity of the local community in order to plan for sustainable agricultural development and (b) strengthening the capacity of officials and agencies concerned in order to have the knowledge and skills to give extension services on sustainable agricultural development, together with the ability of working

in a participatory manner. By this, both local communities and local extension officers will formulate and implement the "tambol plan" together (UNDP, 1999).

As NGOs are recognized to have better skills and management ability in participation than the government agencies, the local NGOs were employed to teach the communities and local officials how to formulate the local plans in a participatory way. Besides emphasis on necessary data collection and analysis, the highlight of the procedure is to make the local communities participate actively in planning. Group discussions in focus groups have been used as a tool to stimulate the people to talk, identify and find solutions to their problems. At this stage, the local extension officers were learning by doing. They were told to observe, listen and learn from the community before starting to tell farmers to do something. They had to learn and assist the NGOs in their work with the community. Although the local extension officers had to be trained on plan analysis and synthesis at the district and provincial level, the core issue in the training of the extension officers of the DOAE is its emphasis on learning by doing at the tambol level (MOAC, 2000).

After implementing agricultural tambol planning through this procedure in 234 tambols of 21 selected provinces from the middle of 1999 to the middle of 2000, the DOAE aims to disseminate its experiences to other provinces. The officers from the planning division of the DOAE felt that many aspects of local extension are improved and agents are able to change their approaches as a result of learning by doing. At this stage, they consider selecting some local extension officers who perform well in this participatory planning approach to support the capacity building efforts in the communities in 2001, in addition to the NGOs. They have a target of providing 20 volunteer officers to work in 100 tambols (5 tambol each in a year).

A related example of retraining is from Vietnam, a country with a strong centralist tradition, where decentralization is as yet at the beginning. Aided by the United Nations Capital Development Fund (UNCDF), the UNDP, and some other foreign donor agencies, the Government of Quang Nam Province has embarked on a most interesting and encouraging experiment of decentralized planning, management and financing of local rural infrastructure. The programme which has been running in the province since 1996 is called Rural Infrastructure Development Fund project (RIDEF). Training of provincial, district and commune officers is a very important component of the programme, and the team of consultants from the Asian Institute of Technology was instrumental in redirecting the programme approach, and in particular, the training, to a truly participatory mode.

As in the case of the new tambol-level training in Thailand, it was encouraging to see that it is possible to change from an authoritarian style of planning to a participatory one. The Vietnam

project also proved that some of the local commune officers can become effective trainers in neighbouring communes, and thus contribute to the multiplier effect that is required in intensive local training and planning. This success developed gradually although it took a lot of time to carry out through with that difficult process of learning by doing. Not all officers who were trained in facilitating the local planning process at village and commune levels, were able to adjust to the new style, and only some could be further trained to be trainers themselves. The experience in Vietnam shows that it is possible to achieve a new participatory, but also efficient, process of local planning and management by means of a practical way of training, close monitoring and strong technical and financial support (see Siriluck, 1999, as one of several project-related reports by the AIT team).

9.3 Requirements for Proper Monitoring and Evaluation

Any newly introduced approach to local planning and management requires substantial efforts in monitoring and evaluation, as part of an enabling framework which has to be provided by the higher-up levels of government. Without supervision and monitoring (which includes corrective action), many local officers would slip back to their old same system (of the T&V in Thailand, or "command and control" in Vietnam). This did happen in the RIDEF project in Vietnam, and it does occur in the context of the "new tambol plan" in Thailand.

Experience from the implementation of the agricultural restructuring programme shows that without a monitoring system, it is hardly possible to assess the performance of the programme (refer to section 8.1), and to have a basis for realistic adjustment and support.
DOAE's pilot project on the new tambol plans is based on the common logic to begin with a reasonably sized experiment in order to fine-tune the procedures. If monitoring and evaluation are carried out effectively on the recent project which has involved 20 extension officers, the approach will yield good results. They can then be disseminated and integrated into the existing system as the DOAE expects.

This method of gradual learning from experience should have been applied systematically to the diversification project. Since the pilot project started with the alternative approach, which is a turning point to a more participatory manner of extension, the DOAE should have focused on the first four provinces in the central plain to evaluate the experience of the first three and then five or seven years thoroughly. It may still be possible to undertake such an evaluation project along the lines of the quantitative and qualitative research methods of this present study.

It would be beyond the scope of this research to draft a complete monitoring and evaluation system for local agricultural development. However, it is obvious that in this respect, the Thai

Government (DOAE and other agencies) will need to make major efforts to support the ongoing plans and programmes. In particular, the national Agricultural Restructuring Programme requires a much more systematic, disaggregated evaluation than the ones that were done in the official evaluation reports. It would be worthwhile to do this by means of a large-scale study in order to cover the years 1996-2000. Furthermore, the recently started tambol-level mode of implementing agricultural planning and restructuring requires a monitoring and evaluation system to be designed and applied.

9.4 Towards a Decentralized Planning and Management System

9.4.1 Restructuring of the DOAE since 1999

Under the Constitution and the "organic laws" (that established procedures under the Constitution), all aspects of politics, public administration and management in Thailand are undergoing profound changes. Kammeier and Demaine (2000) discussed the emerging experiences with decentralization in various Asian countries. In this context, it is possible to speak of a pattern of "incomplete decentralization" in Thailand, because the goals (and possibilities) of the Constitution are way ahead of reality. Restructuring is a term that applies to the entire government machinery, all branches of the central administration and especially to the newly created or re-defined local government units. These are approximately 7000 rural tambol and 1100 municipalities, nearly 1000 of which are new. Most of the local authorities are relatively small in population and poor in financial resources. All but a few local authorities are weak in their administrative capability and in need of capacity-building programmes. They are learning by experience, and they are all looking for ways of creating local revenues.

The DOAE is just one of many operating agencies that are being restructured, and their staff retrained to cope with the new political reality in the rural (and urban) areas. The process of administrative restructuring will take many more years to settle, and along with this process, planning procedures, coordination and monitoring and other functions of public management are being re-defined. The protests by the Teacher's Organization against the restructuring of the education sector (in November 2000) have shown that decentralization is a "hot issue" that affects many people. Similarly, cases of local corruption, land-use conflicts, and industrial pollution have become serious issues everywhere, for local-level officers and citizens alike. So the restructuring of the agricultural extension service, and the new style of tambol-level plans (for agriculture, infrastructure, health, etc.) are part of a complex political development scenario.

The experience of the diversification pilot project has shown that the DOAE is not yet geared to a fully decentralized and participatory style of planning, but it has been active in establishing a new

approach. Supported by the Asian Development Bank (ADB), the DOAE has begun to change its planning style towards a farmer-centred approach from October 1999 onwards, as part of the restructuring of the Department.

As a basis for the local-level activities, the department prepared the 'menu', i.e. a list of standardized projects, which would be applicable over the entire country and then distributed the list to all provinces as a framework for their planning. The provinces received the project list and chose projects in accordance with the development potential in their districts. Those chosen projects were further forwarded to the district level. At this level, the projects are not chosen by the officers as done at the provincial level, they had to be chosen by farmers instead. Each tambol extension officer was directed to find out the local problems and needs and formulate plans at sub-district level to solve the identified problems and needs. This was done on the basis of calling meetings with the newly established local authorities, the *Tambol Administrative Organizations (TAO),* to discuss local problems and needs. These were translated into the plan in accordance with the project guideline received from the province. If not, they had to find other sources of financial support. Project priorities and areas, target areas for development, and farmers and time frame for implementation were identified at this level.

These plans from all sub-districts were gathered at the district level. The project activities and priorities were then compiled and submitted as a district plan to the provincial level. Then the planning section at the provincial level compiled all the plans from the district level and re-tuned the project activities and priorities, and re-formulated the provincial agricultural plan before submitting the plan to the department at the national level.

These plans, however, do not contain budget requests or ceilings. It is the duty of the department to study all plans proposed and sort them out before allocating budgets according to the total budget received from the Ministry. At this level, expert teams for various activities were established in order to assess the regional and local-level requests. Based on this, the technical support will be provided down to the local level according to needs.

The restructuring of the DOAE, as the key agency for implementing the national restructuring programme, plays an important supporting role in the ongoing implementation process, which seems to meet the objectives of using diversification as a means for creating sustainable production systems (FAO, 2000). The farmer-centred approach that is being implemented at the local level allows a higher degree of farmers' participation than in the past. However, it is still a big question how far these plans can be implemented.

9.4.2 Improved Policy Support

A participatory extension approach not only changes the relationship between the local extension officers and the farmers, but also requires a complete change in the culture of the whole extension organization, and often in other parts of the government bureaucracy as well. Such changes however, can only be realized through a change in the structure and the culture of the organization which make it more flexible and participatory. That means the national extension system should be sufficiently flexible to react to local requirements. For the transition to a more flexible and less centralized system, the government must facilitate the process with an appropriate administration that reaches down to the local people.

This then is a major task for the DOAE staff that have to act as extension process managers in a changing organizational culture. Approaches to agricultural extension must therefore be tailored to local conditions, which requires good management and flexible methods, institutions and personnel. So planners must be trained in the use of local level information, which will require linkages with the formal government planning system, methods of articulating local responses with sectoral concerns of line ministries/agencies as well as integrating conventional and new approaches to planning (Pretty, 1995, and van den Ban and Hawkins, 1996).

In fact, this is in line with the changing political-administrative environment in Thailand where the current policy under the Eighth National Plan is shifting towards decentralized and participatory approaches with a strong emphasis on community empowerment. So the new development paradigm is a move away from a central compartmentalized planning approach to a more decentralized and holistic one (NESDB, 1997). Furthermore, as stated in Chapter III, section 3.1.5, the government's role is beginning to change from one where the extension officers give advice to their being coordinators for all parties concerned in order to support and facilitate the alternatives which are in accordance with farmers' needs, and areas' and market potential. Farmers' capacities will be strengthened so that they are able to make their own decisions regarding farm plans. This implies that all government officials should be trained to understand the change of their roles from being mentors to facilitators (NESDB, 1997, DOAE, 1997a and OAE, 1997).

9.4.3 Concluding Remarks

Trying to meet the principles and goals of the Constitution amounts to a great challenge for all public-sector agencies. In the years ahead, the DOAE (as well as other implementing agencies) will have to make sustained efforts in order to adjust the planning and implementation of national programmes to the constitutional requirements of decentralization. This process is underway

across the government, but it would be beyond the scope of this study to assess the impacts of the overall decentralization policy on the agricultural restructuring programme and its long-term success or failure. It would appear to be necessary to establish and maintain an overall system for targeting geographical areas, and sectors of the agricultural system, for monitoring and evaluating progress and feeding experiences back into the system. Otherwise, local diversity, flexibility and freedom, as encouraged by the constitution, does not add up to a coherent national policy.

It is hoped that this research study has contributed towards a better understanding of the complexities of agricultural change and growth and to point out directions for incorporating the farmers' own reasoning and decision-making into a more democratic and better process of rural development.

List of Annexes

Annex I.3.1 Per Capita Income Distribution: Indonesia and Thailand

Indonesia

	Total			Rural			Urban		
	Lowest 40%	Middle 40%	Highest 20%	Lowest 40%	Middle 40%	Highest 20%	Lowest 40%	Middle 40%	Highest 20%
1976	19.6	38.0	42.5	21.2	38.8	40.5	19.6	37.5	50.0
1980	19.5	38.2	42.3	21.2	39.0	39.8	18.7	37.8	43.5
1981	20.4	37.5	42.1	22.8	39.4	37.8	20.8	37.2	41.9
1984	20.7	37.3	42.0	22.3	39.8	37.8	20.6	38.2	41.1
1987	20.9	37.5	41.6	24.3	39.3	36.4	21.5	38.0	40.5

Thailand

	Lowest 10%	Lowest 20%	Lowest 40%	Middle 40%	Highest 20%	Gini Coefficient *
1962/63	-	7.9	16.5	33.7	49.8	-
1975/76	2.4	6.1	15.8	35.0	49.3	0.426
1980/81	2.1	5.4	14.5	34.0	51.5	0.479
1985/86	1.8	4.6	12.4	32.0	55.6	
1988/89	1.8	4.5	12.5	32.5	55.0	0.487
1990	-	4.2	11.6	30.8	57.7	0.522
1992	-	3.9	11.0	30.0	59.0	0.536
1995e	-	3.4	9.5	27.40	63.1	0.578

Note: * 0 = absolute equality; 1 = absolute inequality. This trend shows ineqaulity increasing between 1975 – 1995.

Source: Rigg, 1997, p. 82

Annex I.3.2 Typology of Participation: How People Participate in Development Programmes and Projects

Typology	Characteristics of each type
1. Passive participation	People participate by being told what is going to happen or has already happened . It is unilateral announcement by administration and project management without any listening to people's responses. The information being shared belongs only to external professional.
2. Participation in information giving	People participate by answering questions posed extractive researchers using questionnaire surveys or similar approaches. People do not have the opportunity to influence proceedings, as the findings are neither shared nor checked for accuracy.
3. Participation by consultation	People participate by being consulted and external agents listen to views. These external agents define both problems and solutions, and may modify these in light of people's responses. Such a consultative process does not concede any share in decision making and professionals are under no obligation to take on board people's views.
4. Participation for material incentives	People participate by providing resources, for example, labour in turn for food, cash or other materials incentives. Much on-farm research falls in this category, as farmers provided the fields but are not involved in experimentation or the process of learning. It is very common to see this called participation, yet people have no stake in prolonging activities when the incentives end.
5. Functional participation	People participate by forming groups to meet predetermined objectives related to the project, which can involve the development or promotion of externally initiated the social organization. Such involvement does not tend to be ate early stages of project cycles or planning, but rather on after major decision have been made. These institutions tend to be dependent on external initiators and facilitators, but may become self-dependent.
6. Interactive participation	People participate by joint analysis, which leads to action plans and the formation of new local institutions or the strengthening of existing ones. It tends to involve interdisciplinary methodologies that seek multiple perspectives, and make use of the systematic and structured learning processes. These groups take control over local decisions and so people have a stake in maintaining structures or practices.
7. Self-mobilization	People participate by taking initiatives for resources and technical advice they need, but retain control over how resources are used. Such self-initiatives mobilization and collective action may or may not challenge existing inequality distribution of wealth and power.

Source: Summarized from Pretty 1995, page 173.

Annex I.3.3 Agencies Involved in the Restructuring Agricultural Production Work Plan

Agencies	Responsibilities
1. DOAE	• Set target areas • Finding the needs of farmers who want to diversify and assisting them to prepare farm plans • Provision inputs supply • Co-ordination for local marketing • Provide extension service, training and technical support
2. DLD	• Co-ordinate with the DOAE to find out farmers who want to diversify including assisting for farm plans preparation • Provision stocks of dairy and cattle for farmers to purchase • Services on artificial insemination and animal health care to farmers • Support for pasture land • Co-ordinate with the Dairy Promotion Organization in buying raw milk from farmers • Service of technical training
3. RFD	• Co-ordinate with the DOAE to find out farmers who want to diversify including assisting for farm plans preparation • Produce and provide non fruit tree stock • Co-ordination in marketing for purchasing fast growth trees • Providing extension, advice and technical training
4. Organization of Rubber Replantation Aids Fund	• Assisting farm plans to farmers who want to diversify out of coffee and pepper • Providing aids fund to farmers • Co-ordinate with other agencies concerned in the areas
5. RID	• Supplying irrigated water to farmers
6. Department of Co-operation Promotion	• Support for co-operation formulation • Co-ordinate with local market
7. Agricultural Land Reform Office	• Co-ordinate in setting target areas • Finding the needs of farmers who want to diversify in land reform areas and assisting them to prepare farm plans • Co-ordinate with local market
8. LDD	• Technical support in land development implementation
9. Department of Co-operation Auditing	• Technical assistant provided to co-operatives
10. The Secretariat Office of Ministry of Agriculture and Co-Operatives	• Monitoring the implementation in project areas
11. DOF	• Extension service and technical advice in fisheries
12. DOA	• Technical support
13. Office of Agricultural Statistics	• Analyse the plan and adjusting plan • Monitoring and evaluation

Annex I.3.3 Continued

Agencies	Responsibilities
14. Marketing Organization for Farmers	• Co-ordinate in marketing
15. Dairy Promotion Organization of Thailand	Purchasing raw milk from the project
16. BAAC	Supplying low interest rate credit to farmers
17. Ministry of Commerce	Other necessary supports
18. Ministry of industry	Other necessary supports
19. Ministry of Interior	Other necessary supports
20. Ministry of Finance	Other necessary supports

Source : Chula Unisearch, 1996

Annex I.5.1.1 List of 26 Sub-projects of the Greater Chao Phraya Irrigation Project

Sub-Project	Provinces covered	Irrigated area (rai)
1. Pollathep	Chainat	95,437
2. Thabote	Chainat, Supanburi	160,548
3. Boromathad	Chainat, Singburi, Supanburi	364,965
4. Chanasutr	Singburi, Angthong, Chainat, Ayuthaya, Supanburi	474,758
5. Yangmanee	Singburi, Angthong, Ayuthaya	210,321
6. Phophraya	Supanburi	328,896
7. Samchuk	Supanburi, Angthong	254,217
8. Donjedee	Supanburi	134,478
9. Phakhai	Supanburi, Ayuthaya, Angthong	185,173
10. Bangbal	Ayuthaya, Angthong	144,762
11. Chaoched Bangyeehon	Ayuthaya, Supanburi	405,940
12. Phrayabanlue	Nonthaburi, Ayuthaya, Pathumthani, Nakorn Pathom, Supanburi	437,503
13. Phrapimol	Bangkok, Nakorn Pathom, Pathumthani	285,563
14. Pasicharoen	Samut Sakorn, Nakorn Pathom, Bangkok,	287,850
15. Manorom	Nakorn Sawan, Chainat, Singburi	192,029
16. Chongkae	Singburi, Lopburi, Nakorn Sawan	237,946
17. Khokkratiem	Lopburi, Saraburi, Ayuthaya	193,404
18. Roengrang	Saraburi, Ayuthaya	162,662
19. Maharat	Chainat, Singburi, Lopburi, Ayuthaya, Angthong	422,775
20. Pasak Tai	Ayuthaya, Saraburi	226,000
21. Klongpriew	Ayuthaya, Saraburi	91,872
22. Nakorn Luang	Ayuthaya	219,922
23. Rangsit Nua	Pathumthani, Saraburi, Ayuthaya	454,200
24. Rangsit Tai	Pathumthani, Bangkok, Chachoengsao, Nakorn Nayok	566,000
25. Khlongdan	Samut Prakarn, Bangkok, Chachoengsao	525,000
26. Phraong Chaiyanuchit	Chachoengsao, Samut Prakarn	510,000
Total = 26 sub-projects	16 provinces	7,572,221

Annex I.5.1.2 List of 12 Irrigation Projects in the Entire Country

Project	Region	Provinces covered
Irrigation project 1	North	Chaing Mai, Lampun, Mae Hongsorn,
Irrigation project 2	North	Chaing Rai, Payao, Lampang, Phrae, Nan
Irrigation project 3	North	Tak, Kampaengphet, Nakorn Sawan, Sukhothai, Phitsanulok, Pichit, Phetchabun,
Irrigation project 4	Northeast	Khon Kaen, Mahasarakham, Loei, Nongkhai, Udornthani,
Irrigation project 5	Northeast	Kalasin, Nakorn Panom, Roi-ed, Mukdaharn, Ubolratchathani, Sakol Nakorn
Irrigation project 6	Northeast	Nakorn Ratchasima, Surin, Sri Sraket, Chaipum
Irrigation project 7	Central	Chainat, Supanburi, Angthong, Singburi, Ayuthaya, Nonthaburi, Pathumthani, Bangkok, Nakorn Pathom, Samut Sakorn, Uthai Thani
Irrigation project 8	Central	Chainat, Nakorn Sawan, Singburi, Lopburi, Saraburi, Ayuthaya, Pathumthani, Bangkok, Samut Prakarn, Chachoengsao
Irrigation project 9	East	Chachoengsao, Samut Prakarn, Nakorn Nayok, Prachinburi, Cholburi, Rayong
Irrigation project 10	West	Karnchanaburi, Nakorn Pathom, Ratchaburi, Samut Sakorn, Samut Songkram, Petchburi, Prachuabkirikhan,
Irrigation project 11	South	Nakorn Srithammarat, Pang-nga, Krabi, Surat-thani,
Irrigation project 12	South	Pattalung, Trang, Songkhla, Pattani, Nara-thiwat

Table I.5.2.1 Change of major land use in all irrigated areas (rai)

Crop Year	Second rice	Field crops	Vegetables	Sugar cane	Fruit tree	Non fruit tree	Aquaculture	Total
1985/86	3476763	707704	209027	383075	644619	343149	222103	5986440
1986/87	3182231	730001	187081	419494	605519	370606	231392	5726324
1987/88	3518487	700801	186539	624769	647420	321549	263480	6263045
1988/89	4373277	706407	165663	680010	619099	268118	280026	7092600
1989/90	4591154	710596	187314	669976	805348	194461	300919	7459768
1990/91	3074520	678806	182027	676496	717086	128507	201921	5659363
1991/92	3772579	664368	197175	834633	802577	166673	150696	6588701
1992/93	3105334	709256	194038	872247	811833	172138	257408	6122254
1993/94	2388016	620445	211914	834042	874032	200100	283738	5412287
1994/95	3535308	758690	205723	924425	978338	202447	286469	6891400
1995/96	5157194	649744	208329	937235	1043228	217316	355180	8568226

Table I.5.2.2 Change of major land use in irrigation project 7&8 (rai)

Crop Year	Second rice	Field crops	Vegetables	Sugar cane	Fruit tree	Non Fruit tree	Aquaculture	Total
1985/86	2478701	117339	55159	55572	228316	35286	110523	3080896
1986/87	2226027	103375	56521	60548	198621	34901	133235	2813228
1987/88	2211873	51538	45595	70384	237587	15225	150084	2782286
1988/89	2570529	50462	52152	80184	218586	15745	159550	3147208
1989/90	2734965	62680	50803	78006	249791	10558	175806	3362609
1990/91	1539940	88787	36339	189261	239454	7524	139814	2241119
1991/92	1845948	101402	44589	204551	290383	12057	79251	2578181
1992/93	1730792	94510	53499	219244	296467	12581	117085	2524178
1993/94	1461008	81286	38509	180856	320548	15845	115514	2213566
1994/95	2250218	67664	37910	235337	352861	13762	79441	3037193
1995/96	3385340	32425	45377	282434	377348	26211	125812	4274947

Table I.5.2.3 Change of major land use in irrigation project 3 (rai)

Crop Year	Second rice	Field crops	Vegetables	Sugar cane	Fruit tree	Non Fruit tree	Aquaculture	Total
1985/86	138987	77857	3899	801	12375	1621	768	236308
1986/87	158303	96728	1307	27234	12375	1619	882	298448
1987/88	195900	65197	4250	43659	10945	682	273	320906
1988/89	470363	81741	867	59293	11917	998	972	626151
1989/90	429485	104439	1491	65765	11960	1217	215	614572
1990/91	242836	134745	2306	51456	5633	20	33	437029
1991/92	499014	131476	4155	50539	6017	1009	1059	693269
1992/93	168660	174740	2585	73043	6452	2117	301	427898
1993/94	111156	204102	11731	74195	6627	2117	301	410229
1994/95	337728	241320	5108	88725	7348	2169	301	682699
1995/96	655999	206485	2291	88920	7349	2121	809	963974

Table I.5.2.4 Land use types of the respondents in the 4 provinces in the central plain (crop year 1993/94)

