ARTI / WAGENINGEN UNIVERSITY

RESEARCH PROJECT IN AGRICULTURAL PLANNING

REDUCED PLANNING EFFORTS: IDENTIFICATION OF RURAL POTENTIALS IN SELECTED KEY REGIONS OF RATNAPURA

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IN

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RESEARCH STUDY NO. 53

JULY 1982

AGRARIAN RESEARCH AND TRAINING INSTITUTE,
114, Wijerama Mawatha, Colombo 7.

SRI LANKA

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FOREWORD

Since I979 the Agrarian Research & Training Institute and the Department of Development Economics of the Agriculture University of Wageningen in Netherlands have collaborated in a joint research project on 'Regional Planning for Agricultural Development in Sri Lanka'. The broad aim of this research project is to do research on planning processes at intermediate level, especially on agricultural development in order to draw lessons for the improvement of the efficiency of the planning process. In this general framework of the project several studies have been carried out.

In the first study a demonstration of resource based socio economic planning was attempted for Matara district. In fact it can be called a pioneer attempt in comprehensive district-based agricultural planning in this country. The scope for comprehensive intermediate level planning is large even for small countries like Sri Lanka, However, the complexity and size of comprehensive intermediate level planning demand a high level of planning capacity at sub-national levels. This we do not have and it will take a long time to build up such capacities not merely by training but also by experience. As an alternative to comprehensive planning other approaches have now been developed with reduced planning efforts. Three of them are the key sector approach, the key region approach and the key group approach.

In this study at Ratnapura district the key region approach was used. The large area of Ratnapura district, the very heterogeneous natural conditions with II agro-ecological zones and the prevelance of location specific socio-economic problems justify the use of the key region approach in Ratnapura district.

In a key region approach one may select high potential developed areas, high potential depressed areas or low potential depressed areas for development. The main thrust here is on strengthening the flow of goods, services, capital and labour between areas through economic development and improvement of roads, transport and other communication network. The high potential depressed areas may thus attract investments and increase marketing facilities. On the other hand low potential depressed areas may see reduction of population pressure through temporary or permanent labour emigration.

Development planning of Ratnapura district was initiated by the Ministry of Plan Implementation and aimed at a future integrated rural development programme for the district. The present study identifies potentials for future development and the key regions. It is hoped that this study will help to improve the agricultural planning procedures in the country, as well.

My thanks are due to the research team, the authors of this report and all others who contributed to make this publication possible.

T.B. Subasinghe
DIRECTOR

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ABSTRACT

The objectives of the present report are threefold: to describe the main problems confronting agricultural development in three contiguous agro-ecological regions in the eastern part of Ratnapura district; to explain how the principal constraints faced by farmers in this area came to assume such proportions; and to propose tentative solutions.

The report is situated in the general context of the research effort conducted by the Agricultural Planning Project. Increasing population pressure on limited resources and severe erosion of highlands attendant upon soil mining practices are identified as the constraints weighing heaviest upon agricultural production in the target area. Soil conservation measures, innovatory techniques of tillage and the introduction of new cropping patterns - including systematic rotations, live mulches, leguminous intercrops, and integrated livestock farming - are proposed as a necessarily complex package to assist in restoring some degree of ecological balance. It is suggested that no further work be done on the rehabilitation of minor irrigation schemes until erosion and the consequent risk of silting have been substantially reduced.

In the last chapter, the concept of farming systems research is used to articulate an experimental project proposal: the target area would become the focus of adaptive research and development activities that would seek to marry scientific enquiry with implementation at the farm and community levels in a manner never before attempted in Sri Lanka.

ABBREVIATIONS USED IN THE TEXT

ARTI	Agrarian Research and Training Institute
ASD	Agrarian Services Department
CIAT	Centro Internacional de Agricultura Tropical
CIDA	Canadian International Development Agency
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo
CTB	Ceylon Transport Board
DA	Department of Agriculture
DL	Dry Low agro-ecological region
FSR	Farming systems research
ICRISAT	International Crops Research Institute for the Semi-arid Tropics
ICTA	Instituto de Ciencia y Tecnología Agrícolas
IITA	International Institute of Tropical Agriculture
IL	Intermediate Low agro-ecological region
IM	Intermediate Middle agro-ecological region
IRD	Integrated rural development
IRDP	Integrated rural development project
MPC	Multipurpose cooperative society
NADSA	National Agricultural Diversification and Settlement Authority
ULV	Ultralow volume
WM	Wet Middle agro-ecological region

Chapter One

INTRODUCTION

After working at length in Matara and Kurunegala districts on different aspects of agricultural planning, the ARTI/Wageningen University research team turned its attention to Ratnapura. The presence of a wide range of substantially different ecotypes made Ratnapura an attractive choice when the team came to selecting a third district in which to test the hypotheses and methods elaborated in the earlier locations.

It was, however, soon discovered that Ratnapura offered an additional advantage: unlike Matara and Kurunegala, where most available land is being cultivated on a more or less permanent basis, Ratnapura includes within its boundaries rather large tracts of country into which agriculture is still expanding. Planning for development in such an environment runs up against a number of problems, which either no longer exist or else are much less acute in areas of less recent settlement.

The team's experience elsewhere in the island had demonstrated some of the shortcomings inherent in classical resource based agricultural planning methods at district level whenever very large numbers of smallholdings and a somewhat heterogeneous array of farming systems are concerned: collection and analysis of the massive amounts of data required before meaningful planning proposals could be formulated had proved so labour and time consuming that such procedures seemed hardly appropriate in a development context. It was thus felt that a change of research focus was warranted and an approach was adopted that places emphasis upon the socio-economic impact to be derived from an intensive planning effort

concentrating on a limited number of key regions.

One of the main premises of the Government's Integrated Rural Development Programme is that projects should be so conceived as to correct interregional disparities in the distribution of agricultural income. Since all IRDPs are to be set up within the existing administrative framework at district level (see ARTI/Wageningen 1982a: chapter two) priority is given to assisting those districts where the rural population enjoys the least favourable circumstances.

Although briefly considered as a candidate for IRD, Ratnapura was not finally chosen as a priority area by the Regional Development Division of the Ministry of Plan Implementation, because aggregate figures for *per capita* income are not among the lowest in the country. However, preliminary analysis of the available statistics made it possible for the research team to conclude that there were pockets of considerable rural poverty lying in the district's eastern mountains (see Map 1): while a predominance of irrigated paddy and plantation crops (tea and rubber) brings moderate prosperity to all but the most elevated areas in the western two-thirds of the district, the adjacent agro-ecological regions IM_2 and WM_3 rank in terms of *per capita* income seventh and ninth, respectively, out of a total of 11 such notional units together covering the whole of Ratnapura*.

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* See ARTI/Wageningen 1982b for a complete analysis of the statistical data for the whole of Ratnapura district that enabled us to come to these conclusions. Figures relating to population, income, land use and the tenurial status of farmers were compared for each of the 11 agro-ecological regions. The difficulties involved in collating data from different sources and of varying degrees of reliability are discussed in the same report. The classification into agro-ecological regions is that of the Land and Water Use Division of the Department of Agriculture, slightly corrected on the basis of recent field surveys carried out by S. Dimantha of the Irrigation Department's Land Use Division (Dimantha and de Alwis 1981; Dimantha 1982).

This discovery prompted the team to concentrate on elaborating methods for agricultural plan formulation with a view to correcting *intra*district disparities. Such a research strategy offered, it was thought, the double advantage of demonstrating ways for reducing the overall planning effort required and at the same time respecting national IRD guidelines with regard to equity.

In making this choice we had, it is true, eliminated three agro-ecological regions in which the *per capita* income is about the same or even lower than in IM_2 and WM_3. But they are all (WU_3, north and south, and IU_2) high mountain tracts in which very little else but tea is grown by a small population on extensive estates. We felt that planning for such areas was only of marginal interest, since the State Plantations Corporation pursues somewhat different objectives to those of the authorities concerned with orchestrating IRD activities throughout the island.

IM_2 and WM_3 were thus selected as key regions because of their relative poverty. Their geographical location in rugged terrain is however adjacent to IL_1, which, though still mountainous, is intersected by considerable areas of fairly good valley land and is, moreover, characterised by the highest *per capita* income of all the agro-ecological regions in Ratnapura.