Land use types	Lopburi		Angthong		Ayuthaya		Supanburi	
	project group	non-project group	project group	non-project group	project group	non-project group	project group	non-project group
Total area	1351	1028	977.6	465.75	826.4	600	973.5	877.9
%	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Rice base	1038	1020.2	796.5	406	598	539.5	730.5	487
%	76.8	99.2	81.5	87.2	72.4	89.9	75.0	55.5
Fruit tree base	238	2	157.5	34.25	199	41.5	184.5	178.5
%	17.6	0.2	16.1	7.4	24.1	6.9	19.0	20.3
Sugar cane	15	0	0	0	8	0	22.5	106
%	1.1	0.0	0.0	0.0	1.0	0.0	2.3	12.1
Vegetables	1	5.25	31	5.5	5	16	0	3
%	0.1	0.5	3.2	1.2	0.6	2.7	0.0	0.3
Fish	29.5	0.3	8.3	10	6.2	1.5	0	0.2
%	2.2	0.0	0.8	2.1	0.8	0.3	0.0	0.0
Flowers	0	0	0	0	0	0	6	9.5
%	0.0	0.0	0.0	0.0	0.0	0.0	0.6	1.1
Waste Land	0	0	8	1	2	0	12	57
%	0.0	0.0	0.8	0.2	0.2	0.0	1.2	6.5
Rent outed	30.5	5.55	7.3	16.5	13.2	17.5	18	39.7
%	2.3	0.5	0.7	3.5	1.6	2.9	1.8	4.5
Farm size (rai)	42.2	49.0	32.6	23.4	27.6	30.0	32.5	33.8

Table I.5.2.5 Land use types of the respondents in the 4 provinces in the central plain (crop year 1994/95)

Land Use types	Lopburi		Angthong		Ayuthaya		Supanburi	
	project group	non-project group	project group	non-project group	project group	non-project group	project group	non-project group
Total area	1227.75	989	992.75	438.5	735	542.5	877.5	683.5
%	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Major rice	937	947.5	775	380	489	473.25	559	217
%	76.3	95.8	78.1	86.7	66.5	87.2	63.7	31.7
Second rice	79	32	455	266	484	462.25	362	94
%	6.4	3.2	45.8	60.7	65.9	85.2	41.3	13.8
Third rice	0	0	65	0	0	0	131	49
%	0.0	0.0	6.5	0.0	0.0	0.0	14.9	7.2
Rice base	937	947.5	775	380	489	473.25	559	217
%	76.3	95.8	78.1	86.7	66.5	87.2	63.7	31.7
Sugar cane	35	0	0	0	0	7	106	181
%	2.9	0.0	0.0	0.0	0.0	1.3	12.1	26.5
Fruit tree base	219	11	156	37.5	219	36	188.5	118
%	17.8	1.1	15.7	8.6	29.8	6.6	21.5	17.3
Vegetables	7	0	27.5	16	1	6	0	11
%	0.6	0.0	2.8	3.6	0.1	1.1	0.0	1.6
Flowers	0	0	0	0	0	0	0	1
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Fish	29.75	0.5	14.25	0	16	1.5	6	0.5
%	2.4	0.1	1.4	0.0	2.2	0.3	0.7	0.1
Waste Land	0	30	9	5	2	0	5	54
%	0.0	3.0	0.9	1.1	0.3	0.0	0.6	7.9
Rented out	0	0	11	0	8	18.75	13	101
%	0.0	0.0	1.1	0.0	1.1	3.5	1.5	14.8
Farm size (rai)	42.34	49.45	33.09	21.93	25.34	30.14	30.26	32.55

Table I.5.2.6 Land use types of the respondents in the 2 provinces in the north (crop year 1994/95)

Land Use types	Phitsanulok		Kampaengphet	
	project group	non-project group	project group	non-project group
Total area	1027.5	578.01	1485.6	791.25
%	100.0	100.0	100.0	100.0
Rice base	789	441.25	1049	659.5
%	76.8	76.3	70.6	83.3
Fruit tree base	123.5	18.5	287	7
%	12.0	3.2	19.3	0.9
Sugar cane	0	0	132	50
%	0.0	0.0	8.9	6.3
Soy bean	97.0	103.5	285.0	190.5
%	9.4	17.9	19.2	24.1
Vegetables	8	2.5	9	2
%	0.8	0.4	0.6	0.3
Fish	15	6.26	12.6	1.75
%	1.5	1.1	0.8	0.2
Flowers	0	0	0	0
%	0.0	0.0	0.0	0.0
Waste Land	0	5	5	23
%	0.0	0.9	0.3	2.9
Rented out	100	107	0	50
%	9.7	18.5	0.0	6.3
Farm size (rai)	33.1	28.9	49.5	39.6

Table I.5.2.7 Farm income analysis of the project group in Lopburi
(crop year 1993/94)

Sources	Gross Income (Baht)	%	Cost (Baht)	Gross Margin (Baht)	%
Major rice	67730	69.2	35117	32613	4672.3
Vegetables	5344	5.5	2826	2516	360.5
Sugar cane	6250	6.4	2136	4114	589.4
Fruit	2319	2.4	41765	-39446	-5651.3
Fish	5350	5.5	10192	-4842	-693.7
Livestock	10900	11.1	5157	5743	822.8
Total	97893	100.0	97193	698	100.0

Table I.5.2.8 Farm income analysis of the non-project group in Lopburi
(crop year 1993/94)

Sources	Gross Income (Baht)	%	Cost (Baht)	Gross Margin (Baht)	%
Major rice	95517	95.5	53208	42309	92.3
Vegetables	67	0.1	10	57	0.1
Sugar cane	0	0.0	0	0	0.0
Fruit	0	0.0	0	0	0.0
Fish	0	0.0	6	-6	0.0
Livestock	4405	4.4	914	3491	7.6
Total	99989	100.0	54138	45851	100.0

Table I.5.2.9 Farm income analysis of the project group in Lopburi
(crop year 1994/95)

Sources	Gross Income (Baht)	%	Cost (Baht)	Gross Margin (Baht)	%
Major rice	61721	57.9	36450	25271	57.0
Second rice	7780	7.3	4233	3547	8.0
Vegetables	5274	4.9	2071	3203	7.2
Sugar cane	6414	6.0	2771	3643	8.2
Fruit	8066	7.6	6779	1287	2.9
Fish	12944	12.1	9788	3156	7.1
Livestock	4465	4.2	212	4253	9.6
Total	106664	100.0	62304	44360	100.0

Table I.5.2.10 Farm income analysis of the non-project group in Lopburi
(crop year 1994/95)

Sources	Gross Income (Baht)	%	Cost (Baht)	Gross Margin (Baht)	%
Major rice	89717	92.0	56589	33128	95.9
Second rice	6109	6.3	2127	3982	11.5
Vegetables	40	0.0	43	-3	0.0
Sugar cane	0	0.0	0	0	0.0
Fruit	105	0.1	2947	-2842	-8.2
Fish	50	0.1	254	-204	-0.6
Livestock	1445	1.5	212	480	1.4
Total	97466	100.0	62172	34541	100.0

Table I.5.2.11 Farm income analysis of the project group in Angthong
(crop year 1993/94)

Sources	Gross Income (Baht)	%	Cost (Baht)	Gross Margin (Baht)	%
Major rice	47399	45.3	24715	22684	83.5
Second rice	4809	4.6	2910	1899	7.0
Vegetables	30500	29.2	12157	18343	67.5
Flowers	601	0.6	51	550	2.0
Fruit	327	0.3	22739	-22412	-82.5
Fish	6233	6.0	6603	-370	-1.4
Livestock	14690	14.0	8217	6473	23.8
Total	104559	100.0	77392	27167	100.0

Table I.5.2.12 Farm income analysis of the non-project group in Angthong
(crop year 1993/94)

Sources	Gross Income (Baht)	%	Cost (Baht)	Gross Margin (Baht)	%
Major rice	38036	59.9	17754	20282	63.8
Second rice	6970	11.0	3974	2996	9.4
Vegetables	3390	5.3	717	2673	8.4
Flowers	0	0.0	0	0	0.0
Fruit	240	0.4	1715	-1475	-4.6
Fish	2000	3.2	520	1480	4.7
Livestock	12845	20.2	6996	5849	18.4
Total	63481	100.0	31676	31805	100.0

Table I.5.2.13 Farm income analysis of the project group in Angthong
(crop year 1994/95)

Sources	Gross Income (Baht)	%	Cost (Baht)	Gross Margin (Baht)	%
Major rice	49775	37.6	25961	23814	34.6
Second rice	35437	26.8	17725	17712	25.7
Third rice	4852	3.7	1774	3078	4.5
Vegetables	15221	11.5	5847	9374	13.6
Flowers	1633	1.2	313	1320	1.9
Fruit	1844	1.4	4281	-2437	-3.5
Fish	3483	2.6	2691	792	1.1
Livestock	20177	15.2	4932	15245	22.1
Total	132422	100.0	63524	68898	100.0

Table I.5.2.14 Farm income analysis of the non-project group in Angthong
(crop year 1994/95)

Sources	Gross Income (Baht)	%	Cost (Baht)	Gross Margin (Baht)	%
Major rice	33985	36.8	17176	16809	35.7
Second rice	35128	38.0	14963	20165	42.9
Third rice	0	0.0	0	0	0.0
Vegetables	6630	7.2	2846	3784	8.0
Flowers	0	0.0	0	0	0.0
Fruit	7250	7.8	4632	2618	5.6
Fish	0	0.0	60	-60	-0.1
Livestock	9446	10.2	5717	3729	7.9
Total	92439	100.0	45394	47045	100.0

Table I.5.2.15 Farm income analysis of the project group in Ayuthaya
(crop year 1993/94)

Sources	Gross Income (Baht)	%	Cost (Baht)	Gross Margin (Baht)	%
Major rice	37206	40.19	17397	19809	487.43
Second rice	26584	28.72	16539	10045	247.17
Vegetables	24085	26.02	9163	14922	367.18
Fruit	1966	2.12	36777	-34811	-856.57
Fish	50	0.05	6837	-6787	-167.00
Livestock	2677	2.89	1791	886	21.80
Total	92568	100.00	88504	4064	100.00

Table I.5.2.16 Farm income analysis of the non-project group in Ayuthaya
(crop year 1993/94)

Sources	Gross Income (Baht)	%	Cost (Baht)	Gross Margin (Baht)	%
Major rice	50324	43.87	25928	24396	46.69
Second rice	52458	45.73	25919	26539	50.80
Vegetables	10450	9.11	5670	4780	9.15
Fruit	240	0.21	3402	-3162	-6.05
Fish	0	0.00	915	-915	-1.75
Livestock	1245	1.09	636	609	1.17
Total	114717	100.00	62470	52247	100.00

Table I.5.2.17 Farm income analysis of the project group in Ayuthaya
(crop year 1994/95)

Sources	Gross Income (Baht)	%	Cost (Baht)	Gross Margin (Baht)	%
Major rice	38600	37.45	17659	20941	43.12
Second rice	40996	39.77	17691	23305	47.99
Vegetables	14441	14.01	7409	7032	14.48
Fruit	3956	3.84	7975	-4019	-8.28
Fish	2669	2.59	3541	-872	-1.80
Livestock	2415	2.34	240	2175	4.48
Total	103077	100.00	54515	48562	100.00

Table I.5.2.18 Farm income analysis of the non-project group in Ayuthaya
(crop year 1994/95)

Sources	Gross Income (Baht)	%	Cost (Baht)	Gross Margin (Baht)	%
Major rice	59157	47.64	28850	30307	48.20
Second rice	62022	49.94	29487	32535	51.74
Vegetables	1378	1.11	1256	122	0.19
Fruit	433	0.35	1542	-1109	-1.76
Fish	222	0.18	108	114	0.18
Livestock	972	0.78	57	915	1.46
Total	124184	100.00	61300	62884	100.00

Table I.5.2.19 Farm income analysis of the project group in Supanburi (crop year 1993/94)

Sources	Gross Income (Baht)	%	Cost (Baht)	Gross Margin (Baht)	%
Major rice	59654	61.7	30113	29541	120.9
Second rice	6359	6.6	3823	2536	10.4
Vegetables	4283	4.4	1406	2877	11.8
Sugar cane	8234	8.5	3505	4729	19.3
Flowers	3333	3.4	857	2476	10.1
Fruit	2090	2.2	29934	-27844	-113.9
Fish	2800	2.9	2323	477	2.0
Livestock	9878	10.2	227	9651	39.5
Total	96631	100.0	72188	24443	100.0

Table I.5.2.20 Farm income analysis of the non-project group in Supanburi (crop year 1993/94)

Sources	Gross Income (Baht)	%	Cost (Baht)	Gross Margin (Baht)	%
Major rice	40961	40.2	20720	20241	61.1
Second rice	9808	9.6	4149	5659	17.1
Vegetables	1477	1.4	278	1199	3.6
Sugar cane	18880	18.5	9065	9815	29.7
Flowers	15922	15.6	6416	9506	28.7
Fruit	6493	6.4	24716	-18223	-55.1
Fish	3777	3.7	3334	443	1.3
Livestock	4615	4.5	154	4461	13.5
Total	101933	100.0	68832	33101	100.0

Table I.5.2.21 Farm income analysis of the project group in Supanburi (crop year 1994/95)

Sources	Gross Income (Baht)	%	Cost (Baht)	Gross Margin (Baht)	%
Major rice	52305	31.9	23459	28846	33.0
Second rice	31069	19.0	17101	13968	16.0
Third rice	13580	8.3	8375	5205	6.0
Vegetables	2062	1.3	346	1716	2.0
Sugar cane	18837	11.5	14364	4473	5.1
Flowers	18555	11.3	4015	14540	16.6
Fruit	7875	4.8	7832	43	0.0
Fish	5035	3.1	772	4263	4.9
Livestock	14416	8.8	79	14337	16.4
Total	163734	100.0	76343	87391	100.0

Table I.5.2.22 Farm income analysis of the non-project group in Supanburi (crop year 1994/95)

Sources	Gross Income (Baht)	%	Cost (Baht)	Gross Margin (Baht)	%
Major rice	23962	19.4	12798	11164	19.3
Second rice	13428	10.9	6129	7299	12.6
Third rice	7376	6.0	3709	3667	6.3
Vegetables	448	0.4	129	319	0.6
Sugar cane	47578	38.6	23788	23790	41.1
Flowers	15129	12.3	4295	10834	18.7
Fruit	9312	7.6	11552	-2240	-3.9
Fish	5962	4.8	2895	3067	5.3
Livestock	95	0.1	57	38	0.1
Total	123290	100.0	65352	57938	100.0

Table I.5.2.23 Farm income analysis of the project group in Phitsanulok
(crop year 1994/95)

Sources	Gross Income (Baht)	%	Cost (Baht)	Gross Margin (Baht)	%
Major rice	37710	45.5	24015	13695	2068.7
Second rice	26907	32.5	17816	9091	1373.3
Vegetables	5751	6.9	1239	4512	681.6
Soy Bean	5115	6.2	2504	2611	394.4
Fruit	615	0.7	23267	-22652	-3421.8
Fish	444	0.5	9418	-8974	-1355.6
Livestock	6332	7.6	3953	2379	359.4
Total	82874	100.0	82212	662	100.0

Table I.5.2.24 Farm income analysis of the non-project group in Phitsanulok
(crop year 1994/95)

Sources	Gross Income (Baht)	%	Cost (Baht)	Gross Margin (Baht)	%
Major rice	34407	46.5	17522	16885	48.1
Second rice	27282	36.9	14217	13065	37.3
Vegetables	168	0.2	45	123	0.4
Soy Bean	7081	9.6	4660	2421	6.9
Fruit	1045	1.4	284	761	2.2
Fish	3731	5.0	1958	1773	5.1
Livestock	317	0.4	274	43	0.1
Total	74031	100.0	38960	35071	100.0

Table I.5.2.25 Farm income analysis of the project group in Kampaengphet
(crop year 1994/95)

Sources	Gross Income (Baht)	%	Cost (Baht)	Gross Margin (Baht)	%
Major rice	57035	34.4	37062	19973	34436.2
Second rice	39260	23.7	21706	17554	30265.5
Vegetables	2747	1.7	975	1772	3055.2
Soy Bean	13147	7.9	7096	6051	10432.8
Sugar cane	24108	14.6	16975	7133	12298.3
Flowers	2967	1.8	97	2870	4948.3
Fruit	2114	1.3	44755	-42641	-73519.0
Fish	9617	5.8	24361	-14744	-25420.7
Livestock	14617	8.8	12527	2090	3603.4
Total	165612	100.0	165554	58	100.0

Table I.5.2.26 Farm income analysis of the non-project group in Kampaengphet
(crop year 1994/95)

Sources	Gross Income (Baht)	%	Cost (Baht)	Gross Margin (Baht)	%
Major rice	55610	50.2	30684	24926	53.4
Second rice	28283	25.5	16204	12079	25.9
Vegetables	0	0.0	0	0	0.0
Soy Bean	11015	9.9	6126	4889	10.5
Sugar cane	15125	13.7	10305	4820	10.3
Flowers	0	0.0	0	0	0.0
Fruit	185	0.2	212	-27	-0.1
Fish	375	0.3	222	153	0.3
Livestock	147	0.1	274	-127	-0.3
Total	110740	100.0	64027	46713	100.0

Table I.5.2.27 Average cost and return of livestock sub-system per farm in the 4 provinces in the central plain (crop year 1993/94)

	Lopburi		Angthong		Ayuthaya		Supanburi	
	project group	non-project group	project group	non-project group	project group	non-project group	project group	non-project group
Revenue (Baht)								
Chicken	7259	0	368	150	1332	645	3112	0
Duck	953	2000	351	0	0	0	0	0
Pig	0	167	9933	9150	0	0	0	0
Cow	2688	2238	4037	3545	1345	600	6767	4615
Total	10900	4405	14690	12845	2677	1245	9878	4615
Cost (Baht)								
Chicken	5069	0	80	115	1285	455	117	0
Duck	11	476	222	0	0	0	0	0
Pig	0	214	7800	6838	457	0	0	0
Cow	78	224	116	43	50	181	110	154
Total	5158	914	8217	6996	1792	636	227	154
Gross margin (Baht)								
Chicken	2190	0	288	35	47	190	2995	0
Duck	942	1524	130	0	0	0	0	0
Pig	0	-48	2133	2312	-457	0	0	0
Cow	2609	2014	3921	3503	1295	419	6657	4462
Total	5742	3490	6472	5850	885	609	9652	4462

Table I.5.2.28 Average cost and return of livestock sub-system per farm in the 4 provinces in the central plain (crop year 1994/95)

	Lopburi		Angthong		Ayuthaya		Supanburi	
	project group	non-project group	project group	non-project group	project group	non-project group	project group	non-project group
Revenue (Baht)								
Chicken	4276	170	328	1456	1305	56	9155	95
Duck	44	875	293	40	0	0	72	0
Pig	145	400	16720	5850	690	0	0	0
Cow	0	0	2837	2100	421	917	5190	0
Total	4465	1445	20178	9446	2416	972	14416	95
Cost (Baht)								
Chicken	0	56	146	289	212	1	8	39
Duck	71	550	258	500	10	0	36	0
Pig	128	359	4201	4442	0	0	0	0
Cow	13	0	327	487	17	56	34	0
Total	212	965	4932	5718	240	57	79	39
Gross margin (Baht)								
Chicken	4276	114	182	1167	1093	54	9147	57
Duck	-27	325	36	-460	-10	0	36	0
Pig	17	42	12519	1409	690	0	0	0
Cow	-13	0	2510	1613	403	861	5155	0
Total	4253	480	15246	3728	2176	916	14337	57

Table I.5.2.29 Average cost and return of livestock sub-system per farm in the 2 provinces in the north (crop year 1994/95)

	Phitsanulok		Kampaengphet	
	project group	non-project group	project group	non-project group
Revenue (Baht)				
Chicken	1345	173	1718	47
Duck	1139	144	198	100
Pig	203	0	10133	0
Cow	3645	0	2567	0
Total	6332	317	14617	147
Cost (Baht)				
Chicken	1358	128	3747	97
Duck	523	146	680	177
Pig	1790	0	7350	0
Cow	283	0	750	0
Total	3953	274	12527	274
Gross margin (Baht)				
Chicken	-13	45	-2028	-50
Duck	616	-3	-482	-77
Pig	-1587	0	2784	0
Cow	3363	0	1817	0
Total	2379	43	2090	-127

Table I.5.2.30 Sources of non-farm income of the respondents in Lopburi (crop year 1993/94)

Sources	project group	%	non-project group	%
Trading	4444	18.5	1629	5.4
Home industry	6688	27.8	5906	19.6
Officials	1988	8.3	6857	22.7
Agri. Emp.	1558	6.5	1067	3.5
Non Agri. Emp.	5953	24.7	11355	37.6
Remittamce	3452	14.3	3333	11.0
Land rent	0	0.0	48	0.2
Total	24083	100.0	30195	100.0

Table I.5.2.31 Sources of non-farm income of the respondents in Lopburi (crop year 1994/95)

Sources	project group	%	non-project group	%
Trading	5552	21.2	1700	3.1
Home industry	7186	27.4	7390	13.5
Officials	3048	11.6	20400	37.3
Agri. Emp.	1793	6.8	2720	5.0
Non Agri. Emp.	7152	27.3	14463	26.5
Remittamce	1483	5.7	6850	12.5
Land rent	0	0.0	1150	2.1
Total	26214	100.0	54673	100.0

Table I.5.2.32 Sources of non-farm income of the respondents in Angthong (crop year 1993/94)

Sources	project group	%	non-project group	%
Trading	2707	10.9	0	0.0
Service	0	0.0	1200	7.1
Officials	3800	15.3	1100	6.5
Agri. Emp.	1540	6.2	5385	31.9
Non Agri. Emp.	4716	19.0	7105	42.1
Remittamce	12087	48.6	2100	12.4
Total	24850	100.0	16890	100.0

Table I.5.2.33 Sources of non-farm income of the respondents in Angthong (crop year 1994/95)

Sources	project group	%	non-project group	%
Trading	3783	14.4	0	0.0
Service	0	0.0	1450	9.3
Officials	2400	9.1	0	0.0
Agri. Emp.	1733	6.6	2210	14.2
Non Agri. Emp.	5192	19.8	7865	50.7
Remittamce	13134	50.0	4000	25.8
Total	26242	100.0	15525	100.0

Table I.5.2.34 Sources of non-farm income of the respondents in Ayuthaya (crop year 1993/94)

Sources	project group	%	non-project group	%
Trading	2900	10.0	270	0.6
Service	0	0.0	1050	2.2
Officials	3113	10.8	1523	3.2
Agri. Emp.	1450	5.0	7600	16.2
Non Agri. Emp.	19481	67.3	36495	77.8
Remittamce	2000	6.9	0	0.0
Land Rent	0	0.0	0	0.0
Total	28944	100.0	46938	100.0

Table I.5.2.33 Sources of non-farm income of the respondents in Ayuthaya (crop year 1994/95)

Sources	project group	%	non-project group	%
Trading	517	1.8	1222	2.7
Service	0	0.0	1250	2.8
Officials	4645	16.6	8000	17.9
Agri. Emp.	672	2.4	3944	8.8
Non Agri. Emp.	15571	55.6	23651	52.9
Remittamce	6517	23.3	6667	14.9
Land Rent	84	0.3	0	0.0
Total	28006	100.0	44734	100.0

Table I.5.2.36 Sources of non-farm income of the respondents in Supanburi (crop year 1993/94)

Sources	project group	%	non-project group	%
Trading	1200	5.2	5846	22.5
Home industry	1667	7.3	462	1.8
Officials	6140	26.7	5138	19.8
Agri. Emp.	3467	15.1	2069	8.0
Non Agri. Emp.	6872	29.9	11231	43.2
Remittamce	3600	15.7	615	2.4
Land Rent	33	0.1	615	2.4
Total	22979	100.0	25976	100.0