This paradoxical juxtaposition of rich and poor intrigued the team. Preliminary hypotheses advanced to explain why farmers in IL_1 were so well off proved correct: population density is low, farm size is large and family labour is plentiful*. As it turned out, all three factors are the reverse in WM_3, whereas IM_2 stands between the two extremes - again in all three respects, as it does also geographically (see Table 1.1).

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* The data on farm size and family labour availability are extracted from our farm survey, which covered 83 individual holdings in April-May 1982. The sample number is too small for it to be worthwhile giving precise figures. The information gleaned during this survey did however confirm the more impressionistic information we had gathered in the course of an earlier series (November-December 1981) of collective interviews with some 400 farmers from 36 carefully selected representative villages spread over all three agro-ecological regions.

Table 1.1 Basic statistics for three agro-ecological regions in eastern Ratnapura

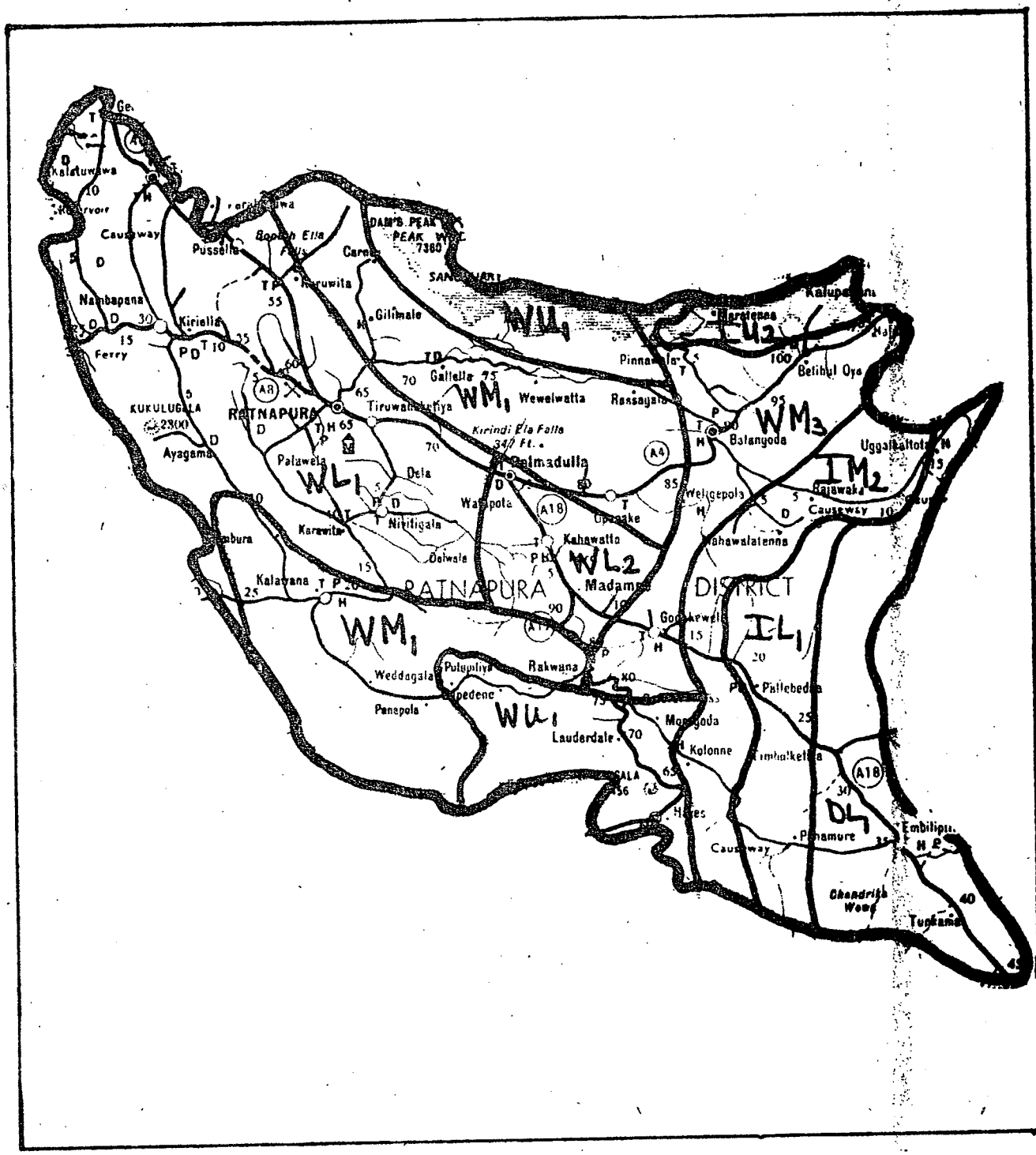
Agro-ecological region	Area ha	Rural population	Population density km^2	Cropped land *per capita* ha	Annual income *per capita* Rs.
WM_3	24,050	55,896	232	0.22	1,410
IM_2	27,674	31,506	114	0.28	1,748
IL_1	22,223	17,671	80	0.53	3,300