Table I.5.2.37 Sources of non-farm income in the respondents in Supanburi (crop year 1994/95)

Sources	project group	%	non-project group	%
Trading	0	0.0	1714	4.8
Home industry	2897	11.1	4500	12.6
Officials	10412	39.9	7429	20.8
Agri. Emp.	1007	3.9	2190	6.1
Non Agri. Emp.	7193	27.6	15000	42.0
Remittamce	2241	8.6	3667	10.3
Land Rent	2329	8.9	1200	3.4
Total	26079	100.0	35700	100.0

Table I.5.2.36 Sources of non-farm income of the respondents in Phitsanulok (crop year 1994/95)

Sources	project group	%	non-project group	%
Trading	5177	20.6	0	0.0
Service	677	2.7	150	1.4
Officials	5516	21.9	2640	24.8
Agri. Emp.	635	2.5	2040	19.2
Non Agri. Emp.	7419	29.5	2716	25.5
Remittamce	3839	15.3	2875	27.0
Rent	1871	7.4	229	2.2
Total	25134	100.0	10650	100.0

Table I.5.2.37 Sources of non-farm income in the respondents in Kampaengphet (crop year 1994/95)

Sources	project group	%	non-project group	%
Trading	8633	73.0	750	3.5
Service	0	0.0	0	0.0
Officials	680	5.8	9900	46.2
Agri. Emp.	521	4.4	2628	12.3
Non Agri. Emp.	1153	9.8	3780	17.7
Remittamce	833	7.0	2200	10.3
Rent	0	0.0	2150	10.0
Total	11820	100.0	21408	100.0

Table I.5.2.40 Farm household income of the respondents in the 4 provinces in the central plain (crop year 1993/94)

	Lopburi		Angthong		Ayuthaya		Supanburi	
Types of income	project group	non-project group	project group	non-project group	project group	non-project group	project group	non-project group
Farm income	97893	99989	104559	63481	92568	114717	96631	101933
Farm expense	97193	54138	77392	31676	88504	62470	72188	68832
Net farm income	700	45851	27167	31805	4064	52247	24443	33101
Non-farm income	24083	30195	24850	16890	28944	46938	22979	25976
Farm household net income	24783	76046	52017	48695	33008	99185	47422	59077

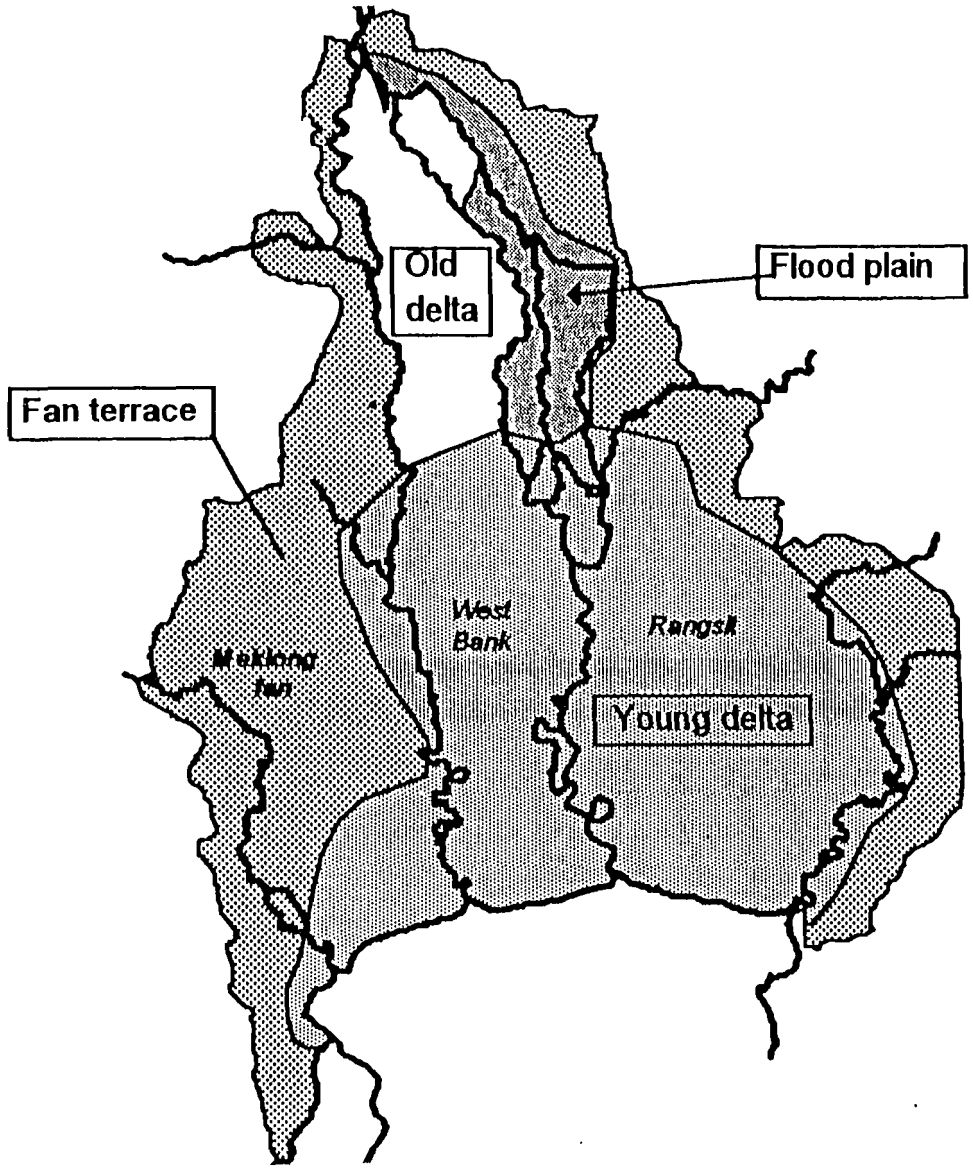
Table I.5.2.41 Farm household income of the respondents in the 4 provinces in the central plain (crop year 1994/95)

	Lopburi		Angthong		Ayuthaya		Supanburi	
Types of income	project group	non-project group	project group	non-project group	project group	non-project group	project group	non-project group
Farm income	106664	97466	132422	92439	103077	124184	163734	123290
Farm expense	63204	62172	63524	45394	54515	61300	76343	65352
Net farm income	43460	35294	68898	47045	48562	62884	87391	57938
Non-farm income	26214	54673	26242	15525	28006	44734	26079	35700
Farm household net income	69674	89967	95140	62570	76568	107618	113470	93638

Table I.5.2.42 Farm household income of the respondents in the 2 provinces in the north (crop year 1994/95)

	Phitsanulok		Kampaengphet	
Types of income	project group	non-project group	project group	non-project group
Farm income	82874	74031	165612	110740
Farm expense	82212	38960	165554	64027
Net farm income	662	35071	58	46713
Non-farm income	25134	10650	11820	21408
Farm household net income	25796	45721	11878	68121

Annex I.5.3: Different geological land forms in the Chao Phraya plain



Source: Based on Kasetsart University,ORSTOM (1996), p. 20, adapted from Takaya (1987)

Annex I.6.1 The Problem of Low Rice Prices: Factors Influencing Price Levels, and Measures of the Thai Government for Stabilizing Farm Gate Prices

The summary presented in this Annex is mainly based on the important study on rice prices and rice-price politics by Ammar Siamwalla and Viroj Na Ranong (1990), in combination with selected statistics published by the Office of Agricultural Economics (OAE).

Rice prices are set by a large number of factors. These are based on the trading conditions among exporters, demand in the country and on the production situation in the country. All of these conditions are clearly visible in Bangkok which is the centre of rice trading both in and outside the country. The price set here is on milled rice. The information flows down to the agencies at the provincial level and provides a signal to rice millers. Based on this, rice millers convert the price for milled rice into paddy price, which can be offered to local merchants and farmers. This calculation also deducts the loss during milling and various marketing costs, such as packing and transportation. Although this is a major factor used in setting the paddy price, other factors such as paddy quality, especially moisture content, and price trends, are also used in combination, based on the experience of the rice millers. Therefore, it can be said that the paddy price farmers receive fluctuates according to the price for milled rice which is set in Bangkok. This price level partly reflects the rice price in the world market.

Influences on the world market prices: Rice prices in the world market very much depend on production and demand worldwide. The rice policy of each exporter also plays an important role in the world market price, especially the policy of a big exporter like the USA. As in 1986 and early 1987, the USA released large quantities of rice from its stock, which strongly depressed the world market price. The measures were a combination of 'deficiency payments' to encourage rice production, [1] and especially marketing loans to relieve the debt of farmers. The farmers used rice as collateral to get the loan, but could get rice back at the rate of the world market price, which was lower than the original price used for the loan (Ammar Siamwalla and Viroj Na Ranong (1990) p. 312).

The rice price in Thailand is mainly set in accordance with the world market price situation, and is not based on production costs like in other countries, for example in India (Ammar Siamwala and Viroj Na Ranong, 1990, pp. 303 – 305). As the production costs do not fluctuate as do world market prices,

[1] This terms used to mean payments to compensate farmers for the difference between purchasing price (at the farm gate) and selling price (to consumer) for rice.

but increase steadily over time, this implies that the profit farmers can gain from rice production tends to be low, and even negative in some years.

Climatic factors: In addition to the world market price, many domestic factors also influence the rice price. Rice traders and rice policy makers have to monitor the production of major and second rice during each year. This depends very much on climatic factors, especially rainfall, because it directly affects the cultivation of major rice. Furthermore, rainfall determines the level of water storage in the two large dams (Bhumipol and Sirikit), which then facilitates second rice cultivation. For example, the low production of paddy in 1987 in Thailand was due to the drought in that year. This was reflected in a higher price in 1988 and 1989. However, in that year, the drought did not only yield low production in Thailand, but also in India, Pakistan and Indonesia while there were flood problems in Bangladesh. This resulted in a declining supply in the world market, which continued to the high price in these two years.

Government policies: Over the past 30 years or so, the Thai Government has used various schemes for influencing the farm gate prices. Many times, the measures used were experiments rather than policies applied over a long period.

The *rice premium* system of the Thai Government, 1966 – 1986: In order to alleviate price fluctuation, there have been many interventions by the government. In particular, the *rice premium* was used from 1966 as a tool to stabilize the rice price in the country and to raise revenue. The money collected in the form of the rice premium was used to support the farm gate price of rice and to lower the price of milled rice for the consumers in the country. A proportion of the rice premium was allocated to set up the "Farmers' Aid Fund" for the former purpose. Although the largest amount of this fund was allocated for price support (more than a half of the total fund), the rice premium was not successful. On the one hand, the implementing agencies such as the "Marketing Organization for Farmers", were not efficient, and on the other hand, there was the conflict in the regulations of the Farmers' Foundation. The government tried to increase the fund by raising the rice premium, which resulted in lower paddy prices, and at the same time, the money from this source was spent for price support. Furthermore, money from this source was requested by many different agencies in the Ministry of Agriculture and Co-operatives, in order to finance their individual purposes, and many such projects were approved without proper evaluation. This was aggravated by the fact that many agencies did not pay back even though funding of their projects had been approved on a revolving-fund basis, and not as a grant. This soaked up the liquidity of the foundation, and the rice premium

system was ended in 1986. In 1988, about 70% of this fund (from a total of 7,011 million Baht) was still on loan.

Other forms of intervention for price stabilization: Other forms of intervention were also employed. The government use to provide large subsidies used to exporters, rice traders, rice millers and farmers. About 300 million Baht was allocated to buy milled rice in order to raise the paddy price just after harvesting during 1985 – 1986, at the time when the rice price dropped in the world market. This milled rice was then sold at a lower price than the world market price to selected some governments (e.g. China, Senegal, and others) and to private companies. By this intervention, it was hoped that the paddy price would increase due to the lower stock in the country. However, with the manipulation of rice millers and exporters, most benefits from this measure were acquired by exporters rather than farmers, because they played the broker role associated with the government and the buyers abroad (Ammar Siamwala and Viroj Na Ranong, 1990, pp. 266 – 267).

Support was also provided directly, in the form of supplying credit at low interest rates to exporters and rice millers. For example, 11,000 million Baht was allocated to support rice exporters in 1987. This support aimed at lowering the operating costs of exporters and thus raising the paddy price. Similarly, 7,000 and 6,000 million Baht were allocated in 1986/87 and 1987/88, respectively, in the form of low interest rate credit support to rice millers in order to buy paddy at a higher price. However, these two projects yielded similar results. Since the credit was released from the Bank of Thailand to the commercial banks and operated by them, credit was poorly distributed to exporters and rice millers. The number of exporters and rice millers who received credit was small. For example, in 1983, only 20 exporters (out of a total of 1,700 exporters) received about one third of the total credit provided. Similarly, only one third of the rice millers could gain access to this credit in 1987/88. There were many others who did not receive support and could not lower their operating costs. Therefore, there was no need for those who received the support to buy paddy at a higher price.

Paddy price support to two public organizations, 1975 - 1982: Paddy price support was emphasized from 1975 onwards, but declined in importance in the early 1980s. The strategy used during 1976 – 1981 was to authorize two organizations, the ***Marketing Organization for Farmers*** and the ***Public Warehouse Organization***, to buy paddy at a higher price than the actual market price. However, the result showed that the major beneficiaries were not farmers as expected but rice millers and exporters instead. The ***Public Warehouse Organization*** accumulated a large deficit (about 4,000 million Baht) after several years of implementation (Ammar Siamwala and Viroj Na Ranong, 1990, pp. 269 – 270) and the government ended this approach to price support.

Paddy mortgage scheme, since the mid-1980s: A paddy mortgage scheme which had already been implemented by the BAAC was considered a more efficient option than the support to public agencies summarized above. The Bank of Thailand allocated 5,000 million Baht as low interest credit to the BAAC in order to implement a rice loan project across the whole country. The strategy was to enable farmers to use paddy as ***collateral*** for credit from the BAAC. They received about 80% of the paddy's value in cases where they were already clients of the BAAC, and 70% in the case of non-clients. By this means, it was expected that farmers could store their crop until the price of rice rose in the weeks and months after harvesting. This measure, however, pushed farmers into speculating on the rice price, and led to these competing with merchants and rice millers who always have better information and more experience in terms of rice marketing. So in the end, this did not benefit farmers very much, because they had to provide storage facilities on their own. Their expenses were usually higher than the low storage rates paid by the BAAC, especially compared to the actual maintenance cost over time. In addition, farmers had a loss of opportunity cost of the remaining 20% of rice value during the same time.

Although this project is continuing, in practice farmers put up rice as ***collateral*** only in years of very low rice prices (such as in 1986/87). So with the higher price of rice in 1987/88, rice loans at the beginning of this year amounted to only one-fifth of the value in crop year 1986/87 (750 million Baht). More than ten years later, in crop year 1999/00, the target amount was 2.5 million tons, but paddy mortgages came to less than 700,000 tons with a total value of about 3.5 million Baht (OAE, 2000). It should be noted that the rice mortgaging scheme is not applicable in the irrigated areas where the moisture content of rice is high. Therefore, rice has to be sold immediately after harvesting, and can not be kept by the farmers who just do not have the required facilities for drying and storing rice.

Rice price fluctuation during the 1990s: Despite the many measures of intervention, the government has not succeeded in solving the problem of low rice prices. The rice price has mainly fluctuated following the world market situation. The slight increase in price in 1994, however, was a response to the lower production rate due to the severe drought in 1993 in the country. Since then, the rice price increased continually during 1995 to 1998 before dropping down again in 1999. It should be noted that the sharp increase in 1996 is associated with production and export of the leading exporters (the USA, India and Vietnam). Rice production in 1995 in the US was about 1 million tons lower than in 1994, and dropped further by about 100,000 tons in 1996. This occurred at the same time as export volumes from India and Vietnam declined. The rice export volume from India in 1996 was only half

of that in 1995, while that of Vietnam in 1996 was about 900,000 tons lower than in 1995 (OAE, 1999).

Farm gate prices of paddy still continued increasing in 1997 and 1998. At this period, the main influence was the drastic devaluation of the Thai Baht following the onset of the economic crisis from mid 1997. The mean exchange rate varied from 25.61 Baht in 1996, to 47.25 Baht, 41.37 Baht and 37.84 Baht for 1 $US in 1997, 1998 and 1999, respectively. The result was that the price of 5.6 and 4.7 Baht/kg of the major and second rice in 1997 went up to nearly 7 Baht/kg (for both major and second rice) in 1998, but the price did not increase at all in the world market. However, the paddy price in Thailand again dropped in 1999 (5.8 and 5 Baht/kg, major and second rice). Given the weight differential of paddy to white rice, this appears to be a reasonable portion of the current rate for white rice of about $US 250 per ton free on board (approximately 10,000 Baht).

The sudden increase in price caused by the devaluation of the Thai Baht after the economic crash of 1997 was not translated into a proportional increase in the farm gate price. So again, traders and exporters received a greater share of that "windfall" profit than the farmers themselves.

Oneway

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
age group	self support	70	48.66	10.70	1.28	46.11	51.21	27	71
	project	157	46.34	9.56	.76	44.84	47.85	26	69
	non project	83	45.88	11.19	1.23	43.44	48.32	22	67
	Total	310	46.84	10.30	.58	45.59	47.89	22	71

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
age	1.210	2	307	.300

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
age	Between Groups	343.361	2	171.681	1.625	1.999
	Within Groups	32427.993	307	105.629		
	Total	32771.355	309			

Crosstabs

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
education* group	310	100.0%	0	.0%	310	100.0%

education* group Crosstabulation

			group			
			self support	project	non project	Total
Education	lower primary	Count	53	129	66	248
		% within education	21.4%	52.0%	26.6%	100.0%
		% within group	75.7%	82.2%	79.5%	80.0%
		% of total	17.1%	42.6%	21.3%	80.0%
	upper primary	Count	8	14	10	32
		% within education	25.0%	43.8%	31.3%	100.0%
		% within group	11.4%	8.9%	12.0%	10.3%
		% of total	2.6%	4.5%	3.2%	10.3%
	secondary and higher	Count	9	14	7	30
		% within education	30.0%	46.7%	23.3%	100.0%
		% within group	12.9%	8.9%	8.4%	9.7%
		% of total	2.9%	4.5%	2.3%	9.7%
Total		Count	70	157	83	32
		% within education	22.6%	50.6%	26.8%	100.0%
		% within group	100.0%	100.0%	100.0%	100.0%
		% of total	22.6%	50.6%	26.8%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-tailed)
Pearson Chi-square	1.836[a]	4	.776
Likelihood Ratio	1.777	4	.777
Linear-by Linear Association	.558	1	.455
N of Valid Cases	310		

a. 0 cells (.0%) have expected counted less than 5. The minimum expected counted is 6.77.

Oneway

Descriptives

			N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
							Lower Bound	Upper Bound		
farm size (rai)	farmers' group	self support	70	36.141	25.420	3.038	30.080	42.203	4.0	117
		project	157	33.985	23.879	1.906	30.220	37.749	3.0	160
		non project	83	35.994	29.939	3.286	29.457	42.531	3.0	172
		Total	310	35.010	25.906	1.471	32.115	37.905	3.0	172

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
farm size (rai)	.756	2	307	.471

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
farm size (rai)	Between Groups	335.011	2	167.505	.248	.780
	Within Groups	207035.605	307	674.383		
	Total	207370.616	309			

Crosstabs

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Land tenure* group	681	100.0%	0	.0%	681	100.0%

education* group Crosstabulation

			group			
			self support	project	non project	Total
Land tenure	owned	Count	154	210	75	439
		% within Land tenure	35.1%	47.8%	17.1%	100.0%
		% within group	79.8%	63.8%	47.2%	64.5%
	rent	Count	28	81	70	179
		% within Land tenure	15.6%	45.3%	39.1%	100.0%
		% within group	14.5%	24.6%	44.0%	26.3%
	others	Count	11	38	14	63
		% within Land tenure	17.5%	60.3%	22.2%	100.0%
		% within group	5.7%	11.6%	8.8%	9.3%
Total		Count	193	329	159	681
		% within Land tenure	28.3%	48.3%	23.3%	100.0%
		% within group	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-tailed)
Pearson Chi-square	48.547[a]	4	.000
Likelihood Ratio	47.854	4	.000
Linear-by Linear Association	26.360	1	.000
N of Valid Cases	681		

a. 0 cells (.0%) have expected counted less than 5. The minimum expected counted is 14.71.

Oneway

Descriptives

			N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
							Lower Bound	Upper Bound		
workforce	group	self support	70	2.61	1.11	.13	2.35	2.88	1	6
		project	157	2.52	.91	7.26E-02	2.38	2.67	1	6
		non project	83	2.45	1.02	.11	2.22	2.67	1	6
		Total	310	2.52	.98	5.59E-02	2.41	2.63	1	6

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
workforce	1.904	2	307	.151

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
workforce	Between Groups	1.078	2	.539	.555	.575
	Within Groups	289.264	307	.972		
	Total	299.342	309			

Crosstabs

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Type of occupation* farmers group	1277	100.0%	0	.0%	1277	100.0%

education* group Crosstabulation

			group			
			self support	project	non project	Total
type of occupation	full time farming	Count	145	315	113	537
		% within type of occupation	25.3%	55.0 %	19.7%	100.0%
	full time employed	% within group	51.2%	46.9%	35.0%	44.9%
		Count	16	25	17	58
		% within type of occupation	27.6%	43.1%	29.3%	100.0%
	farm & employed	% within group	5.7%	3.7%	5.3%	4.5%
		Count	37	79	91	207
		% within type of occupation	17.9%	38.2%	44.0%	100.0%
		% within group	13.1%	11.8%	2 8.2%	16.2%
	none & studying	Count	85	252	102	439
		% within type of occupation	19.4%	57.4%	23.2%	100.0%
		% within group	30.0%	37.6%	31.6%	34.4%
Total		Count	283	671	323	1277
		% within type of occupation	22.2%	52.2%	25.3%	100.0%
		% within group	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-tailed)
Pearson Chi-square	55.002[a]	6	.000
Likelihood Ratio	51.271	6	.000
Linear-by Linear Association	14.286	1	.000
N of Valid Cases	1277		

a. 0 cells (.0%) have expected counted less than 5. The minimum expected counted is 12.85.

Annex II.1 Questionnaire for the Project Group (Crop year 1993/94 for the central plain and 1994/95 for the north)

1. Household information

1.1 Name of household head .....
1.2 How long have you been here?
( ) born here ( ) came to stay here since .....(year)
1.3 Number of household members..... persons
1.4 Household Composition, details of family membership as follows:

No	Age	Educational level	*Occupation
1.			
2.			
3.			
4.			
5.			
6.			
7.			

*Occupation Coding:
1. Working on farm;
2. Non-farm public sector job;
3. Non-farm private sector/state enterprise;
4. Working on other farms;
5. Employee(outside agricultural sector);
6. Others (specify);
7. Working on their own farm and other works outside the farm;
8. Study

2. Present land use and land holding (crop year 1993/94 for the central plain and 1994/95 for the North)

Land holding

2.1 How many rai of land do you have ? ..... rai

2.2 How many plots? ..... plots

Land use

2.3 Please specify details of land use, land holding and land ownership by plots (including crop cultivated after paddy).

Plot no.	Land use type	Area (rai)	*Ownership status	Irrigation Accessibility	
				Rainy season	Dry season
1. 1.1 1.2					
2. 2.1 2.2					
3. 3.1 3.2					
4. 4.1 4.2					

2.4 Have you ever given up second rice cultivation before this year?

( ) Yes ( ) No

2.5 If yes, why? (can select more than one choice)

( ) water shortage ( ) low price

( ) insect damage ( ) others (specify) .....