Source: ARTI/Wageningen 1982 b

This agro-sociological continuum is all the more interesting in that the topographical and climatic catena upon which it has developed is to be found in other districts abutting in the east and north onto the central mountain core of the island. The possibility of extrapolating planning procedures elaborated in eastern Ratnapura to other similar areas thus provided the team with a rationale for including IL_1 as a third key region.

A detailed account of the methodology employed both to select the key regions and to underpin the formulation of proposals for their future development is to be published in ARTI/Wageningen 1982 b. The object of the present report is to describe the general trends operative in the agro-ecological system of the target area and to identify the direction in which viable solutions to certain problems may lay.

Map 1. Map of Ratnapura district showing the agro-ecological regions as identified by the Land and Water Use Division of the Department of Agriculture



Chapter Two

AGRO-ECOLOGICAL CHARACTERISTICS OF THE TARGET AREA

In Ratnapura district the three agro-ecological regions that concern us cover a total area of approximately 74,000 ha. IM_2 is the largest with 27,674 ha and IL_1 the smallest with somewhat over 22,000 ha, while WM_3 is about 24,000 ha in extent.

The topography is such that the most elevated points are to be found in the north, in the foothills preceding the central highlands escarpment, and from north to south down the watershed between the Uda Walawe catchment area and those of the Kalu and Gin Gangas.

From data gathered in the course of an exploratory village survey it would appear that population density is highest in WM_3 as a whole (232 persons per km^2), but greater still in the northwestern extremities of this agro-ecological region. The distinctly mountainous tracts lying in WM_3 and adjoining parts of IM_2 are heavily settled in the intermontane basins and along the numerous valley bottoms. Proceeding south and east from this core, altitudes generally decrease, while villages also stand at a greater distance from one another in the landscape. With two or three major exceptions (valleys of the Rakwana Ganga, the Hulanda Oya and the Panamure anicut scheme) the agricultural economy is here in the main less directly dependent upon the cultivation of asweddumised land and highland crops consequently play a commanding role.

The shift in emphasis from irrigated agriculture to a predominantly rainfed farming system reflects the rainfall gradient: the north and west of WM_3 receive larger amounts of rain, better distributed throughout the year than the rest of the target area; precipitation decreases and becomes

less reliable the lower the mean altitude and the further any given point is situated to the south and east. Increasing mean temperatures, clearer atmospheric conditions leading to longer hours of unveiled sunlight and stronger winds all contribute to higher levels of potential evapotranspiration in areas further removed from the highland massif.

Concretely, this means that total annual rainfall is not only less in quantity but also less available to plants grown further to the south and east in unirrigated conditions. Although absolute rainfall in WM_3 can be expected to exceed by only 25% the amount enjoyed by IL_1, crops selected for cultivation in the former agro-ecological region can in reality be proportionately more demanding in terms of overall water requirements*.

These climatological facts largely explain why the target area is more densely populated in the more mountainous sectors: agriculture is - under traditional conditions - a less risky and more productive pursuit in the wetter localities. Population pressure has been responsible for a gradual move over the last 50 years from adjacent Wet Zone areas into the drier parts of IM_2 and IL_1.