*Coding for ownership status:

1. owned 2. rented in

3. rented out 4. Free

3. Land use and land holding before restructuring (crop year 1992/93 for the central plain and 1993/94 for the north)

Land holding

3.1 How many rai of land do you have ? ..... rai

3.2 How many plots? ..... plots

Land use

3.3 Please specify details of land use, land holding and land ownership by plots (including crop cultivated after paddy).

Plot no.	Land use type	Area (rai)	*Ownership status	Irrigation Accessibility	
				Rainy season	Dry season
1. 1.1 1.2					
2. 2.1 2.2					
3. 3.1 3.2					
4. 4.1 4.2					

*Coding for ownership status:

1. owned 2. rented in

3. rented out 4. free

4. Inputs and output of rice cultivation

Please identify details of inputs and output of rice (use separate form for first and second rice)

Variety specified..... Planting until harvesting time ..... (month specified)

Items		Quantity	Values (Baht)	Remarks
Land use				
4.1	Area planted (rai)	.....	xxxxxx	
4.2	Area harvested (rai)	.....	xxxxxx	
Income and outputs				
4.3	Total production (kg., tonnes)	.....	xxxxxx	
4.4	Price (Baht/unit)	.....	xxxxxx	
4.5	Sold	.....	.....	
4.6	Kept for land rental	.....	.....	
4.7	Kept for consumption and seed stock	.....	xxxxxx	
4.8	Others	.....	xxxxxx	
Material inputs				
4.9	Land preparation	xxxxxx	.....	
4.10	Fuel for land preparation	xxxxxx	.....	
4.11	Land rental	xxxxxx	.....	
4.12	Seed	.....	.....	
4.13	Fertilizer			
	Compost	.....	.....	
	Manure	.....	.....	
	Chemical fertilizer	xxxxxx	.....	
4.14	Insecticide			
	Chemical	xxxxxx	.....	
	Natural	xxxxxx	.....	
4.15	Herbicide	xxxxxx	.....	
4.16	Water fee	xxxxxx	.....	
4.17	Fuel for water pumping	xxxxxx	.....	
4.18	Sack	xxxxxx	.....	
4.19	Others (specify)	.....	.....	
Hired labour costs				
4.20	Planting	xxxxxx	.....	
4.21	Fertilizer application	xxxxxx	.....	
4.22	Spraying	xxxxxx	.....	
4.23	Harvesting			
	Machine	xxxxxx	.....	
	Manual	xxxxxx	.....	
4.24	Transportation	xxxxxx	.....	

5. Inputs and output of vegetables growing

Types of Vegetables ..... Planting – harvesting time ..... (month specified)

Items		Quantity	Values (Baht)	Remarks
Output				
5.1	Area planted (rai)	.....	xxxxxxx	
5.2	Production	.....	xxxxxxx	
5.3	Price (Baht/unit)	xxxxxx	.....	
5.4	Sold (Baht.)	xxxxxx	.....	
Material inputs				
5.5	Land preparation	xxxxxx	.....	
5.6	Land rental	xxxxxx	.....	
5.7	Seed	.....	.....	
5.8	Chemical fertilizer	.....	.....	
5.9	Compost	.....	.....	
5.10	Manure	.....	.....	
5.11	Lime	.....	.....	
5.12	Insecticide			
	Chemical	xxxxxx	.....	
	Natural	xxxxxx	.....	
5.13	Herbicide	xxxxxx	.....	
5.14	Water fee	xxxxxx	.....	
5.15	Fuel for water pumping	xxxxxx	.....	
Hired labour costs				
5.16	Planting	xxxxxx	.....	
5.17	Fertilizer application	xxxxxx	.....	
5.18	Weeding/spraying	xxxxxx	.....	
5.19	Harvesting	xxxxxx	.....	
5.20	Others (specify)	xxxxxx	.....	

6. Inputs and output of fruit tree plantation

Types of fruit trees ..... Area planted ..... rai
Year planted ..... Supported by the project or not? ( ) yes ( ) No
Please specify details of inputs and outputs as follows:

Items/year	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Output							
6.1 Prodution (kg.)							
6.2 Price (Baht/kg.)							
6.3 Revenue (Baht)							
Material inputs							
6.4 Land modification							
6.5 Land preparation							
6.6 Land rental							
6.7 Seed/stock/saplings							
6.8 Chemical fertilizer							
6.9 Compost							
6.10 Manure							
6.11 Lime							
6.12 Insecticide Chemical Natural							
6.13 Herbicide							
6.14 Water fee							
6.15 Fuel for water pumping							
Hired labour costs							
6.16 Planting							
6.17 Fertilizer application							
6.18 Weeding/spraying							
6.19 Harvesting							
6.20 Others (specify)							

7. Inputs and output of fish raising

7.1 What kind of fish have you raised? .....
7.2 Since when? .....
7.3 How many fish ponds do you have? ..... ponds How many rai? ..... rai.
7.4 Does the fish raising come from the restructure project?
( ) Yes ( ) No
7.5 Please specify details of inputs and outputs as follows:

Inputs and output

Items/year	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Output							
7.1 Production (kg.)							
7.2 Price (Baht/kg.)							
7.3 Revenue (Baht)							
Input costs							
7.4 Pond preparation							
7.5 Land rental							
7.6 Fish stock							
7.7 Fish feed							
7.8 Fertilizer							
7.9 Lime							
7.10 Chemical treatment							
7.11 Water fee							
7.12 Fuel for water pumping							
7.13 Hired labour costs							
7.14 Transportation cost							
7.15 Others (specify)							

8. Livestock raising

8.1 Please specify present number of raised livestock including the numbers of purchasing and selling during the year.

Types of Livestock	Number	Change during the year (numbers)			Purchasing cost (Baht)	Sold value (Baht)
1.		Born	Sold	Bought		
2.						
3.						
4.						
5.						

8.2 Input costs of livestock

Types of Livestock	Construction cost (Baht)	Year built	Animal feed (Baht)	Medical treatment (Baht)	Others (Baht)	Supported by the project or not
1.						
2.						
3.						
4.						
5.						
6.						

9. Marketing

9.1 Please give details in terms of selling farm products and problems occurred during the year.

Type of Products	*Sold to Whom	**Where	When (month)	*** Problems
Crop				
1.				
2.				
3.				
4.				
Livestock/fish				
5.				
6.				
7.				

*Sold to Whom
1. local people
2. middleman/merchant
3. factory, rice mill
4. others (specific)

**Location
1. at farm/house
2. local market
3. district's market
4. provincial market
5. Bangkok market
6. others (specify)

***Problems
1. low price
2. few buyers
3. difficult to sell due to poor quality
4. inconvenient transportation
5. others (specify)

10. Water resources for agriculture

10.1 What are your sources of water for cultivation? (Please prioritize according to the importance)

Rainy Season	Dry Season
1.	1. .....
2.	2. .....
3.	3. .....

10.2 Do you have your own well?
( ) Yes ( ) No

10.3 If yes, it was dug by whom? ..... How much it costs ..... Baht

10.4 In case you use water from the other wells, how much do you have to pay? ..... Baht

10.5 Do you have enough water in dry season?
( ) Yes ( ) No

10.6 If not enough, why?

_____
_____
_____
_____

10.7 How do you solve this problem?

_____
_____
_____
_____

11. Non-farm Employment

11.1 Please specify non-farm employment engaged by all family members during the year.

Types of employment	Who worked?	Duration of work	Location	Total Income (Baht)
1.				
2.				
3.				
4.				
5.				

Types of employment
1. government official
2. private sector and state enterprise staff
3. work on other farms
4. employee in non-agricultural sector
5. trading
6. remittances
7. others (specify)

Location:
1. in the same sub-district
2. in the same district
3. in the same province
4. Neighbouring province
5. other provinces, Bangkok
6. abroad

12. Agricultural Restructuring Project

12.1 What are your reasons to join the agriculture restructuring project?
( ) low and fluctuating price of rice
( ) do not want to work outside the farm
( ) not enough water for dry season rice
( ) expectation for higher income
( ) others (specify)) _____

12.2 What was the amount of credit you received for restructuring?
..... Baht

12.3 How large is the restructured area?
..... rai

12.4 Based on credit you received, what enterprises you invested in?
( ) fruit tree/vegetables ..... rai
( ) fish pond ..... rai
( ) livestock (specify) .....amount .....
( ) others (specify) .....amount .....

12.5 What are the results after joining the project?
( ) good ( ) not good

12.6 If it is good, in what aspects? (multiple choice)
( ) increasing household income
( ) better income distribution throughout a year
( ) do not need to work outside their own farms
( ) others (specify)

12.7 If it is not good, why? (multiple choice)

( ) too complicated ( ) being in debt
( ) already satisfied with the existing system
( ) do not think that restructure will give better result
( ) not enough labour

12.8 What are the sources of information you had about agricultural restructuring project?
( ) agricultural extension officers
( ) friends
( ) mass media such as news, radio, T.V.
( ) others (specify)

12.9 How often did the agricultural extension officers visit you?
( ) once a week ( ) once a mount ( ) never
( ) twice a month ( ) 2 months time or longer than that

12.10 Are you satisfied with the support from the project?
( ) Yes ( ) No

12.11 If not, what kind of support you want?

1. _____
2. _____
3. _____

12.12 Have you ever thought about restructuring before the project implementation?

( ) Yes ( ) No

12.13 If yes, have you ever done it before?

( ) Yes (continue no. 13) ( ) No (continue no. 12.14)

12.14 In case you have thought about this, but not doing it, why?

( ) lack of capital ( ) others (specify) _____
( ) lack of technical knowledge ( ) no encouragement

12.15 Do you think of expansion of the restructuring area?

( ) Yes ( ) No

12.16 If yes, please identify type of enterprises, area and capital source as follows:

Type of enterprises	Areas (rai)	Capital	
		Sources	Amount (Baht)
1.			
2.			
3.			

12.17 If rice price is up to 4,000 Baht/ton, do you think of reverting the restructured land back to rice?

( ) Yes ( ) No

12.18 What are the reasons of reverting back to rice?

( ) expectation of higher income ( ) sufficient labour for on farm work
( ) less complicated ( ) others) _____

12.19 What are the reasons for still continuing with restructuring?

( ) already having secured income ( ) not enough water for dry season rice
( ) fluctuation of rice price ( ) already satisfied with existing system
( ) others

12.20 What caused low price of rice?

( ) over supply of Vietnamese rice ( ) over supply of Thai rice
( ) over supply of the US rice ( ) powerful of the merchants
( ) others (specified) _____

12.21 Have you got any other credit (besides the project) for agricultural investment and household consumption?

( ) Yes ( ) No

12.22 If yes, please specify

Credit amount (Baht)	* Purposes	Interest rate (Baht)	** Sources
1.			
2.			
3.			

* Purpose
1. farm investment
2. household consumption
3. both 1 and 2

** Source
1. the BAAC
2. agricultural co-operatives
3. commercial bank
4. relatives
5. friends
6. middleman
7. others (specify)

13. In case of restructuring before the project was implemented

13.1 When did you start to do agricultural restructuring?
year..... area..... rai

13.2 What types of diversified enterprises? (multiple choice)
( ) crop cultivation ( ) livestock raising
( ) fisheries ( ) others (specify).....

13.3 Please give details of diversified enterprises

Type of crops/fish	Area (rai)
1.	.....
2.	.....
3.	.....

13.4

Type of Livestock	Number (animals)
1.	.....
2.	.....

13.5 What are your reasons for restructuring at that time?
( ) low and fluctuated price of rice
( ) do not want to work outside the farm
( ) better income distribution throughout a year
( ) not enough water for dry season rice
( ) others (specify)_____

14. Problems in Agriculture

14.1 Do you have problems in agriculture?
( ) Yes ( ) No

14.2 If yes, please specify?
_____
_____
_____

14.3 In your opinion, how can these problems be solved?
_____
_____
_____

Annex II.2 Questionnaire for the Non-Project Group (Crop year 1993/94 for the central plain and 1994/95 for the north)

Section 1 – 2, 3 – 10, and 14 are identical with sections 1 –2, 4 – 11 and 14 in the questionnaire for the project group (Annex II.1). Only section 11 – 13 are different. Only these are presented in this Annex.

11. Attention to Agricultural Restructuring Project (in case of no restructuring before)

11.1 Have you ever known about the agricultural restructure project?
( ) Yes (continue no. 11.2) ( ) No (continue no. 12)

11.2 If yes, from whom?

_____
_____
_____

11.3 In your opinion, is this project good?
( ) Yes ( ) No

11.4 If yes, in what aspects? (multiple choice)
( ) increasing household income
( ) better income distribution throughout a year
( ) do not need to work outside their own farms
( ) others (specify)

11.5 If not, why?

_____
_____
_____

11.6 Do you want to join this project?
( ) Yes ( ) No ( ) Not sure

11.7 If yes, what are your obstacles?

_____
_____
_____

11.8 If not, why?

_____
_____
_____

12. In case of restructuring before the project was implemented

12.1 Have you ever restructured before?
( ) Yes (continue no. 12.2) ( ) No (continue no.13)

12.2 If yes, please specify time and area
year..... area..... rai

12.3 What types of diversified enterprises? (multiple choice)
( ) crop cultivation ( ) livestock raising
( ) fisheries ( ) others (specify) _____

12.4 Please give details of diversified enterprises

Type of crops/fish	Area (rai)
1.	.....
2.	.....
3.	.....

12.5

Type of Livestock	Number (animals)
1.	.....
2.	.....

12.6 What are your reasons for restructuring?
( ) low and fluctuated price of rice
( ) do not want to work outside the farm
( ) better income distribution throughout a year
( ) others (specify) _____

12.7 Who encouraged you to do restructuring?
( ) friends
( ) agricultural extension officers
( ) observed from other farms
( ) mass media such as news, radio, T.V.
( ) observed from other places
( ) others (specify) _____

12.8 What is your capital source for restructuring?
( ) own capital source
( ) loan from the BAAC
( ) loan from relatives
( ) loan from co-operatives
( ) loan from commercial bank
( ) loan from middlemen

12.9 Interest rate? ..... Baht/year

12.10 What are the results from restructuring?
( ) good (continue no. 12.11) ( ) fail (continue no. 12.14)

12.11 If good, how?

( ) increasing household income
( ) do not need to work outside the farm
( ) better income distribution throughout a year
( ) others (specify)

12.12 Do you want to expand the restructuring?

( ) Yes (continue no. 12.3) ( ) No (continue no. 12.4)

12.13 If yes, please identify type of enterprises, area and capital source as follows:

Type of enterprises	Areas (rai)	Capital	
1.		Sources	Amount (Baht)
2.			
3.			

12.4 If not, why?

1. _____
2. _____
3. _____

13. Credit for agricultural investment and household consumption

13.1 Have you got any credit for agricultural investment and household consumption?

( ) Yes ( ) No

13.2 If yes, please specify

Credit amount (Baht)	* Purposes	Interest rate (Baht)	** Sources
1.			
2.			
3.			

* Purpose
1. farm investment
2. household consumption
3. both 1 and 2

** Source
1. the BAAC
2. agricultural co-operatives
3. commercial bank
4. relatives
5. friends
6. middleman
7. others (specify)

Annex II.3 Questionnaire for the Project Group (Year 2 Survey in the central plain: crop year 1994/95)

1. Household information

1.1 Name of household head .....

1.2 Is there any change regarding your household members after the last year survey (crop year June 1994)?

( ) no change ( ) increasing ( ) decreasing

1.3 In case of increasing, please specify persons and the relationship to head of household.

No	Relationship to head of household	Age	Educational level	*Occupation
1.				
2.				
3.				

1.4 In case of decreasing, please specify those persons.

Who?	Reasons (where to go)
1.	
2.	
3.	

1.5 Is there any change regarding education of household members after the last year survey (crop year June 1994)? (For example, start going to school, upgrading or finished schooling.)

( ) Yes ( ) No

1.6 If there is, please specify those persons and change

No.	Age	Education of last year	Education level of this year	* Change
1.				
2.				
3.				

* Change

1. start going to school
2. upgrading
3. leaving the school
4. others (specify) _____

1.7 Is there any change regarding occupation of household members after the last year survey (crop year June 1994)?

( ) Yes ( ) No

1.8 If there is, please specify those persons and change

No.	Age	Occupation of last year	Occupation of this year
1.			
2.			
3.			
4.			

Remark: Sections 2 – 14 are identical with the respective sections in questionnaires of year 1 survey (Annex II.1).

Annex II.4 Questionnaires for the Non-Project Group (Year 2 Survey in the central plain: crop year 1994/95)

Section 1 is identical with section 1 in the questionnaire for the year 2 survey of the project group (Annex II.3) while sections 2 – 13 are identical with the respective sections in questionnaires for year 1 survey of the non-project group (Annex II.2).

Table III.A.1 Basic information of household compositions

Table III. A.1.1 Original place of the head of household

Original place	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
born here	26	81.3	18	85.7	26	86.7	18	90.0	24	80.0	19	95.0	25	83.3	20	76.9
migrated	6	18.8	3	14.3	4	13.3	2	10.0	6	20.0	1	5.0	5	16.7	6	23.1
total	32	100.0	21	100.0	30	100.0	20	100.0	30	100.0	20	100.0	30	100.0	26	100.0

Table III.A.1.2 Family size broken down by age group

	Respondents' groups															
Age group	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	mean	No.	mean	No.	mean	No.	mean	No.	mean	No.	mean	No.	mean	No.	mean
below 15	34	1.1	12	0.6	31	1.0	11	0.6	32	1.1	23	1.15	28	0.9	26	1.0
16 - 65	102	3.2	62	3.0	85	2.8	54	2.7	89	3.0	73	3.65	89	3.0	62	2.4
over 65	6	0.2	2	0.1	4	0.1	5	0.3	8	0.3	1	0.05	9	0.3	6	0.2
total	142	4.4	76	3.6	120	4.0	70	3.5	129	4.3	97	4.85	126	4.2	94	3.6

Table III A.1.3 Education level of household members

Education level	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
None	9	6.3	4	5.3	13	10.8	5	7.1	8	6.2	4	4.1	9	7.1	6	6.4
grade 1-4	56	39.4	37	48.7	70	58.3	40	57.1	71	55.0	54	55.7	67	53.2	57	60.6
grade 5-6	16	11.3	10	13.2	15	12.5	10	14.3	27	20.9	30	30.9	20	15.9	13	13.8
grade 7-9	31	21.8	12	15.8	8	6.7	5	7.1	12	9.3	7	7.2	15	11.9	10	10.6
grade 10-12	12	8.5	4	5.3	8	6.7	9	12.9	7	5.4	2	2.1	3	2.4	3	3.2
technician	18	12.7	7	9.2	5	4.2	1	1.4	3	2.3	0	0.0	10	7.9	3	3.2
BSc.	0	0.0	2	2.6	1	0.8	0	0.0	1	0.8	0	0.0	2	1.6	2	2.1
total	142	100.0	76	100.0	120	100.0	70	100.0	129	100.0	97	100.0	126	100.0	94	100.0

Table III A.2 Average farm size (rai)

Farm size (rai)	Respondents' groups							
	Lp-P	Lp-N	Ag-P	Ag -N	Ay-P	Ay-N	Su-P	Su-N
mean	42.2	48.9	32.6	23.4	27.6	30	32.5	33.8
minimum	8.0	7.0	3.0	3.0	4.0	5.0	5.0	8.0
maximum	160.0	170.0	70.0	70.0	63.0	84.0	78.0	172.0

Table III. A.3 Land ownership status (area in rai)

ownership status	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
owned	696.9	51.6	191	18.6	597	61.1	336.8	72.0	389.7	47.2	158	26.3	618.5	63.5	670.7	76.4
rented in	580	42.9	775	75.4	339	34.7	113	24.2	271.7	32.9	361	60.2	345	35.4	154.7	17.6
rented out	0	0.0	5	0.5		0.0	0	0.0	8	1.0	0	0.0	0	0.0	52	5.9
free	0.1	0.0	30	2.9	41.6	4.3	28	6.0	0	0.0	0	0.0	10	1.0	0.5	0.1
hire-purchasing	74	5.5	27	2.6	0	0.0	0	0.0	157	19.0	81	13.5	0	0.0	0	0.0
total	1351	100.0	1028	100.0	977.6	100.0	467.8	100.0	826.4	100.0	600	100.0	973.5	100.0	877.9	100.0

Table III. A.4 Water resources for agriculture

Table III. A.4.1 Water resources for agriculture in the rainy season

Water resources	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
rainfall																
first priority	32	100.0	21	100.0	26	86.7	17	85.0	21	70.0	16	80.0	25	83.3	17	65.4
second priority	0	0.0	0	0.0	4	13.3	3	15.0	9	30.0	4	20.0	5	16.7	9	34.6
irrigated water																
first priority	0	0.0	0	0.0	4	13.3	3	15.0	9	30.0	4	20.0	5	16.7	9	34.6
second priority	30	93.8	21	100.0	23	76.7	12	60.0	21	70.0	16	80.0	23	76.7	14	53.8
third priority	2	6.3	0	0.0	2	6.7	3	15.0	0	0.0	0	0.0	1	3.3	0	0.0

Table III. A.4.2 Water resources for agriculture in the dry season

Water resources	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
irrigated water																
first priority	22	68.8	9	42.9	10	33.3	16	80.0	29	96.7	18	90.0	21	70.0	20	76.9
second priority	4	12.5	1	4.8	13	43.3	2	10.0	1	3.3	1	5.0	5	16.7	1	3.8
third priority	0	0.0	0	0.0	1	3.3	0	0.0	0	0.0	0	0.0	1	3.3	0	0.0
shallow well																
first priority	0	0.0	0	0.0	16	53.3	3	15.0	1	3.3	1	5.0	9	30.0	1	3.8
second priority	3	9.4	1	4.8	5	16.7	3	15.0	1	3.3	0	0.0	1	3.3	7	26.9
third priority	0	0.0	0	0.0	1	3.3	0	0.0	0	0.0	0	0.0	0	0.0	1	3.8
others																
first priority	9	28.1	4	19.0	4	13.3	1	5.0	0	0.0	0	0.0	0	0.0	1	3.8
second priority	3	9.4	1	4.8	1	3.3	2	10.0	0	0.0	0	0.0	3	10.0	1	3.8
third priority	1	3.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0

Table III.A.5. Water resoources from shallow well

Table III.A.5.1 No. of farmers who are having shallow well

Having shallow well	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Yes	4	12.5	2	9.5	25	83.3	6	30.0	3	10.0	1	5.0	11	36.7	13	50.0
No	28	87.5	19	90.5	5	16.7	14	70.0	27	90.0	19	95.0	19	63.3	13	50.0
total	32	100.0	21	100.0	30	100.0	20	100.0	30	100.0	20	100.0	30	100.0	26	100.0

Table III.A.5.2 No. of respondents who identifed water sufficiency in the dry season

Sufficiency of water	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Yes	19	59.4	4	19.0	22	73.3	15	75.0	26	86.7	15	75.0	22	73.3	18	69.2
No	13	40.6	17	81.0	8	26.7	5	25.0	4	13.3	5	25.0	8	26.7	8	30.8
total	32	100.0	21	100.0	30	100.0	20	100.0	30	100.0	20	100.0	30	100.0	26	100.0

Table A.5.3 No. of respondents who identified causes of insufficient water in the dry season (multiple choice)

Causes of insufficiency	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
not enough irrgated water	11	34.4	13	61.9	8	26.7	3	15.0	4	13.3	5	25.0	8	26.7	8	30.8
not enough rain water	2	6.3	4	19.0	0	0.0	2	10.0	0	0.0	0	0.0	0	0.0	0	0.0
valid cases	13	40.6	17	81.0	8	26.7	5	25.0	4	13.3	5	25.0	8	26.7	8	30.8

Table A.5.4 How to solve problem of water insufficiency (multile choice)

How to solve problem	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
do not know	4	12.5	4	19.0	1	3.3	3	15.0	1	3.3	0	0.0	2	6.7	3	11.5
asked for water provided	9	28.1	13	61.9	7	23.3	2	10.0	3	10.0	5	25.0	6	20.0	5	19.2
valid cases	13	40.6	17	81.0	8	26.7	5	25.0	4	13.3	5	25.0	8	26.7	8	30.8

Table III. A.6 Main occupations of household members

types of occupation	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
farming	51	35.9	20	26.3	67	55.8	29	41.4	60	46.5	34	35.1	60	47.6	40	42.6
farming & employee	27	19.0	24	31.6	14	11.7	22	31.4	12	9.3	34	35.1	15	11.9	20	21.3
officials	3	2.1	4	5.3	1	0.8	0	0.0	2	1.6	0	0.0	2	1.6	1	1.1
employee	5	3.5	4	5.3	0	0.0	1	1.4	13	10.1	6	6.2	2	1.6	4	4.3
students	47	33.1	19	25.0	28	23.3	12	17.1	30	23.3	19	19.6	36	28.6	21	22.3
others	9	6.3	5	6.6	10	8.3	6	8.6	12	9.3	4	4.1	11	8.7	8	8.5
total	142	100.0	76	100.0	120	100.0	70	100.0	129	100.0	97	100.0	126	100.0	94	100.0

Table III. A.7 Livestock sub-system

Table III. A.7.1 No. of households raising livestock by types

Types of livestock	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
chicken	9	28.1	2	9.5	11	36.7	4	20.0	11	36.7	8	40.0	10	33.3	1	3.8
duck	5	15.6	2	9.5	5	16.7	1	5.0	1	3.3	2	10.0	1	3.3	1	3.8
pig	0	0.0	3	14.3	2	6.7	2	10.0	1	3.3	0	0.0	0	0.0	0	0.0
cow	5	15.6	1	4.8	7	23.3	6	30.0	2	6.7	2	10.0	7	23.3	0	0.0

Table III. A.7.2 Average number of livestock by types

Types of livestock	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No. of farms	mean (head)	No. of farms	mean (head)	No. of farms	mean (head)	No. of farms	mean (head)	No. of farms	mean (head)	No. of farms	mean (head)	No. of farms	mean (head)	No. of farms	mean (head)
chicken	9	101	2	15	11	29	4	25	11	31	8	11	10	30	1	15
duck	5	13	2	65	5	17	1	5	1	4	2	10	1	12	1	8
pig	0	0	3	2	2	22	2	31	1	10	0	0	0	0	0	0
cow	5	6	1	5	7	9	6	6	2	2	2	4	7	14	0	0

Table III.A.8 Marketing systems

Table III.A.8.1 Types of products sold by types of buyers in the project group in Lopburi (Lp-P)

farm products / buyers	rice	vegetables	fruit	sugar cane	chicken	egg	cow	fish	total (no.)	total (%)
local people	3	12	6		2	2	2	6	33	37.9
merchants	21	10	5		3	1	2	6	48	55.2
industries	4			2					6	6.9
total (no.)	28	22	11	2	5	3	4	12	87	100.0
total (%)	32.2	25.3	12.6	2.3	5.7	3.4	4.6	13.8	100.0	

Table III.A.8.2 Types of products sold by types of buyers in the non-project group in Lopburi (Lp-N)

farm products / buyers	rice	vegetables	fruit	sugar cane	chicken	egg	cow	fish	pig	total (no.)	total (%)
local people		1								1	3.6
merchants	15				2	1	1		2	21	75.0
industries	6									6	21.4
total (no.)	21	1	0	0	2	1	1	0	2	28	100.0
total (%)	75.0	3.6	0.0	0.0	7.1	3.6	3.6	0.0	7.1	100.0	

Table III.A.8.3 Types of products sold by types of buyers in the project group in Angthong (Ag-P)

farm products / buyers	rice	vegetables	fruit	flowers	chicken	egg	cow	fish	pig	total (no.)	total (%)
local people		7	3			2	1	1		14	15.9
merchants	22	25	2	1	2	2	5	2	2	63	71.6
industries	2				4					6	6.8
co-operatives	5									5	5.7
total (no.)	29	32	5	1	6	4	6	3	2	88	100.0
total (%)	33.0	36.4	5.7	1.1	6.8	4.5	6.8	3.4	2.3	100.0	

Table III.A.8.4 Types of products sold by types of buyers in the non-project group in Angthong (Ag-N)

farm products / buyers	rice	vegetables	fruit	flowers	chicken	cow	fish	pig	total (no.)	total (%)
local people		3	2		1	3			9	22.0
merchants	21	2	1		1	3	2	2	32	78.0
industries									0	0.0
co-operatives									0	0.0
total (no.)	21	5	3	0	2	6	2	2	41	100.0
total (%)	51.2	12.2	7.3	0.0	4.9	14.6	4.9	4.9	100.0	

Table III.A.8.5 Types of products sold by types of buyers in the project group in Ayuthaya (Ay-P)

farm products / buyers	rice	vegetables	fruit	chicken	egg	cow	fish	pig	total (no.)	total (%)
local people	12	7	1	4	2		1		27	29.3
merchants	32	23	2	5		1			63	68.5
industries	2								2	2.2
co-operatives									0	0.0
total (no.)	46	30	3	9	2	1	1	0	92	100.0
total (%)	50.0	32.6	3.3	9.8	2.2	1.1	1.1	0.0	100.0	

Table III.A.8.6 Types of products sold by types of buyers in the non-project group in Ayuthaya (Ay-N)

farm products / buyers	rice	vegetables	fruit	chicken	egg	cow	fish	pig	total (no.)	total (%)
local people	6	1	1	1					9	19.1
merchants	31	2	1	1	1	1	1		38	80.9
industries									0	0.0
co-operative									0	0.0
total (no.)	37	3	2	2	1	1	1	0	47	100.0
total (%)	78.7	6.4	4.3	4.3	2.1	2.1	2.1	0.0	100.0	

Table III.A.8.7 Types of products sold by types of buyers in the project group in Supanburi (Su-P)

farm products / buyers	rice	vegetables	fruit	flowers	sugar cane	chicken	egg	cow	fish	total (no.)	total (%)
local people	1	7	2	1		1		2	1	15	15.8
merchants	24	18	2	16	2	4	2	4	2	74	77.9
industries	3									3	3.2
co-operatives	3									3	3.2
total (no.)	31	25	4	17	2	5	2	6	3	95	100.0
total (%)	32.6	26.3	4.2	17.9	2.1	5.3	2.1	6.3	3.2	100.0	

Table III.A.8.8 Types of products sold by types of buyers in the non-project group in Supanburi (Su-N)

farm products / buyers	rice	vegetables	fruit	flowers	sugar cane	chicken	egg	cow	fish	total (no.)	total (%)
local people			2	1					1	4	7.7
merchants	16	4	5	8		1		2		36	69.2
industries	5				6					11	21.2
co-operatives	1									1	1.9
total (no.)	22	4	7	9	6	1	0	2	1	52	100.0
total (%)	42.3	7.7	13.5	17.3	11.5	1.9	0.0	3.8	1.9	100.0	

Table III.A.8.9 Market places of farm products of the project group in Lopburi (Lp-P)

farm products / market places	rice	vegetables	fruit	sugar cane	chicken	egg	cow	fish	total (no.)	total (%)
at home	20	2	4		3	3	3	6	41	47.1
in the village	6	16	4		2			6	34	39.1
in the district	2	4	1	2			1		10	11.5
in the province			2						2	2.3
total (no.)	28	22	11	2	5	3	4	12	87	100.0
total (%)	32.2	25.3	12.6	2.3	5.7	3.4	4.6	13.8	100.0	

Table III.A.8.10 Market places of farm products of the non-project group in Lopburi (Lp-N)

farm products / market places	rice	vegetables	fruit	sugar cane	chicken	egg	cow	fish	pig	total (no.)	total (%)
at home	15	1			2		1		2	21	84.0
in the village	4					1				5	20.0
in the district	2									2	8.0
total (no.)	21	1			2	1	1		2	28	112.0
total (%)	84.0	4.0			8.0		4.0			100.0	

Table III.A.8.11 Market places of farm products of the project group in Angthong (Ag-P)

farm products / market places	rice	vegetables	fruit	flowers	chicken	egg	cow	fish	pig	total (no.)	total (%)
at home	1	6	1	1	3	2	6	1	2	23	26.1
in the village	1	5	3					2		11	12.5
in the district	6	4			2	1				13	14.8
in the province	10	17	1		1	1				30	34.1
central market	11									11	12.5
total (no.)	29	32	5	1	6	4	6	3	2	88	100.0
total (%)	33.0	36.4	5.7	1.1	6.8	4.5	6.8	3.4	2.3	100.0	

Table III.A.8.12 Market places of farm products of the non-project group in Angthong (Ag-N)

farm products / market places	rice	vegetables	fruit	flowers	chicken	cow	fish	pig	total (no.)	total (%)
at home	1	1	1		1	4	2	2	12	29.3
in the village		2	1		1	2			6	14.6
in the district	4								4	9.8
in the province	5	2	1						8	19.5
central market	11								11	26.8
total (no.)	21	5	3	0	2	6	2	2	41	100.0
total (%)	51.2	12.2	7.3	0.0	4.9	14.6	4.9	4.9	100.0	

Table III.A.8.13 Market places of farm products of the project group in Ayuthaya (Ay-P)

farm products / market places	rice	veget-ables	fruit	chicken	egg	cow	fish	pig	total (no.)	total (%)
at home	38	22	3	9	2	1	1		76	82.6
in the village	5	7							12	13.0
in the district	3	1							4	4.3
total (no.)	46	30	3	9	2	1	1	0	92	100.0
total (%)	50.0	32.6	3.3	9.8	2.2	1.1	1.1	0.0	100.0	

Table III.A.8.14 Market places of farm products of the non-project group in Ayuthaya (Ay-N)

farm products / market places	rice	veget-ables	fruit	chicken	egg	cow	fish	pig	total (no.)	total (%)
at home	33	3	2	2	1	1	1		43	91.5
in the village	3								3	6.4
in the district	1								1	2.1
total (no.)	37	3	2	2	1	1	1	0	47	100.0
total (%)	78.7	6.4	4.3	4.3	2.1	2.1	2.1	0.0	100.0	

Table III.A.8.15 Market places of farm products of the project group in Supanburi (Su-P)

farm products / market places	rice	veget-ables	fruit	flowers	sugar cane	chicken	egg	cow	fish	total (no.)	total (%)
at home	9	13	1	11	2	4	2	4	2	48	50.5
in the village	6	10	1	5		1			1	24	25.3
in the district	5	2		1				2		10	10.5
in the province	5		2							7	7.4
central market	6									6	6.3
total (no.)	31	25	4	17	2	5	2	6	3	95	100.0
total (%)	32.6	26.3	4.2	17.9	2.1	5.3	2.1	6.3	3.2	100.0	

Table III.A.8.16 Market places of farm products of the non-project group in Supanburi (Su-N)

farm products / market places	rice	veget-ables	fruit	flowers	sugar cane	chicken	egg	cow	fish	total (no.)	total (%)
at home	6	2	2	7		1		2		20	38.5
in the village	7	1	2	2						12	23.1
in the district	4	1	1						1	7	13.5
in the province	5		2		6					13	25.0
total (no.)	22	4	7	9	6	1	0	2	1	52	100.0
total (%)	42.3	7.7	13.5	17.3	11.5	1.9	0.0	3.8	1.9	100.0	

Table III.A.8.17 Market problems by types of farm products of the project group in Lopburi (Lp-P)

farm products / problems	rice	vegetables	fruit	sugar cane	chicken	egg	cow	fish	total (no.)	total (%)
low price	9	2	4					1	16	66.7
poor quality	1	3	4						8	33.3
total (no.)	10	5	8					1	24	100.0
total (%)	41.7	20.8	33.3					4.2	100.0	

Table III.A.8.18 Market problems by types of farm products of the non-project group in Lopburi (Lp-N)

farm products / problems	rice	vegetables	fruit	sugar cane	chicken	egg	cow	fish	pig	total (no.)	total (%)
low price	8						1		1	10	71.4
few buyers	1									1	7.1
others	3									3	21.4
total (no.)	12						1		1	14	100.0
total (%)	85.7						7.1		7.1	100.0	

Table III.A.8.19 Market problems by types of farm products of the project group in Angthong (Ag-P)

farm products / problems	rice	vegetables	fruit	flowers	chicken	egg	cow	fish	pig	total (no.)	total (%)
low price	8	5		1	1					15	78.9
few buyers	2									2	10.5
others		2								2	10.5
total (no.)	10	7		1	1					19	100.0
total (%)	52.6	36.8		5.3	5.3					100.0	

Table III.A.8.20 Market problems by types of farm products of the non-project group in Angthong (Ag-N)

farm products / problems	rice	vegetables	fruit	flowers	chicken	cow	fish	pig	total (no.)	total (%)
low price	9		1			2		2	14	100.0
total (no.)	9		1			2		2	14	100.0
total (%)	64.3		7.1			14.3		14.3	100.0	

Table III.A.8.21 Market problems by types of farm products of the project group in Ayuthaya (Ay-P)

farm products / problems	rice	vegetables	fruit	chicken	egg	cow	fish	pig	total (no.)	total (%)
low price	14	2		3					19	95.0
others							1		1	5.0
total (no.)	14	2		3			1		20	100.0
total (%)	70.0	10.0		15.0			5.0		100.0	

Table III.A.8.22 Market problems by types of farm products of the non-project group in Ayuthaya (Ay-N)

farm products / problems	rice	vegetables	fruit	chicken	egg	cow	fish	pig	total (no.)	total (%)
low price	14								14	93.3
others	1								1	6.7
total (no.)	15								15	100.0
total (%)	100.0								100.0	

Table III.A.8.23 Market problems by types of farm products of the project group in Supanburi (Su-P)

farm products / problems	rice	vegetables	fruit	flowers	sugar cane	chicken	egg	cow	fish	total (no.)	total (%)
low price	6	1								7	63.6
few buyers		1								1	9.1
others				3						3	27.3
total (no.)	6	2		3						11	100.0
total (%)	54.5	18.2		27.3						100.0	

Table III.A.8.24 Market problems by types of farm products of the non-project group in Supanburi (Su-N)

farm products / problems	rice	vegetables	fruit	flowers	sugar cane	chicken	egg	cow	fish	total (no.)	total (%)
low price	3		1					1		5	83.3
others		1								1	16.7
total (no.)	3	1	1					1		6	100.0
total (%)	50.0	16.7	16.7					16.7		100.0	

Table III.A.9 Problems in Agriculture

Table III A.9.1 Problems identified by respondents

Having problems	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Yes	20	62.5	20	95.2	22	73.3	15	75.0	17	56.7	17	85.0	21	70.0	19	73.1
No	12	37.5	1	4.8	8	26.7	5	25.0	13	43.3	3	15.0	9	30.0	7	26.9
total	32	100.0	21	100.0	30	100.0	20	100.0	30	100.0	20	100.0	30	100.0	26	100.0

Table III. A.9.2 Causes of problems (multiple choice)

Causes of problems	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
not enough water	13	40.6	17	81.0	8	26.7	5	25.0	4	13.3	5	25.0	8	26.7	8	30.8
marketing	9	28.1	10	47.6	9	30.0	9	45.0	14	46.7	14	70.0	10	33.3	6	23.1
lack of credit	8	25.0	3	14.3	3	10.0			1	3.3			2	6.7	2	7.7
insect damage	2	6.3	5	23.8	10	33.3	9	45.0	6	20.0	3	15.0	9	30.0	8	30.8
others	1	3.1			2	6.7	1	5.0	1	3.3	1	5.0			2	7.7
valid cases	20	62.5	20	95.2	22	73.3	15	75.0	17	56.7	17	85.0	21	70.0	19	73.1

Table III. A.9.3 Suggestion for solving problems (multiple choice)

Suggested items	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
water provided	9	28.1	13	61.9	5	16.7	4	20.0	1	3.3	5	25.0	5	16.7	6	23.1
price support	4	12.5	3	14.3	6	20.0	5	25.0	11	36.7	11	55.0	8	26.7	4	15.4
credit provided	7		3		3	10.0							1	3.3	2	7.7
land development			1	4.8											1	3.8
valid cases	20	62.5	20	95.2	14	46.7	9	45.0	12	40.0	16	80.0	14	46.7	13	50.0

Table III.A.10 Credit systems

Table III. A.10.1 No. of responents who received credit (besides the support for diversification)

	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
Receiving	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
credit	25	78.1	21	100.0	24	80.0	14	70.0	27	90.0	14	70.0	19	63.3	22	84.6

Table III. A.10.2 Sources of credit

Sources	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
BAAC	13	40.6	8	38.1	14	46.7	8	40.0	21	70.0	9	45.0	5	16.7	5	19.2
co-operatives	8	25.0	6	28.6	5	16.7	5	25.0	1	3.3	2	10.0	9	30.0	6	23.1
commercial bank	3	9.4			4	13.3	1	5.0	2	6.7			4	13.3	9	34.6
friends	1	3.1	1	4.8	1	3.3			1	3.3	2	10.0	1	3.3		
merchants			6	28.6					2	6.7	1	5.0			2	7.7
valid cases	25	78.1	21	100.0	24	80.0	14	70.0	27	90.0	14	70.0	19	63.3	22	84.6

Table III.A.11 Cancelling of second rice cultivation

Table III A.11.1 No. of responents who used to cancel second rice (both partial and full cancled)

	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
Cancelling	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
second rice	32	100.0	18	85.7	22	73.3	15	75.0	6	20.0	1	5.0	22	73.3	20	76.9

Table III A.11.2 Time of cancelling second rice

Year	Respondents' groups															
canceled	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
before 1993/94	32	100.0	21	100.0	15	50.0	15	75.0	2	6.7		0.0	9	30.0	17	65.4
in 1993/94		0.0		0.0	7	23.3		0.0	4	13.3	1	5.0	13	43.3	3	11.5
valid cases	32	100.0	21	100.0	22	73.3	15	75.0	6	20.0	1	5.0	22	73.3	20	76.9

Table III A.11.3 Reasons of cancelling second rice (multiple choice)

Reasons of	Respondents' groups															
cancelling	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
not enough water	25	78.1	14	66.7	20	66.7	13	65.0	2	6.7			17	56.7	15	57.7
low price of rice	7	21.9	1	4.8	2	6.7	2	10.0	1	3.3	1	5.0	2	6.7	7	26.9
insect damage	23	71.9	9	42.9	4	13.3	4	20.0	1	3.3			1	3.3	2	7.7
others	1	3.1			2	6.7	1	5.0	2	6.7	1	5.0	2	6.7	2	7.7
valid cases	32	100.0	21	100.0	22	73.3	15	75.0	6	20.0	1	5.0	22	73.3	20	76.9

Table III.A.12 Diversification before the programme launch

Table III A.12.1 No. of responents who diversified before the programme launch

	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
Diversified	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
before	8	25.0	1	4.8	6	20.0	6	30.0	4	13.3	4	20.0	6	20.0	17	65.4

Table III A.12.2 Time of diversificaiton in the past

Year diversified	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
before 1985	1	3.1			2	6.7	2	10.0								0.0
1985-1989	1	3.1			1	3.3			2	6.7	1	5.0	2	6.7	4	15.4
1990-1992	5	15.6	1	4.8	3	10.0	1	5.0	2	6.7	1	5.0	2	6.7	5	19.2
in 1993	1	3.1					3	15.0			2	10.0	2	6.7	8	30.8
valid cases	8	25.0	1	4.8	6	20.0	6	30.0	4	13.3	4	20.0	6	20.0	17	65.4

Table III A.12.3 Area diversified before the programme luanch (rai)

Area diver-sified (rai)	Respondents' groups							
	Lp-P	Lp-N	Ag-P	Ag -N	Ay-P	Ay-N	Su-P	Su-N
mean	6.1	2.0	3.5	4.9	5.6	5.9	3.8	6.0
minimum	2.0	2.0	2.0	1.0	2.0	1.0	2.0	1.0
maximum	20.0	2.0	6.0	10.0	11.0	15.0	6.0	15.0

Table III A.12.4 Reasons of diversification by theirown (multiple choice)

Reasons	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
low price of rice			1	4.8	2	6.7	2	10.0	1	3.3	3	15.0	4	13.3	9	34.6
insufficient water	6	18.8			2	6.7			1	3.3			2	6.7		
higher income	3	9.4	1	4.8	4	13.3	6	30.0	4	13.3	3	15.0	3	10.0	17	65.4
others													2	6.7	4	15.4
valid cases	8	25.0	1	4.8	6	20.0	6	30.0	4	13.3	4	20.0	6	20.0	17	65.4

Table III.A.13 Diversification within the programme

Table III A.13.1 Reasons of joining Diversification programme (multiple choice; identified by the project group only)

Reasons	Respondent's groups							
	Lp-P		Ag -P		Ay-P		Su-P	
	No.	%	No.	%	No.	%	No.	%
expectation of higher income	27	84.4	22	73.3	22	73.3	20	66.7
unstable&low price of rice	22	68.8	20	66.7	20	66.7	22	73.3
not enough water for second rice	17	53.1	15	50.0	6	20.0	14	46.7
no need to find off-farm work	7	21.9	8	26.7	7	23.3	5	16.7
others	1	3.1	8	26.7	6	20.0	1	3.3
total	32	100.0	30	100.0	30	100.0	30	100.0

Table III A.13.2 Amount of credit received for diversification (Baht)

Amount of credit received (Baht)	Respondent's groups			
	Lp-P	Ag -P	Ay-P	Su-P
mean	63650	46700	70170	41755
minimum	30000	20000	6500	14000
maximum	150000	114000	180000	180000

Table III A.13.3 Area changed for diversification (rai)

Area changed (rai)	Respondent's groups			
	Lp-P	Ag -P	Ay-P	Su-P
mean	5.97	4.23	5.0	4.86
minimum	3.0	2.0	1.0	3.0
maximum	20.0	10.0	10.0	16.0

Table III A.13.4 Opinion about diversification

Opinion given	Respondent's groups							
	Lp-P		Ag -P		Ay-P		Su-P	
	No.	%	No.	%	No.	%	No.	%
good	32	100.0	30	100.0	30	100.0	30	100.0
bad	0	0.0	0	0.0	0	0.0	0	0.0
total	32	100.0	30	100.0	30	100.0	30	100.0

Table III A.13.5 Good attitude about diversification programme (multiple choice)

Reasons	Respondent's groups							
	Lp-P		Ag -P		Ay-P		Su-P	
	No.	%	No.	%	No.	%	No.	%
increasing income	23	71.9	25	83.3	28	93.3	25	83.3
better income disribution	17	53.1	20	66.7	25	83.3	22	73.3
no need to find off-farm work	15	46.9	15	50.0	17	56.7	16	53.3
others			3	10.0	3	10.0	4	13.3
total	32	100.0	30	100.0	30	100.0	30	100.0

Table III A.13.6 Satisfaction about the support for diversification

Satisfactory	Respondent's groups							
	Lp-P		Ag -P		Ay-P		Su-P	
	No.	%	No.	%	No.	%	No.	%
Yes	32	100.0	30	100.0	30	100.0	30	100.0
No	0	0.0	0	0.0	0	0.0	0	0.0
total	32	100.0	30	100.0	30	100.0	30	100.0

Table III A.13.7 Consideration about diversification before the programme luanch

Consideration before?	Respondent's groups							
	Lp-P		Ag -P		Ay-P		Su-P	
	No.	%	No.	%	No.	%	No.	%
Yes	29	90.6	23	76.7	24	80.0	25	83.3
No	3	9.4	7	23.3	6	20.0	5	16.7
total	32	100.0	30	100.0	30	100.0	30	100.0

Table III A.13.8 Obstruction of diversification before getting the support from programme (multiple choice)

Types of obstruction	Respondent's groups							
	Lp-P		Ag -P		Ay-P		Su-P	
	No.	%	No.	%	No.	%	No.	%
lack of capital	23	71.9	20	66.7	19	63.3	16	53.3
no technical support	6	18.8	5	16.7	4	13.3	5	16.7
no encouragement	2	6.3	6	20.0	2	6.7	2	6.7
others			3	10.0			4	13.3
valid cases	29	90.6	23	76.7	24	80.0	25	83.3

Table III A.13.9 Consideration about expansion of diversification

Consideration about expansion	Respondent's groups							
	Lp-P		Ag -P		Ay-P		Su-P	
	No.	%	No.	%	No.	%	No.	%
Yes	19	59.4	17	56.7	12	40.0	10	33.3
No	12	37.5	12	40.0	18	60.0	17	56.7
hestiating	1	3.1	1	3.3			3	10.0
total	32	100.0	30	100.0	30	100.0	30	100.0

Table III A.13.10 Reconsideration of reverting back to rice, in case rice price is up

Reconsideration of reverting to rice	Respondent's groups							
	Lp-P		Ag -P		Ay-P		Su-P	
	No.	%	No.	%	No.	%	No.	%
back to rice	0	0.0	0	0.0	0	0.0	0	0.0
continuing diversification	32	100.0	30	100.0	30	100.0	30	100.0
total	32	100.0	30	100.0	30	100.0	30	100.0

Table III A.13.11 Reasons of still continuing diversification (multiple choice)

Reasons	Respondent's groups							
	Lp-P		Ag -P		Ay-P		Su-P	
	No.	%	No.	%	No.	%	No.	%
income is more stable	22	68.8	19	63.3	22	73.3	20	66.7
unstable of rice price	17	53.1	11	36.7	15	50.0	18	60.0
not enough water for second rice	8	25.0	4	13.3	1	3.3	7	23.3
satifaction with diversification	20	62.5	14	46.7	20	66.7	14	46.7
others			3	10.0	3	10.0		
total	32	100.0	30	100.0	30	100.0	30	100.0

Table III A.13.12 Opinion regarding to low price of rice (multiple choice)

Opinions	Respondent's groups							
	Lp-P		Ag -P		Ay-P		Su-P	
	No.	%	No.	%	No.	%	No.	%
over supply in Thailand	13	40.6	18	60.0	15	50.0	14	46.7
too much rice from Vietnam	8	25.0	7	23.3	4	13.3	4	13.3
too much rice from the USA	4	12.5	6	20.0	4	13.3	3	10.0
too powerful of the merchants	16	50.0	10	33.3	15	50.0	19	63.3
total	32	100.0	30	100.0	30	100.0	30	100.0

Table III.A.14 Interested in diversification (identified by the non-project group farmers only)

Table III A.14.1 Opinion of respondents about diversification programme

Opinion given	Respondent's groups							
	Lp-N		Ag -N		Ay-N		Su-N	
	No.	%	No.	%	No.	%	No.	%
good	19	90.5	20	100.0	19	95.0	22	84.6
not good	2	9.5	0	0.0			2	7.7
not yet sure					1	5.0	2	7.7
total	21	100.0	20	100.0	20	100.0	26	100.0

Table III A.14.2 Reasons given in terms of good opinion about diversification programme (multiple choice)

Reasons	Respondent's groups							
	Lp-N		Ag -N		Ay-N		Su-N	
	No.	%	No.	%	No.	%	No.	%
increasing income	19	90.5	16	80.0	16	80.0	13	50.0
better income disribution	14	66.7	14	70.0	11	55.0	18	69.2
no need to find off-farm work	10	47.6	11	55.0	8	40.0	10	38.5
others			2	10.0	3	15.0	3	11.5
valid cases	19	90.5	20	100.0	19	95.0	22	84.6

Table III A.14.3 Reasons given in terms of poor opinion about diversification programme (multiple choice)

Reasons	Respondent's groups							
	Lp-N		Ag -N		Ay-N		Su-N	
	No.	%	No.	%	No.	%	No.	%
has to be in debt	1	4.8					2	7.7
do not like to grow fruit trees	1	4.8					1	3.8
valid cases	2	9.5					2	7.7

Table III A.14.4 No. of non-project farmers who were interested in joining the programme

Interested in joining the programme	Respondent's groups							
	Lp-N		Ag -N		Ay-N		Su-N	
	No.	%	No.	%	No.	%	No.	%
Yes	14	66.7	15	75.0	14	70.0	14	53.8
No	7	33.3	3	15.0	5	25.0	9	34.6
not yet sure			2	10.0	1	5.0	3	11.5
total	21	100.0	20	100.0	20	100.0	26	100.0

Table III A.14.5 Reasons of not joining the programme, eventhough they were interested in (multiple choice)

Reasons	Respondent's groups							
	Lp-N		Ag -N		Ay-N		Su-N	
	No.	%	No.	%	No.	%	No.	%
lack of capital	2	9.5	3	15.0	2	10.0	2	7.7
not enough water (even for fruit trees)	4	19.0			1	5.0	2	7.7
not enough labour	1	4.8	1	5.0	5	25.0		
not understanding the programme	7	33.3			1	5.0	1	3.8
prefer growing rice			1	5.0	4	20.0	4	15.4
no land available			6	30.0			2	7.7
already diversified							2	7.7
no answer			4	20.0	1	5.0	4	15.4
valid cases	14	66.7	15	75.0	14	70.0	14	53.8

Table III A.14.6 Reasons of not interested in joining the programme (multiple choice)

Reasons	Respondent's groups							
	Lp-N		Ag -N		Ay-N		Su-N	
	No.	%	No.	%	No.	%	No.	%
do not want to be in debt	1	4.8			1	5.0	1	3.8
not enough labour							1	3.8
very time consuming					1	5.0	1	3.8
no land available	6	28.6	2	10.0	2	10.0	1	3.8
already diversified			1	5.0	1	5.0	5	19.2
valid cases	7	33.3	3	15.0	5	25.0	9	34.6

Table III.B.1 Change of household compositions in 1995 (base on 1994 population)

Table III. B.1.1 No. of household has population changed in 1995

types of change	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
no change	21	72.4	15	75.0	23	76.7	17	90.0	25	86.2	12	66.7	21	72.4	16	76.2
increased	5	17.2	4	20.0	5	16.7	3	10.0	2	6.9	2	11.1	5	17.2	4	19.0
decreased	3	10.3	1	5.0	2	6.7			2	6.9	4	22.2	3	10.3	1	4.8
total	29	100.0	20	100.0	30	100.0	20	100.0	29	100.0	18	100.0	29	100.0	21	100.0

Table III.B.1.2 Amount of population change by numbers in 1995

types of change	Respondents' groups							
	Lp-P	Lp-N	Ag-P	Ag-N	Ay-P	Ay-N	Su-P	Su-N
increased no.	7	5	7	5	2	3	9	5
decreased no.	4	1	2	0	2	6	6	1
% change (base on 1994)	2.3	5.5	4.2	7.1	0	-3.4	2.4	5.1

Table III B.1.3 Causes of population increased

cause of increasing	Respondents' groups							
	Lp-P	Lp-N	Ag-P	Ag-N	Ay-P	Ay-N	Su-P	Su-N
joined by cousin	5		4	3	1	2	3	2
married and moved in	1		1	1			2	
new born	1	5	2	1	1	1	4	3
total	7	5	7	5	2	3	9	5

Table III B.1.4 Causes of population decreased

cause of decreasing	Respondents' groups							
	Lp-P	Lp-N	Ag-P	Ag-N	Ay-P	Ay-N	Su-P	Su-N
married and moved out			1			3	2	
studying and stay outside	1	1				1	2	
working and stay outside	1		1		2	1	2	1
died	2					1		
total	4	1	2	0	2	6	6	1

Table III.B.1.5 Change of education in 1995

change in education	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag-N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
change by no. of household	25	86.2	13	65.0	21	70.0	10	34.5	17	58.6	11	61.1	16	55.2	12	57.1
change by no. of persons	48	36.4	20	26.0	36	28.8	16	21.3	27	22.0	17	20.0	31	24.6	20	24.1

Table III.B.1.6 Causes of education change in 1995

causes of change	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag-N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
start schooling			1	1.3	1	0.8			1	0.8			1	0.8	1	1.2
upgrading	43	32.6	18	23.4	32	25.6	15	20.0	22	17.9	17	20.0	26	20.6	19	22.9
finish studying	5	3.8	1	1.3	3	2.4	1	1.3	4	3.3			4	3.2		
total	48	36.4	20	26.0	36	28.8	16	21.3	27	22.0	17	20.0	31	24.6	20	24.1

Table III B.2 Comparison of average farm size between year 1994 and 1995 (area in rai)

Crop Year	Respondents' groups							
	Lp-P	Lp-N	Ag-P	Ag -N	Ay-P	Ay-N	Su-P	Su-N
1993/94	42.2	48.9	32.6	23.4	27.6	30	32.5	33.8
1994/95	42.3	49.5	33.1	21.9	25.3	30.1	30.3	32.6
change from 1993/94	0.1	0.6	0.5	-1.5	-2.3	0.1	-2.2	-1.2

Table III. B.3 Land ownership status (area in rai)

ownership status	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
owned	642	52.3	206	20.8	600	60.4	330	75.2	349	47.5	142	26.2	534	60.8	447	65.4
rented in	518	42.2	751	75.9	376	37.9	106	24.1	244	33.2	329	60.6	327	37.2	150	21.9
rented out	0	0.0	5	0.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	77	11.3
free	0	0.0		0.0	17	1.7	3	0.7	0	0.0	0	0.0	17	1.9	10	1.5
hire-purchasing	68	5.5	27	2.7	0	0.0	0	0.0	142	19.3	72	13.3	0	0.0	0	0.0
total	1228	100.0	989	100.0	993	100.0	439	100.0	735	100.0	543	100.0	878	100.0	684	100.0

Table III. B.4 Water resources for agriculture in crop year 1994/95

Table III. B.4.1 Water resources for agriculture in the rainy season (crop year 1994/95)

Water resources	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
rainfall																
first priority	28	96.6	17	85.0	28	93.3	18	90.0	19	65.5	11	61.1	20	69.0	15	71.4
second priority	1	3.4	3	15.0	2	6.7	2	10.0	10	34.5	7	38.9	9	31.0	5	23.8
irrigated water																
first priority	1	3.4	3	15.0	2	6.7	2	10.0	10	34.5	7	38.9	9	31.0	4	19.0
second priority	28	96.6	17	85.0	28	93.3	16	80.0	19	65.5	11	61.1	19	65.5	12	57.1
third priority	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	3.4	1	4.8

Table III. B.4.2 Water resources for agriculture in the dry season in crop year 1994/95

Water resources	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
irrigated water																
first priority	27	93.1	6	30.0	22	73.3	14	70.0	29	100.0	18	100.0	24	82.8	16	76.2
second priority	1	3.4	0	0.0	7	23.3	1	5.0	0	0.0	0	0.0	5	17.2	2	9.5
third priority	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
shallow well																
first priority	0	0.0	0	0.0	8	26.7	2	10.0	0	0.0	0	0.0	5	17.2	5	23.8
second priority	0	0.0	0	0.0	6	20.0	2	10.0	1	3.4	0	0.0	2	6.9	4	19.0
third priority	0	0.0	0	0.0	1	3.3	0	0.0	0	0.0	0	0.0	1	3.4	1	4.8
others																
first priority	2	6.9	2	10.0	0	0.0	2	10.0	0	0.0	0	0.0	0	0.0	0	0.0
second priority	0	0.0	4	20.0	1	3.3	0	0.0	1	3.4	0	0.0	4	13.8	2	9.5
third priority	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	3.4	0	0.0

Table III.B.5 Water resource from shallow well

Table III.B.5.1 Comparison of no. of shallow well between crop year 1993/94 and 1994/95

	No. of shallow well owned by each respondents' group							
crop year	Lp-P	Lp-N	Ag-P	Ag -N	Ay-P	Ay-N	Su-P	Su-N
year 1994	4	2	25	6	3	1	11	13
year 1995	5	3	25	7	5	1	10	11
differences (base on 1994)	1	1	0	1	2	0	-1	-2

Table III.B.5.2 No. of respondents who identifed water sufficiency in the dry season

Sufficiency of water	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%		%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Yes	27	93.1	15	75.0	26	86.7	17	85.0	28	96.6	18	100.0	26	89.7	18	85.7
No	2	6.9	5	25.0	4	13.3	3	15.0	1	3.4	0	0.0	3	10.3	3	14.3
total	29	100.0	20	100.0	30	100.0	20	100.0	29	100.0	18	100.0	29	100.0	21	100.0

Table A.B.5.3 No. of respondents who identified causes of insufficient water in the dry season

Causes of insufficiency	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
not enough irrgated water	2	6.9	2	10.0					1	3.4			2	6.9	2	9.5
not enough rain water			2	10.0			1	5.0							1	4.8
both			1	5.0	2	6.7	1	5.0					1	3.4		
poor quality of well water					2	6.7	1	5.0								
total	2	6.9	5	25.0	4	13.3	3	15.0	1	3.4	0	0.0	3	10.3	3	14.3

Table B.5.4 How to solve problem of water insufficiency

How to solve problem	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
do not know					2	6.7	2	10.0					1	3.4		
asked for water provided	2	6.9	5	25.0	2	6.7	1	10.0	1	3.4			2	6.9	3	14.3
total	2	6.9	5	25.0	4	13.3	3	15.0	1	3.4	0	0.0	3	10.3	3	14.3

Table III. B.6 Change of occupations of respondents in crop year 1994/95

Table III.B.6.1 No. of respondents changed occupation in crop year 19994/95

types of occupation	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
No. of persons change occupation	2	1.5	2	2.6	3	2.4	1	1.3	4	3.3	1	1.2	5	4.0	0	0.0

Table III.B.6.2 Types of occupation of these respondents before change (in crop year 1993/94)

types of occupation	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
before change	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
farming	1	0.8			2	1.6			1	0.8			1	0.8		
farming & employee			1	1.3	1	0.8			1	0.8	1	1.2				
officials			1	1.3									1	0.8		
employee													1	0.8		
students	1	0.8					1	1.3	2	1.6			2	1.6		
others																
total	2	1.5	2	2.6	3	2.4	1	1.3	4	3.3	1	1.2	5	4.0	0	0.0

Table III.B.6.3 Types of occupation of these respondents after change (in crop year 1994/95)

types of occupation	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
before change	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
farming									1	0.8			1	0.8		
farming & employee					1	0.8	1	1.3	1	0.8	1	1.2				
officials													2	1.6		
employee	2	1.5	2	2.6	2	1.6			2	1.6			2	1.6		
students																
others																
total	2	1.5	2	2.6	3	2.4	1	1.3	4	3.3	1	1.2	5	4.0	0	0.0

Table III. B.7 Livestock sub-system

Table III. B.7.1 No. of households raising livetock by types

Types of livestovk	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
chicken	5	17.2	4	20.0	11	36.7	7	35.0	8	27.6	7	38.9	10	34.5	3	14.3
duck	3	10.3	2	10.0	4	13.3	2	10.0	2	6.9	2	11.1	2	6.9	1	4.8
pig	1	3.4	2	10.0	1	3.3	3	15.0	1	3.4						
cow	1	3.4			5	16.7	4	20.0	4	13.8	2	11.1	7	24.1		

Table III. B.7.2 Average number of livetock by types

Types of livestovk	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No. of farms	mean (head)	No. of farms	mean (head)	No. of farms	mean (head)	No. of farms	mean (head)	No. of farms	mean (head)	No. of farms	mean (head)	No. of farms	mean (head)	No. of farms	mean (head)
chicken	5	1854	4	5	11	34	7	48	8	395	7	15	10	31	3	32
duck	3	9	2	20	4	17	2	55	2	60	2	15	1	7	1	6
pig	1	1	2	5	1	5	3	7	0	0	0	0	0	0	0	0
cow	1	8	0	0	5	6	3	4	4	3	2	3	7	13	0	0

Table III.B.8 Marketing systems

Table III.B.8.1 Types of products sold by types of buyers in the project group in Lopburi (Lp-P)

farm products / buyers	rice	vegetables	fruit	sugar cane	chicken	egg	cow	fish	total (no.)	total (%)
local people		4	10		2	2		5	23	25.6
merchants	23	9	19		2			11	64	71.1
industries	2			1					3	3.3
total (no.)	25	13	29	1	4	2	0	16	90	100.0
total (%)	27.8	14.4	32.2	1.1	4.4	2.2	0.0	17.8	100.0	

Table III.B.8.2 Types of products sold by types of buyers in the non-project group in Lopburi (Lp-N)

farm products / buyers	rice	vegetables	fruit	sugar cane	chicken	egg	cow	fish	pig	total (no.)	total (%)
local people		1	1		3	1		1		7	18.9
merchants	21		1		3	1		2	2	30	81.1
industries										0	0.0
total (no.)	21	1	2	0	6	2	0	3	2	37	100.0
total (%)	56.8	2.7	5.4	0.0	16.2	5.4	0.0	8.1	5.4	100.0	

Table III.B.8.3 Types of products sold by types of buyers in the project group in Angthong (Ag-P)

farm products / buyers	rice	vegetables	fruit	flowers	chicken	egg	cow	fish	pig	total (no.)	total (%)
local people	1	5	2	1	4	2		2		17	18.9
merchants	27	14	8	2	3	1	4	2	2	63	70.0
industries	9									9	10.0
co-operatives	1									1	1.1
total (no.)	38	19	10	3	7	3	4	4	2	90	100.0
total (%)	42.2	21.1	11.1	3.3	7.8	3.3	4.4	4.4	2.2	100.0	

Table III.B.8.4 Types of products sold by types of buyers in the non-project group in Angthong (Ag-N)

farm products / buyers	rice	vegetab	fruit	flowers	chicken	egg	cow	fish	pig	total (no.)	total (%)
local people		2			2					4	8.5
merchants	15	6	2		4	1	2		2	32	68.1
industries	11									11	23.4
co-operatives										0	0.0
total (no.)	26	8	2	0	6	1	2	0	2	47	100.0
total (%)	55.3	17.0	4.3	0.0	12.8	2.1	4.3	0.0	4.3	100.0	

Table III.B.8.5 Types of products sold by types of buyers in the project group in Ayuthaya (Ay-P)

farm products / buyers	rice	vegetab	fruit	chicken	egg	cow	fish	pig	total (no.)	total (%)
local people		5	3	4			3		15	16.7
merchants	30	13	16	3	4	2	6	1	75	83.3
industries										
co-operatives										
total (no.)	30	18	19	7	4	2	9	1	90	100.0
total (%)	33.3	20.0	21.1	7.8	4.4	2.2	10.0	1.1	100.0	

Table III.B.8.6 Types of products sold by types of buyers in the non-project group in Ayuthaya (Ay-N)

farm products / buyers	rice	vegetab	fruit	chicken	egg	cow	fish	pig	total (no.)	total (%)
local people		1	1						2	4.7
merchants	30	3	3	1		1	1		39	90.7
industries	2								2	4.7
co-operatives									0	0.0
total (no.)	32	4	4	1	0	1	1	0	43	100.0
total (%)	74.4	9.3	9.3	2.3	0.0	2.3	2.3	0.0	100.0	

Table III.B.8.7 Types of products sold by types of buyers in the project group in Supanburi (Su-P)

farm products / buyers	rice	vegetab	fruit	flowers	sugar cane	chicken	egg	cow	fish	total (no.)	total (%)
local people		1	3	2		3				9	9.0
merchants	30	6	15	14	5	3	1	6	4	84	84.0
industries	4				2	1				7	7.0
co-operatives										0	0.0
total (no.)	34	7	18	16	7	7	1	6	4	100	100.0
total (%)	34.0	7.0	18.0	16.0	7.0	7.0	1.0	6.0	4.0	100.0	

Table III.B.8.8 Types of products sold by types of buyers in the non-project group in Supanburi (Su-N)

farm products / buyers	rice	vegetab	fruit	flowers	sugar cane	chicken	egg	cow	fish	total (no.)	total (%)
local people			6			1				7	13.5
merchants	13	5	10	5	6				3	42	80.8
industries	3									3	5.8
co-operatives										0	0.0
total (no.)	16	5	16	5	6	1	0	0	3	52	100.0
total (%)	30.8	9.6	30.8	9.6	11.5	1.9	0.0	0.0	5.8	100.0	

Table III.B.8.9 Market places of farm products of the project group in Lopburi (Lp-P)

farm products / market places	rice	vegetab	fruit	sugar cane	chicken	egg	cow	fish	total (no.)	total (%)
at home	13	3	12	1	2	2		1	34	37.8
in the village	6	7	10		2			11	36	40.0
in the district	5	3	7					4	19	21.1
in the province	1								1	1.1
total (no.)	25	13	29	1	4	2	0	16	90	100.0
total (%)	27.8	14.4	32.2	1.1	4.4	2.2	0.0	17.8	100.0	

Table III.B.8.10 Market places of farm products of the non-project group in Lopburi (Lp-N)

farm products / market places	rice	vegetab	fruit	sugar cane	chicken	egg	cow	fish	pig	total (no.)	total (%)
at home	11	1	2		4			1		19	51.4
in the village	5				2	2		2	2	13	35.1
in the district	5									5	13.5
in the province											
total (no.)	21	1	2	0	6	2	0	3	2	37	100.0
total (%)	56.8	2.7	5.4	0.0	16.2	5.4	0.0	8.1	5.4	100.0	

Table III.B.8.11 Market places of farm products of the project group in Angthong (Ag-P)

farm products / market places	rice	vegetab	fruit	flowers	chicken	egg	cow	fish	pig	total (no.)	total (%)
at home	2	3	3	3	5	1	4	2	2	25	27.8
in the village	1	3	2		2	2		2		12	13.3
in the district	9	4								13	14.4
in the province	6	9	5							20	22.2
central market	20									20	22.2
total (no.)	38	19	10	3	7	3	4	4	2	90	100.0
total (%)	42.2	21.1	11.1	3.3	7.8	3.3	4.4	4.4	2.2	100.0	

Table III.B.8.12 Market places of farm products of the non-project group in Angthong (Ag-N)

farm products / market places	rice	vegetab	fruit	flowers	chicken	egg	cow	fish	pig	total (no.)	total (%)
at home	1	1	2		4	1	2		2	13	27.7
in the village		2			2					4	8.5
in the district										0	0.0
in the province	3	5								8	17.0
central market	22									22	46.8
total (no.)	26	8	2	0	6	1	2	0	2	47	100.0
total (%)	55.3	17.0	4.3	0.0	12.8	2.1	4.3	0.0	4.3	100.0	

Table III.B.8.13 Market places of farm products of the project group in Ayuthaya (Ay-P)

farm products / market places	rice	vegetab	fruit	chicken	egg	cow	fish	pig	total (no.)	total (%)
at home	23	15	12	6	4	2	5	1	68	75.6
in the village	5	3	3	1			4		16	17.8
in the district	2		3						5	5.6
in the province			1						1	1.1
total (no.)	30	18	19	7	4	2	9	1	90	100.0
total (%)	33.3	20.0	21.1	7.8	4.4	2.2	10.0	1.1	100.0	

Table III.B.8.14 Market places of farm products of the non-project group in Ayuthaya (Ay-N)

farm products / farm products	rice	vegetab	fruit	chicken	egg	cow	fish	pig	total (no.)	total (%)
market places	20	2	2	1		1	1		27	62.8
at home	7	1	1						9	20.9
in the village	5	1	1						7	16.3
in the district									0	0.0
in the province										
total (no.)	32	4	4	1	0	1	1	0	43	100.0
total (%)	74.4	9.3	9.3	2.3	0.0	2.3	2.3	0.0	100.0	

Table III.B.8.15 Market places of farm products of the project group in Supanburi (Su-P)

farm products / market places	rice	vegetab	fruit	flowers	sugar cane	chicken	egg	cow	fish	total (no.)	total (%)
at home	7	1	3	2		3				16	16.0
in the village	11	6	15	14	5	3	1	6	4	65	65.0
in the district	11				2	1				14	14.0
in the province										0	0.0
central market	5									5	5.0
total (no.)	34	7	18	16	7	7	1	6	4	100	100.0
total (%)	34.0	7.0	18.0	16.0	7.0	7.0	1.0	6.0	4.0	100.0	

Table III.B.8.16 Market places of farm products of the non-project group in Supanburi (Su-N)

farm products / market places	rice	vegetab	fruit	flowers	sugar cane	chicken	egg	cow	fish	total (no.)	total (%)
at home	3	2	6			1			1	13	25.0
in the village	2	1	4	3	3				2	15	28.8
in the district	8	2	3	2						15	28.8
in the province			3		3					6	11.5
central market	3									3	
total (no.)	16	5	16	5	6	1	0	0	3	52	94.2
total (%)	30.8	9.6	30.8	9.6	11.5	1.9	0.0	0.0	5.8	100.0	

Table III.B.8.17 Market problems by types of farm products of the project group in Lopburi (Lp-P)

farm products / problems	rice	vegetab	fruit	sugar cane	chicken	egg	cow	fish	pig	total (no.)	total (%)
low price	12	5	2					4	1	24	66.7
few buyers	1		5							6	16.7
poor quality	1	3	1							5	13.9
others								1		1	2.8
total (no.)	14	8	8	0	0	0	0	5	1	36	100.0
total (%)	38.9	22.2	22.2	0.0	0.0	0.0	0.0	13.9	2.8	100.0	

Table III.B.8.18 Market problems by types of farm products of the non-project group in Lopburi (Lp-N)

farm products / problems	rice	vegetab	fruit	sugar cane	chicken	egg	cow	fish	pig	total (no.)	total (%)
low price	16								1	17	77.3
few buyers	1				3				1	5	22.7
total (no.)	17	0	0	0	3	0	0	0	2	22	100.0
total (%)	77.3	0.0	0.0	0.0	13.6	0.0	0.0	0.0	9.1	100.0	

Table III.B.8.19 Market problems by types of farm products of the project group in Angthong (Ag-P)

farm products / problems	rice	vegetab	fruit	flowers	chicken	egg	cow	fish	pig	total (no.)	total (%)
low price	20	2						5		27	90.0
few buyers								1		1	3.3
poor quality								1		1	3.3
others								1		1	3.3
total (no.)	20	2	0	0	0	0	0	8	0	30	100.0
total (%)	66.7	6.7	0.0	0.0	0.0	0.0	0.0	26.7	0.0	100.0	

Table III.B.8.20 Market problems by types of farm products of the non-project group in Angthong (Ag-N)

farm products / problems	rice	vegetab	fruit	flowers	chicken	egg	cow	fish	pig	total (no.)	total (%)
low price	12		2			1		2	1	18	100.0
total (no.)	12	0	2	0	0	1	0	2	1	18	100.0
total (%)	66.7	0.0	11.1	0.0	0.0	5.6	0.0	11.1	5.6	100.0	

Table III.B.8.21 Market problems by types of farm products of the project group in Ayuthaya (Ay-P)

farm products / problems	rice	vegetab	fruit	flowers	chicken	egg	cow	fish	pig	total (no.)	total (%)
low price	9	5						3	1	18	100.0
total (no.)	9	5	0	0	0	0	0	3	1	18	100.0
total (%)	50.0	27.8	0.0	0.0	0.0	0.0	0.0	16.7	5.6	100.0	

Table III.B.8.22 Market problems by types of farm products of the non-project group in Ayuthaya (Ay-N)

farm products / problems	rice	vegetab	fruit	flowers	chicken	egg	cow	fish	pig	total (no.)	total (%)
low price	13	2								15	100.0
total (no.)	13	2	0	0	0	0	0	0	0	15	100.0
total (%)	86.7	13.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	

Table III.B.8.23 Market problems by types of farm products of the project group in Supanburi (Su-P)

farm products / problems	rice	vegetab	fruit	flowers	chicken	egg	cow	fish	pig	total (no.)	total (%)
low price	6		2	1	1			2		12	80.0
few buyers	1						1			2	13.3
no transportati	1									1	6.7
total (no.)	8	0	2	1	1	0	1	2	0	15	100.0
total (%)	53.3	0.0	13.3	6.7	6.7	0.0	6.7	13.3	0.0	100.0	

Table III.B.8.24 Market problems by types of farm products of the non-project group in Supanburi (Su-N)

farm products / problems	rice	veget-ables	fruit	flowers	chicken	egg	cow	fish	pig	total (no.)	total (%)
low price	3		3							6	100.0
total (no.)	3	0	3	0	0	0	0	0	0	6	100.0
total (%)	50.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	

Table III.B.9 Problems in Agriculture

Table III. B.9.1 Problems identified by respondents

Having problems	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Yes	15	51.7	16	80.0	16	53.3	15	75.0	15	51.7	16	88.9	14	48.3	9	42.9
No	14	48.3	4	20.0	14	46.7	5	25.0	14	48.3	2	11.1	15	51.7	12	57.1
total	29	100.0	20	100.0	30	100.0	20	100.0	29	100.0	18	100.0	29	100.0	21	100.0

Table III. B.9.2 Causes of problems (multiple choice)

Causes of problems	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
not enough water	2	6.9	5	25.0	4	13.3	3	15.0	1	3.4	0	0.0	3	10.3	3	14.3
marketing	12	41.4	16	80.0	11	36.7	12	60.0	9	31.0	13	72.2	6	20.7	4	19.0
lack of credit	0	0.0	2	10.0	0	0.0	1	5.0	1	3.4	0	0.0	0	0.0	0	0.0
insect damage	8	27.6	1	5.0	7	23.3	3	15.0	3	10.3	3	16.7	6	20.7	3	14.3
high input cost	2	6.9	9	45.0	7	23.3	5	25.0	7	24.1	7	38.9	4	13.8	3	14.3
others	4	13.8	2	10.0	1	3.3	2	10.0	0	0.0	2	11.1	1	3.4	0	0.0
valid cases	15	51.7	16	80.0	16	53.3	15	75.0	15	51.7	16	88.9	14	48.3	9	42.9

Table III. B.9.3 Suggestion for solving problems (multiple choice)

Suggested items	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
water provided	1	3.4	3	15.0	3	10.0	4	20.0	1	3.4	0	0.0	2	6.9	3	14.3
price support	5	17.2	7	35.0	8	26.7	9	45.0	7	24.1	11	61.1	4	13.8	2	9.5
credit provided	0	0.0	1	5.0	0	0.0	0	0.0	1	3.4	0	0.0	1	3.4	0	0.0
inputs subsidy	3	10.3	4	20.0	6	20.0	5	25.0	5	17.2	5	27.8	2	6.9	3	14.3
technical advice	2	6.9	0	0.0	3	10.0	2	10.0	1	3.4	1	5.6	3	10.3	0	0.0
diversification	0	0.0	1	5.0	2	6.7	2	10.0	1	3.4	0	0.0	0	0.0	0	0.0
others	0	0.0	1	5.0	2	6.7	0	0.0	0	0.0	2	11.1	0	0.0	1	4.8
valid cases	12	41.4	11	55.0	14	46.7	11	55.0	11	37.9	14	77.8	10	34.5	7	33.3

Table III.B.10 Credit systems

Table III. B.10.1 No. of responents who received credit (besides the support for diversification)

	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
Receiving	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
credit	18	62.1	18	90.0	22	73.3	14	70.0	18	62.1	14	77.8	17	58.6	12	57.1

Table III. B.10.2 Sources of credit

Sources	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
BAAC	11	34.4	5	25.0	12	40.0	7	35.0	14	48.3	12	66.7	7	24.1	1	4.8
co-operatives	4	12.5	9	45.0	3	10.0	6	30.0	4	13.8	0	0.0	9	31.0	6	28.6
commercial bank	2	6.3	0	0.0	4	13.3	1	5.0	0	0.0		0.0	0	0.0	5	23.8
friends	1	3.1	1	5.0	2	6.7	0	0.0	0	0.0	1	5.6	0	0.0	0	0.0
merchants	0		3	15.0	1	3.3	0	0.0	0	0.0	1	5.6	1	3.4	0	0.0
valid cases	18	56.3	18	90.0	22	73.3	14	70.0	18	62.1	14	77.8	17	58.6	12	57.1

Table III. B.11 No. of responents not growing second rice in crop year 1994/95 (both partial and full canceled)

	Respondents' groups															
	Lp-P		Lp-N		Ag-P		Ag -N		Ay-P		Ay-N		Su-P		Su-N	
Cancelling	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
second rice	27	93.1	18	90.0	7	23.3	6	30.0	7	24.1	0	0.0	12	41.4	15	71.4

Table III B.13 Diversification within the Programme

Table III B.13.1 Opinion about diversification after joining the programme for a year

Opinion given	Respondent's groups							
	Lp-P		Ag -P		Ay-P		Su-P	
	No.	%	No.	%	No.	%	No.	%
good	29	100.0	29	96.7	28	96.6	29	100.0
bad	0	0.0	0	0.0	0	0.0	0	0.0
not sure	0	0.0	1	3.3	1	3.4	0	0.0
total	29	100.0	30	100.0	29	100.0	29	100.0

Table III B.13.2 Good attitude about diversification programme (multiple choice)

Reasons	Respondent's groups							
	Lp-P		Ag -P		Ay-P		Su-P	
	No.	%	No.	%	No.	%	No.	%
incresing income	28	96.6	26	86.7	23	79.3	25	86.2
better income disribution	19	65.5	18	60.0	16	55.2	23	79.3
no need to find off-farm work	8	27.6	13	43.3	12	41.4	6	20.7
others	4	13.8	5	16.7	3	10.3	3	10.3
total	29	100.0	30	100.0	29	100.0	29	100.0

Table III B.13.3 Satisfaction about the support for diversification

Satisfactory	Respondent's groups							
	Lp-P		Ag -P		Ay-P		Su-P	
	No.	%	No.	%	No.	%	No.	%
Yes	29	100.0	30	100.0	29	100.0	29	100.0
No	0	0.0	0	0.0	0	0.0	0	0.0
total	29	100.0	30	100.0	29	100.0	29	100.0

Table III B.13.4 Consideration about expansion of diversification

Consideration about expansion	Respondent's groups							
	Lp-P		Ag -P		Ay-P		Su-P	
	No.	%	No.	%	No.	%	No.	%
Yes	8	27.6	10	33.3	3	10.3	6	20.7
No	21	72.4	20	66.7	26	89.7	23	79.3
total	29	100.0	30	100.0	29	100.0	29	100.0

Table III B.13.5 Reconsideration of reverting back to rice

Reconsideration of reverting to rice	Respondent's groups							
	Lp-P		Ag -P		Ay-P		Su-P	
	No.	%	No.	%	No.	%	No.	%
back to rice	1	3.4	0	0.0	0	0.0	0	0.0
continuing diversification	28	96.6	30	100.0	29	100.0	29	100.0
total	29	100.0	30	100.0	29	100.0	29	100.0

Table III B.13.6 Reasons of still continuing diversification (multiple choice)

Reasons	Respondent's groups							
	Lp-P		Ag -P		Ay-P		Su-P	
	No.	%	No.	%	No.	%	No.	%
income is more stable	24	82.8	24	80.0	18	62.1	20	69.0
unstable of rice price	13	44.8	10	33.3	11	37.9	13	44.8
not enough water for second rice	4	13.8	4	13.3	1	3.4	5	17.2
satifaction with diversification	14	48.3	19	63.3	18	62.1	13	44.8
others	1	3.4	0	0.0	0	0.0	0	0.0
valid cases	28	96.6	30	100.0	29	100.0	29	100.0

Table III. B.13.7 Opinion regarding to low price of rice (multiple choice)

Opinions	Respondent's groups							
	Lp-P		Ag -P		Ay-P		Su-P	
	No.	%	No.	%	No.	%	No.	%
over supply in Thailand	11	37.9	7	23.3	10	34.5	10	34.5
too much rice in the world market	8	27.6	10	33.3	6	20.7	10	34.5
too powerful of the merchants	12	41.4	11	36.7	9	31.0	9	31.0
not enough efficiency of government	5	17.2	4	13.3	4	13.8	5	17.2
total	29	100.0	30	100.0	29	100.0	29	100.0

Table III.B.14 Interested in diversification (identified by the non-project group farmers only)

Table III. B.14.1 No. of respondents who joined the diversification programme in crop year 1994/95

	Respondent's groups							
	Lp-N		Ag -N		Ay-N		Su-N	
	No.	%	No.	%	No.	%	No.	%
joining the programme	2	10.0	2	10.0	2	11.1	3	14.3

Table III B.14.2 Reasons of joining the diversification programme in crop year 1994/95 (multiple choice)

Reasons	Respondent's groups							
	Lp-N		Ag -N		Ay-N		Su-N	
	No.	%	No.	%	No.	%	No.	%
unstable of rice price	2	10.0	1	5.0	0	0.0	2	9.5
no need to find off-farm work	1	5.0	0	0.0	0	0.0	1	4.8
not enough water for second rice	1	5.0	0	0.0	0	0.0	1	4.8
expect to get higher income	2	10.0	2	10.0	2	11.1	2	9.5
others	1	5.0	1	5.0	0	0.0	1	4.8
valid cases	2	10.0	2	10.0	2	11.1	3	14.3

Table III B.14.3 Amount of credit received for diversification (Baht)

Amount of credit received (Baht)	Respondent's groups			
	Lp-N	Ag -N	Ay-N	Su-N
mean	126000	43500	18000	91333
minimum	72000	35000	18000	34000
maximum	180000	52000	18000	200000

Table III B.14.4 Area changed for diversification (rai)

area changed (rai)	Respondent's groups			
	Lp-N	Ag -N	Ay-N	Su-N
average	6.0	5.0	2.0	9.75

Table III B.14.5 Opinion of non-project farmers who joined the programme in crop year 1994/95

Opinion given	Respondent's groups							
	Lp-N		Ag -N		Ay-N		Su-N	
	No.	%	No.	%	No.	%	No.	%
good	2	10.0	2	10.0	2	11.1	3	14.3
not good	0	0.0	0	0.0	0	0.0	0	0.0
valid cases	2	10.0	2	10.0	2	11.1	3	14.3

Table III B.14.6 Reasons given in terms of good opinion in terms of joinng the programme (multiple choice)

Reasons	Respondent's groups							
	Lp-N		Ag -N		Ay-N		Su-N	
	No.	%	No.	%	No.	%	No.	%
incresing income	2	10.0	2	10.0	2	11.1	3	16.7
better income disribution	2	10.0	1	5.0	1	5.6	3	16.7
no need to find off-farm work	1	5.0	2	10.0	0	0.0	3	16.7
others	0	0.0	0	0.0	0	0.0	0	0.0
valid cases	2	10.0	2	10.0	2	11.1	3	16.7

Table III. B.14.7 Satisfaction about the support for diversification (identified by those who joined the project in 1994/95)

Satisfactory	Respondent's groups							
	Lp-N		Ag -N		Ay-N		Su-N	
	No.	%	No.	%	No.	%	No.	%
Yes	2	10.0	2	10.0	2	11.1	3	14.3
No	0	0.0	0	0.0	0	0.0	0	0.0
total	2	10.0	2	10.0	2	11.1	3	14.3

Table III B.14.8 Opinion about diversification of the non-project farmers who did not join the programme

Opinion given	Respondent's groups							
	Lp-N		Ag -N		Ay-N		Su-N	
	No.	%	No.	%	No.	%	No.	%
good	17	85.0	15	75.0	13	72.2	16	76.2
not good	1	5.0	0	0.0	2	11.1	1	4.8
not yet sure	0	0.0	3	15.0	1	5.6	1	4.8
valid cases	18	90.0	18	90.0	16	88.9	18	85.7

Table III B.14.9 Reasons given in terms of good opinion about diversification programme (multiple choice)
(identified by the non-project farmers who did not join the programme)

Reasons	Respondent's groups							
	Lp-N		Ag -N		Ay-N		Su-N	
	No.	%	No.	%	No.	%	No.	%
increasing income	17	85.0	11	55.0	13	72.2	11	52.4
better income disribution	12	60.0	8	40.0	10	55.6	12	57.1
no need to find off-farm work	8	40.0	5	25.0	4	22.2	5	23.8
others	1	5.0	1	5.0	0	0.0	1	4.8
valid cases	17	85.0	15	75.0	13	72.2	16	76.2

Table III B.14.10 Reasons given in terms of poor opinion about diversification programme (multiple choice)
(identified by the non-project farmers who did not join the programme)

Reasons	Respondent's groups							
	Lp-N		Ag -N		Ay-N		Su-N	
	No.	%	No.	%	No.	%	No.	%
has to be in debt	1	5.0	0	0.0	2	11.1	1	4.8
does not give high return	0	0.0	0	0.0	1	5.6	0	0.0
more labour required and complicated	1	5.0	0	0.0	2	11.1	0	0.0
valid cases	1	5.0	0	0.0	2	11.1	1	4.8

Table III B.14.11 Reasons given in terms of hesitating about diversification programme
(identified by the non-project farmers who did not join the programme)

Reasons	Respondent's groups							
	Lp-N		Ag -N		Ay-N		Su-N	
	No.	%	No.	%	No.	%	No.	%
not sure about the results	0	0.0	3	15.0	1	5.6	1	4.8
valid cases	0	0.0	3	15.0	1	5.6	1	4.8

Table III B.14.12 No. of non-project farmers who were interested in joining the programme
(identified by the non-project farmers who did not join the programme)

Interested in joining the programme	Respondent's groups							
	Lp-N		Ag -N		Ay-N		Su-N	
	No.	%	No.	%	No.	%	No.	%
Yes	14	70.0	12	60.0	8	44.4	7	26.9
No	4	20.0	4	20.0	7	38.9	11	42.3
not yet sure	0	0.0	2	10.0	1	5.6	0	0.0
total	18	90.0	18	90.0	16	88.9	18	69.2

Table III B.14.13 Reasons of not joining the programme, eventhough they were interested in (multiple choice)

Reasons	Respondent's groups							
	Lp-N		Ag -N		Ay-N		Su-N	
	No.	%	No.	%	No.	%	No.	%
lack of capital	1	5.0	4	20.0	3	16.7	1	4.8
not enough water (even for fruit trees)	1	5.0	0	0.0	0	0.0	0	0.0
not enough labour	2	10.0	6	30.0	0	0.0	3	14.3
no land available	10	50.0	3	15.0	5	27.8	3	14.3
valid cases	14	70.0	12	60.0	8	44.4	7	33.3

Table III B.14.14 Reasons of not interested in joining the programme (multiple choice)

Reasons	Respondent's groups							
	Lp-N		Ag -N		Ay-N		Su-N	
	No.	%	No.	%	No.	%	No.	%
lack of capital	0	0.0	0	0.0	2	11.1	1	4.8
not enough labour	3	15.0	3	15.0	2	11.1	6	28.6
no land available	1	5.0	1	5.0	2	11.1	5	23.8
already diversified	1	5.0	0	0.0	0	0.0	5	23.8
do not like fruit tree (too complicated)	2	10.0	1	5.0	3	16.7	0	0.0
valid cases	4	20.0	4	20.0	5	27.8	11	52.4

Table III B.14.15 Reasons of hesitatng in joining the programme

Reasons	Respondent's groups							
	Lp-N		Ag -N		Ay-N		Su-N	
	No.	%	No.	%	No.	%	No.	%
far from water resource	0	0.0	1	5.0	0	0.0	0	0.0
not enough labour	0	0.0	1	5.0	0	0.0	0	0.0
no land available	0	0.0	0	0.0	0	0.0	0	0.0
wait to see the result first	0	0.0	0	0.0	1	5.6	0	0.0
valid cases	0	0.0	2	10.0	1	5.6	0	0.0

Table III.C.1 Basic information of household compositions

Table III. C.1.1 Origianl palce of the head of household

original place	Respondents' groups							
	Ph-P		Ph-N		Ka-P		Ka -N	
	No.	%	No.	%	No.	%	No.	%
born here	26	81.3	18	85.7	26	86.7	18	90.0
migrated	6	18.8	3	14.3	4	13.3	2	10.0
total	32	100.0	21	100.0	30	100.0	20	100.0

Table III.A.1.2 Family size by age group

Age group	Respondents' groups							
	Ph-P		Ph-N		Ka-P		Ka -N	
	No.	mean	No.	mean	No.	mean	No.	mean
below 15	38	1.2	19	1.0	33	1.1	17	0.9
16 - 65	83	2.7	54	2.7	92	3.1	64	3.2
over 65	9	0.3	3	0.2	7	0.2	2	0.1
total	130	4.2	76	3.8	132	4.4	83	4.2

Table III C.1.3 Education level of household members

Education level	Respondents' groups							
	Ph-P		Ph-N		Ka-P		Ka -N	
	No.	%	No.	%	No.	%	No.	%
None	16	12.3	11	14.5	11	8.3	10	12.0
grade 1-4	61	46.9	39	51.3	66	50.0	37	44.6
grade 5-6	25	19.2	13	17.1	29	22.0	21	25.3
grade 7-9	14	10.8	8	10.5	13	9.8	10	12.0
grade 10-12	7	5.4	1	1.3	10	7.6	2	2.4
technician	6	4.6	2	2.6	2	1.5	1	1.2
BSc.	1	0.8	2	2.6	1	0.8	2	2.4
total	130	100.0	76	100.0	132	100.0	83	100.0

Table III C.2 Average farm size (rai)

Farm size (rai)	Respondents' groups			
	Ph-P	Ph-N	Ka-P	Ka -N
mean	33.2	28.9	49.5	39.6
minimum	3.0	10.0	8.0	10.0
maximum	104.0	112.0	141.0	90.0

Table III. C.3 Land ownership status (area in rai)

ownership status	Respondents' groups							
	Ph-P		Ph-N		Ka-P		Ka -N	
	Area	%	Area	%	Area	%	Area	%
owned	501.3	48.8	302.0	52.2	995.0	67.0	449.0	56.7
rented in	389.0	37.9	152.0	26.3	490.5	33.0	292.3	36.9
rented out	107.0	10.4	107.0	18.5	0.0	0.0	50.0	6.3
free	30.3	2.9	17.0	2.9	0.0	0.0	0.0	0.0
total	1027.5	100.0	578.0	100.0	1485.5	100.0	791.3	100.0

Table III.C.4 Water resources for agriculture

Table III. C.4.1 Water resources for agriculture in the rainy season

Water resources	Respondents' groups							
	Ph-P		Ph-N		Ka-P		Ka -N	
	No.	%	No.	%	No.	%	No.	%
rainfall								
first priority	11	35.5	6	30.0	5	16.7	2	10.0
second priority	13	41.9	9	45.0	18	60.0	15	75.0
irrigated water								
first priority	15	48.4	9	45.0	20	66.7	15	75.0
second priority	8	25.8	6	30.0	3	10.0	2	10.0
shallow well								
first priority	5	16.1	5	25.0	5	16.7	3	15.0
second priority	10	32.3	3	15.0	9	30.0	3	15.0

Table III. C.4.2 Water resources for agriculture in the dry season

Water resources	Respondents' groups							
	Ph-P		Ph-N		Ka-P		Ka -N	
	No.	%	No.	%	No.	%	No.	%
irrigated water								
first priority	18	68.8	11	42.9	20	33.3	14	80.0
second priority	8	12.5	5	4.8	3	43.3	3	10.0
shallow well								
first priority	13	0.0	9	0.0	10	53.3	6	15.0
second priority	9	9.4	3	4.8	10	16.7	2	15.0

Table III.C.5. Water resoources from shallow well

Table III.C.5.1 No. of farmers who are having shallow well

Having shallow well	Respondents' groups							
	Ph-P		Ph-N		Ka-P		Ka -N	
	No.	%	No.	%	No.	%	No.	%
Yes	25	80.6	13	65.0	23	76.7	8	40.0
No	6	19.4	7	35.0	7	23.3	12	60.0
total	31	100.0	20	100.0	30	100.0	20	100.0

Table III.C.5.2 No. of respondents who identifed water sufficiency in the dry season

Sufficiency of water	Respondents' groups							
	Ph-P		Ph-N		Ka-P		Ka -N	
	No.	%	No.	%	No.	%	No.	%
Yes	28	90.3	18	90.0	26	86.7	18	90.0
No	3	9.7	2	10.0	4	13.3	2	10.0
total	31	100.0	20	100.0	30	100.0	20	100.0

Table III. C.5.3 No. of respondents who identified causes of insufficient water in the dry season (multiple choice)

Causes of insufficiency	Respondents' groups							
	Ph-P		Ph-N		Ka-P		Ka -N	
	No.	%	No.	%	No.	%	No.	%
not enough water resource	2	6.5	1	5.0	1	3.3	1	5.0
not enough irrigated water	3	9.7	2	10.0	4	13.3	2	10.0
not enough rain water	1	3.2	0	0.0	0	0.0	0	0.0
valid cases	3	9.7	2	10.0	4	13.3	2	10.0

Table III.C.5.4 How to solve problem of water insufficiency (multiple choice)

How to solve problem	Respondents' groups							
	Ph-P		Ph-N		Ka-P		Ka -N	
	No.	%	No.	%	No.	%	No.	%
do not know	1	3.2	0	0.0	1	3.3	2	10.0
asked formore water provided	3	9.7	2	10.0	2	6.7	2	10.0
improve water resources	2	6.5	1	5.0	1	3.3	0	0.0
valid cases	3	9.7	2	10.0	4	13.3	2	10.0

Table III. C.6 Main occupations of household members

types of occupation	Respondents' groups							
	Ph--P		Ph-N		Ka-P		Ka -N	
	No.	%	No.	%	No.	%	No.	%
farming	50	38.5	36	47.4	56	42.4	40	48.2
farming & employee	22	16.9	11	14.5	18	13.6	17	20.5
officials	1	0.8	2	2.6	0	0.0	1	1.2
employee	1	0.8	3	3.9	2	1.5	0	0.0
students	43	33.1	17	22.4	43	32.6	17	20.5
others	13	10.0	7	9.2	13	9.8	8	9.6
total	130	100.0	76	100.0	132	100.0	83	100.0

Table III.C.7 Livestock sub-system

Table III.C.7.1 No. of households raising livestock by types

Types of livestock	Respondents' groups							
	Ph--P		Ph-N		Ka-P		Ka -N	
	No.	%	No.	%	No.	%	No.	%
chicken	18	58.1	10	50.0	23	76.7	8	40.0
duck	9	29.0	3	15.0	9	30.0	3	15.0
pig	3	9.7	0	0.0	2	6.7	0	0.0
cow	1	3.2	0	0.0	1	3.3	0	0.0

Table III.C.7.2 Average number of livestock by types

Types of livestock	Respondents' groups							
	Ph-P		Ph-N		Ka-P		Ka -N	
	No. of farms	mean (head)	No. of farms	mean (head)	No. of farms	mean (head)	No. of farms	mean (head)
chicken	18	47	10	16	23	271	8	31
duck	9	70	3	26	9	181	3	37
pig	3	17	0	0	2	34	0	0
cow	1	13	0	0	1	2	0	0

Table III.C.8 Marketing systems

Table III.C.8.1 Types of products sold by types of buyers in the project group in Phitsanulok (Ph-P)

farm products / buyers	rice	vegeta-bles	fruit	soy bean	chicken	egg	cow	fish	pig	total (no.)	total (%)
local people	7	6	2	1	3	1		3		23	25.0
merchants	37	7	1	11	7	1	1	1	2	68	73.9
industries	1									1	1.1
total (no.)	45	13	3	12	10	2	1	4	2	92	100.0
total (%)	48.9	14.1	3.3	13.0	10.9	2.2	1.1	4.3	2.2	100.0	

Table III. C.8.2 Types of products sold by types of buyers in the non-project group in Phitsanuloki (Ph-N)

farm products / buyers	rice	vegeta-bles	fruit	soy bean	chicken	egg	cow	fish	pig	total (no.)	total (%)
local people	2	1	2		1			1		7	12.7
merchants	29	1	3	10	3			1		47	85.5
industries	1									1	1.8
total (no.)	32	2	5	10	4	0	0	2	0	55	100.0
total (%)	58.2	3.6	9.1	18.2	7.3	0.0	0.0	3.6	0.0	100.0	

Table III.C.8.3 Types of products sold by types of buyers in the project group in Kampaengphet (Ka-P)

farm products / buyers	rice	vegeta-bles	fruit	soy bean	sugar cane	flowers	chicken	egg	cow	fish	pig	total (no.)	total (%)
local people		7	1				1			2		11	10.4
merchants	46	9	6	18		1	3	2	1	5	1	92	86.8
industries	1				2							3	2.8
total (no.)	47	16	7	18	2	1	4	2	1	7	1	106	100.0
total (%)	44.3	15.1	6.6	17.0	1.9	0.9	3.8	1.9	0.9	6.6	0.9	100.0	

Table III.C.8.4 Types of products sold by types of buyers in the non-project group in Kampaengphet (Ka-N)

farm products / buyers	rice	vegeta-bles	fruit	soy bean	sugar cane	chicken	egg	cow	fish	pig	total (no.)	total (%)
local people	2		2	1		2	1		3		11	19.0
merchants	32		2	12							46	79.3
industries					1						1	1.7
total (no.)	34	0	4	13	1	2	1	0	3	0	58	100.0
total (%)	58.6	0.0	6.9	22.4	1.7	3.4	1.7	0.0	5.2	0.0	100.0	

Table III.C.8.5 Market places of farm products of the project group in Phitsanulok (Ph-P)

farm products / market places	rice	vegeta-bles	fruit	soy bean	chicken	egg	cow	fish	pig	total (no.)	total (%)
at home		1	3	1	6	1		1	1	14	15.2
in the village	14	12		3	2	1	1	3		36	39.1
in the district	24			6	2				1	33	35.9
in the province	5			2						7	7.6
central market	2									2	2.2
total (no.)	45	13	3	12	10	2	1	4	2	92	100.0
total (%)	48.9	14.1	3.3	13.0	10.9	2.2	1.1	4.3	2.2	100.0	

Table III.C.8.6 Market places of farm products of the non-project group in Phitsanulok (Ph-N)

farm products / market places	rice	vegeta-bles	fruit	soy bean	chicken	egg	cow	fish	pig	total (no.)	total (%)
at home			2		2			1		5	9.1
in the village	9	2	2	6				1		20	36.4
in the district	15		1	4	2					22	40.0
in the province	6									6	10.9
central market	2									2	3.6
total (no.)	32	2	5	10	4	0	0	2	0	55	100.0
total (%)	58.2	3.6	9.1	18.2	7.3	0.0	0.0	3.6	0.0	100.0	

Table III.C.8.7 Market places of farm products of the project group in Kampaengphet (Ka-P)

farm products / market places	rice	vegeta-bles	fruit	soy bean	sugar cane	flowers	chicken	egg	cow	fish	pig	total (no.)	total (%)
at home	4	4	4	1		1	3	2	1	6	1	27	25.5
in the village	38	10	2	14			1			1		66	62.3
in the district	5	2		3								10	9.4
in the province			1		2							3	2.8
total (no.)	47	16	7	18	2	1	4	2	1	7	1	106	100.0
total (%)	44.3	15.1	6.6	17.0	1.9	0.9	3.8	1.9	0.9	6.6	0.9	100.0	

Table III.C.8.8 Market places of farm products of the non-project group in Kampaengphet (Ka-N)

farm products / market places	rice	vegeta-bles	fruit	soy bean	sugar cane	chicken	egg	cow	fish	pig	total (no.)	total (%)
at home	1		1			2	1		3		8	13.8
in the village	21		3	7							31	53.4
in the district	12			6	1						19	32.8
total (no.)	34	0	4	13	1	2	1	0	3	0	58	100.0
total (%)	58.6	0.0	6.9	22.4	1.7	3.4	1.7	0.0	5.2	0.0	100.0	

Table III.C.8.9 Market problems by types of farm products of the project group in Phitsanulok (Ph-P)

farm products / problems	rice	vegetab	fruit	soy bean	chicken	pig	total (no.)	total (%)
low price	28	3		4	1	1	37	88.1
few buyers		3					3	7.1
poor quality	2						2	4.8
total (no.)	30	6	0	4	1	1	42	100.0
total (%)	71.4	14.3	0.0	9.5	2.4	2.4	100.0	

Table III.C.8.10 Market problems by types of farm products of the non-project group in Phitsanulok (Ph-N)

farm products / problems	rice	vegetab	fruit	soy bean	total (no.)	total (%)
low price	11		1	1	13	92.9
poor quality	1				1	7.1
total (no.)	12	0	1	1	14	100.0
total (%)	85.7	0.0	7.1	7.1	100.0	

Table III.C.8.11 Market problems by types of farm products of the project group in Kampaengphet (Ka-P)

farm products / problems	rice	vegetab	soy bean	sugar cane	fish	total (no.)	total (%)
low price	15	4	2		1	22	75.9
few buyers	1					1	3.4
poor quaity	3					3	10.3
no transportation	2			1		3	10.3
total (no.)	21	4	2	1	1	29	100.0
total (%)	72.4	13.8	6.9	3.4	3.4	100.0	

Table III.C.8.12 Market problems by types of farm products of the non-project group in Kampaengphet (Ka-N)

farm products / problems	rice	vegetab	fruit	soy bean	sugar cane	total (no.)	total (%)
low price	19		1	2	1	23	76.7
few buyers	1			2		3	10.0
poor quaity	2			1		3	10.0
no transportation	1					1	3.3
total (no.)	23	0	1	5	1	30	100.0
total (%)	76.7	0.0	3.3	16.7	3.3	100.0	

Table III.C.9 Problems in Agriculture

Table III C.9.1 Problems identified by responents

Having problems	Respondents' groups							
	Ph-P		Ph-N		Ka-P		Ka -N	
	No.	%	No.	%	No.	%	No.	%
Yes	27	87.1	14	70.0	23	76.7	18	90.0
No	4	12.9	6	30.0	7	23.3	2	10.0
total	31	100.0	20	100.0	30	100.0	20	100.0

Table III.C.9.2 Causes of problems (multiple choice)

Causes of problems	Respondents' groups							
	Ph-P		Ph-N		Ka-P		Ka -N	
	No.	%	No.	%	No.	%	No.	%
not enough water	3	9.7	2	10.0	4	13.3	2	10.0
marketing	27	87.1	11	55.0	15	50.0	19	95.0
high input cost	4	12.9	2	10.0	5	16.7	2	10.0
insect damage	11	35.5	4	20.0	9	30.0	8	40.0
flood	11	35.5	4	20.0	3	10.0	3	15.0
lack of knowledge	1	3.2	0	0.0	3	10.0	0	0.0
shortage of labour	0	0.0	0	0.0	2	6.7	0	0.0
others	0	0.0	0	0.0	1	3.3	5	25.0
valid cases	27	87.1	14	70.0	23	76.7	18	90.0

Table III. C.9.3 Suggestion for solving problems (multiple choice)

Suggested items	Respondents' groups							
	Ph-P		Ph-N		Ka-P		Ka -N	
	No.	%	No.	%	No.	%	No.	%
water provided	5	16.1	3	15.0	5	16.7	3	15.0
price support	15	48.4	8	40.0	7	23.3	16	80.0
lower inputs cost	4	12.9	2	10.0	7	23.3	4	20.0
pest control assistant	3	9.7	1	5.0	5	16.7	4	20.0
technical advice	1	3.2	0	0.0	4	13.3	2	10.0
land development	0	0.0	1	5.0	0	0.0	0	0.0
valid cases	27	87.1	14	70.0	23	76.7	18	90.0

Table III C.10 Credit systems

Table III. C.10.1 No. of responents who received credit
(besides the support for diversification)

	Respondents' groups							
	Ph-P		Ph-N		Ka-P		Ka -N	
Receiving	No.	%	No.	%	No.	%	No.	%
credit	21	67.7	17	85.0	22	73.3	19	95.0

Table III. C.10.2 Sources of credit (multiple choice)

	Respondents' groups							
Sources	Ph-P		Ph-N		Ka-P		Ka -N	
	No.	%	No.	%	No.	%	No.	%
BAAC	19	61.3	12	60.0	12	40.0	8	40.0
co-operatives	2	6.5	4	20.0	2	6.7	4	20.0
commercial bank			1	5.0	5	16.7	7	35.0
village fund			1	5.0				
friends					1	3.3	1	5.0
merchants					3	10.0	3	15.0
valid cases	21	67.7	17	85.0	22	73.3	19	95.0

Table III.C.11 Cancelling of second rice cultivation

Table III C.11.1 No. of responents who used to cancel second rice
(both partial and full cancled)

	Respondents' groups							
	Ph-P		Ph-N		Ka-P		Ka -N	
Cancelling	No.	%	No.	%	No.	%	No.	%
second rice	13	41.9	5	25.0	14	46.7	6	30.0

Table III C.11.2 Time of cancelling second rice

Year	Respondents' groups							
canceled	Ph-P		Ph-N		Ka-P		Ka -N	
	No.	%	No.	%	No.	%	No.	%
before 1994	4	12.9	3	15.0	4	13.3	1	5.0
in 1994	7	22.6	1	5.0	7	23.3	4	20.0
in 1995	2	6.5	1	5.0	3	10.0	1	5.0
valid cases	13	41.9	5	25.0	14	46.7	6	30.0

Table III C.11.3 Reasons of cancelling second rice (multiple choice)

Reasons of cancelling	Respondents' groups							
	Ph-P		Ph-N		Ka-P		Ka -N	
	No.	%	No.	%	No.	%	No.	%
not enough water	6	19.4	3	15.0	2	6.7	2	10.0
low price of rice	2	6.5			6	20.0		
high input cost of rice	2	6.5						
insect damage	1	3.2			1	3.3		
shifted to other crops	4	12.9	2	10.0	5	16.7	3	15.0
labour constraint					1	3.3	1	5.0
valid cases	13	41.9	5	25.0	14	46.7	6	30.0

Table III.C.12 Diversification before the programme launch

Table III C.12.1 No. of responents who diversified before the programme launch

	Respondents' groups							
	Ph-P		Ph-N		Ka-P		Ka -N	
Diversified	No.	%	No.	%	No.	%	No.	%
before	2	6.5	5	25.0	5	16.7	6	30.0

Table III C.12.2 Time of diversificaiton in the past

Year diversified	Respondents' groups							
	Ph-P		Ph-N		Ka-P		Ka -N	
	No.	%	No.	%	No.	%	No.	%
before 1985	1	3.2	1	5.0	2	6.7		
1985-1989			2	10.0	1	3.3	2	10.0
1990-1995	1	3.2	2	10.0	2	6.7	4	20.0
valid cases	2	6.5	5	25.0	5	16.7	6	30.0

Table III C.12.3 Area diversified before the programme luanch (rai)

Area diversified (rai)	Respondents' groups			
	Ph-P	Ph-N	Ka-P	Ka -N
mean	2.86	4.0	4.5	3.8
minimum	1.0	3.0	1.0	0.3
maximum	6.0	5.0	7.0	5.0

Table III. C.12.4 Reasons of diversification by theirown (multiple choice)

Reasons	Respondents' groups							
	Ph-P		Ph-N		Ka-P		Ka -N	
	No.	%	No.	%	No.	%	No.	%
low price of rice	2	6.5	1	5.0	3	10.0	1	5.0
need not to find off-farm work	1	3.2	1	5.0	1	3.3	1	5.0
expect for higher income	2	6.5	2	10.0	3	10.0	3	15.0
insufficient water	2	6.5			2	6.7	1	5.0
unsuiatable area for rice					2	6.7	4	20.0
like to work on orchard			2	10.0	2	6.7		
valid cases	2	6.5	5	25.0	5	16.7	6	30.0

Table III.C.13 Diversification within the programme

Table III. C.13.1 Reasons of joining Diversification programme
(multiple choice; identified by the project group only)

Reasons	Respondents' groups			
	Ph-P		Ka-P	
	No.	%	No.	%
expectation of higher income	18	58.1	18	60.0
unstable&low price of rice	15	48.4	20	66.7
not enough water for second rice	5	16.1	3	10.0
no need to find off-farm work	5	16.1	2	6.7
like to work on orchard	9	29.0	6	20.0
able to obtain low interest rate of loan	5	16.1		
follow the officers' advice			3	10.0
others	3	9.7	2	6.7
total	31	100.0	30	100.0

Table III. C.13.2 Amount of credit received for diversification (Baht)

Amount of credit received (Baht)	Respondents' groups	
	Ph-P	Ka-P
mean	75452	99207
minimum	10000	13000
maximum	200000	220000

Table III C.13.3 Area changed for diversification (rai)

Area changed (rai)	Respondents' groups	
	Ph-P	Ka-P
mean	3.85	6.00
minimum	1.0	2.0
maximum	14.0	22.0

Table III C.13.4 Opinion about diversification

Opinion given	Respondent's groups			
	Ph-P		Ka -P	
	No.	%	No.	%
good	28	90.3	30	100.0
bad	0	0.0	0	0.0
not sure yet	3	9.7	0	0.0
total	31	100.0	30	100.0

Table III C.13.5 Good attitude about diversification programme (multiple choice)

Reasons	Respondent's groups			
	Ph-P		Ka -P	
	No.	%	No.	%
increasing income	23	74.2	25	83.3
better income disribution	12	38.7	24	80.0
no need to find off-farm work	5	16.1	4	13.3
others	5	16.1	4	13.3
total	28	90.3	30	100.0

Table III C.13.6 Satisfaction about the support for diversification

Satisfactory	Respondent's groups			
	Ph-P		Ka -P	
	No.	%	No.	%
Yes	31	100.0	29	96.7
No	0	0.0	1	3.3
total	31	100.0	30	100.0

Table III C.13.7 Consideration about diversification before the programme luanch

Consideration before?	Respondent's groups			
	Ph-P		Ka -P	
	No.	%	No.	%
Yes	24	77.4	24	80.0
No	7	22.6	6	20.0
total	31	100.0	30	100.0

Table III C.13.8 Obstruction of diversification before getting the support from programme (multiple choice)

Types of obstruction	Respondent's groups			
	Ph-P		Ph -P	
	No.	%	No.	%
lack of capital	15	48.4	18	60.0
no technical support	7	22.6	4	13.3
no encouragement	3	9.7	3	10.0
others	2	6.5	1	3.3
valid cases	24	77.4	24	80.0

Table III C.13.9 Consideration about expansion of diversification

Consideration about expansion	Respondent's groups			
	Ph-P		Ph -P	
	No.	%	No.	%
Yes	18	58.1	23	76.7
No	9	29.0	7	23.3
hestiating	4	12.9	0	0.0
total	31	100.0	30	100.0

Table III C.13.10 Reconsideration of reverting back to rice, in case rice price is up

Reconsideration of reverting to rice	Respondent's groups			
	Ph-P		Ph -P	
	No.	%	No.	%
back to rice	0	0.0	0	0.0
continuing diversification	31	100.0	30	100.0
total	31	100.0	30	100.0

Table III C.13.11 Reasons of still continuing diversification (multiple choice)

Reasons	Respondent's groups			
	Ph-P		Ph -P	
	No.	%	No.	%
income is more stable	18	58.1	16	53.3
unstable of rice price	14	45.2	17	56.7
not enough water for second rice	3	9.7	2	6.7
satifaction with diversification	10	32.3	16	53.3
do not want to modify land again	3	9.7	4	13.3
total	31	100.0	30	100.0

Table III C.13.12 Opinion regarding to low price of rice (multiple choice)

Opinions	Respondent's groups			
	Ph-P		Ka -P	
	No.	%	No.	%
over supply in Thailand	5	16.1	11	36.7
too much rice in the world market	7	22.6	8	26.7
too powerful of the merchants	7	22.6	11	36.7
no efficiency of the government	7	22.6	4	13.3
do not know	7	22.6	2	6.7
poor quality of rice	2	6.5	4	13.3
total	31	100.0	30	100.0

Table III.C.14 Interested in diversification
(identified by the non-project group farmers only)

Table III. C.14.1 Opinion of respondents about diversification programme

Opinion given	Respondent's groups			
	Ph-N		Ka -N	
	No.	%	No.	%
good	17	85.0	16	80.0
not good	0	0.0	0	0.0
not yet sure	3	15.0	4	20.0
total	20	100.0	20	100.0

Table III C.14.2 Reasons given in terms of good opinion
about diversification programme (multiple choice)

Reasons	Respondent's groups			
	Ph-N		Ka -N	
	No.	%	No.	%
increasing income	11	55.0	13	65.0
better income disribution	10	50.0	6	30.0
no need to find off-farm work	1	5.0	4	20.0
others	1	5.0	2	10.0
valid cases	17	85.0	16	80.0

Table III A.14.3 Reasons given in terms of not yet sure
about diversification programme (multiple choice)

Reasons	Respondent's groups			
	Ph-N		Ka -N	
	No.	%	No.	%
do not see the result yet	3	15.0	4	20.0
valid cases	3	15.0	4	20.0

Table III. C.14.4 No. of non-project farmers who were interested in joining the programme

Interested in joining the programme	Respondent's groups			
	Ph-N		Ph -N	
	No.	%	No.	%
Yes	7	35.0	12	60.0
No	5	25.0	3	15.0
not yet sure	8	40.0	5	25.0
total	20	100.0	20	100.0

Table III C.14.5 Reasons of not joining the programme, eventhough they were interested in (multiple choice)

Reasons	Respondent's groups			
	Ph-N		Ph -N	
	No.	%	No.	%
lack of capital	0	0.0	2	10.0
do not want to be in debt	1	5.0	0	0.0
not enough labour	0	0.0	3	15.0
no land available	5	25.0	5	25.0
not prepared for diversification yet	1	5.0	2	10.0
valid cases	7	35.0	12	60.0

Table III C.14.6 Reasons of not interested in joining the programme (multiple choice)

Reasons	Respondent's groups			
	Ph-N		Ph -N	
	No.	%	No.	%
do not want to be in debt	1	5.0	0	0.0
not enough labour	2	10.0	1	5.0
no land available	2	10.0	1	5.0
afraid of not having a good yield	0	0.0	1	5.0
valid cases	5	25.0	3	15.0

Table III C.14.7 Reasons of hesitating to join the programme (multiple choice)

Reasons	Respondent's groups			
	Ph-N		Ph -N	
	No.	%	No.	%
do not see the result yet	8	40.0	5	25.0
valid cases	8	40.0	5	25.0

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