It is however probable that this eastward migration would not have occurred so soon had the Wet Zone mountain slopes not been preempted by plantations of tea and, to a lesser extent, rubber: the commercial estates left little room for upward expansion of villages into lands which, if unoccupied, could have been farmed as *chenas* or permanent homegardens planted with tree crops. What room there was in this ecological niche has been heavily settled around Balangoda, near Weligapola and on either side of the Rakwana Ganga valley in the vicinity of Godakewela. In all three situations there has developed a system of highland intercropping

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* More sunlight and less atmospheric humidity in the south and east certainly make for higher potential yields in the case of improved cereals, grain legumes and some *solanaceae* whenever rainfall conforms to the average pattern. It must however be stressed that such levels of productivity will not be regularly attained until drought resistent, high yielding varieties have been introduced along with appropriate tillage systems (see chapter five).

based on subsistence food annuals, coconuts and some cash perennials (pepper, coffee, spices and fruit), supplemented by as much irrigated paddy as is feasible.

Where in WM_3 highland was too infertile to attract entrepreneurial planters or bottom lands suitable for paddy cultivation were not available and in the two other agro-ecological regions, dryland farming has come to predominate. In certain more humid micro-environments (e.g. the river valleys in the extreme west of IL_1) some small coconut estates have been planted in the last 30 years.

A quantified synopsis of land use in the target area is given in Table 2.1. A salient feature is the importance of tea plantations and smallholdings in WM_3, where both categories taken together occupy one-third of the total cropped area. Woodlands are also relatively significant in the same region covering 21% of the land. In IM_2 the tracts under forest and scrub are hardly greater in extent (26%). But grasslands constitute the dominant vegetation over an area almost as large (20%).

It might be hypothesised that the very broad expanses of *patna* and savannah to be found in IM_2 are the product of an historical process of human migration eastwards, upon which we expatiate in the next chapter (3.1.): they could be what remains of a recent phase of exploitative swidden cultivation now that the erstwhile population has moved on, after exhausting the soils, to a more fertile 'frontier' in IL_1. In this respect it is interesting to note that unirrigated field annuals occupy a much larger proportion of total crop land in this latter region (42%) and in IM_2 (48%) than they do in WM_3 (17%), where the population explosion seems to have originated. Plantation crops and paddy fall to a negligible level of significance in the two more easterly agro-ecological regions.

It could be expected that the ratio of unirrigated field annuals to total crop land would be higher in IL_1, where settlement is a fairly new phenomenon. That the ratio is in this agro-ecological region, however, apparently smaller than in the one adjoining its western border (IM_2) may be explained by lower density of population (see Table 1.1.)

Table 2.1 Land use in the key regions (1981)

LAND USE CATEGORIES	WM_3		IM_2		IL_1	
	Ha	%	Ha	%	Ha	%
1. Settlements and non-agricultural land	271	0.8	16	0.1	3	
2. Homegardens	7,573	21.1	3,223	11.7	2,308	10.4
3. Tree and other perennial crops:						
- coconut plantations	117	0.4	90	0.3	184	0.9
- coconut smallholdings	695	1.9	240	0.9	306	1.4
- tea plantations	5,710	16.0				
- tea smallholdings	2,390	6.7				
- tea (general)			124	0.4		
- rubber	753	2.1	19	0.1		
- smallholdings: mixed tree and other crops	285	0.8	2,390	8.6	5,830	26.3
4. Asweddumised land:						
- rainfed	799	2.2	756	2.7	231	1.0
- irrigated	2,918	8.1	651	2.4	747	3.4
5. Grasslands and lightly wooded savannah	2,278	6.3	5,672	20.5	1,832	8.2
6. Field annuals:						
- shifting cultivation	4,287	12.0	6,878	24.9	6,891	31.0
- irrigated sugar cane			21	0.1		
- irrigated upland annuals			18	0.1	21	0.1
7. Woodlands	7,629	21.3	7,336	26.5	3,652	16.4
8. Water bodies (tanks, etc.)	79	0.2	18	0.1	16	0.1
9. Unproductive (barren, rocky)	33	0.1	205	0.7	165	0.7
TOTAL	35,817	100	27,657	100	22,186	100

Sources: Dimantha and de Alwis 1981
Dimantha 1982

and the physical layout of most of the farms in the east of the target area.

Prolonged occupation and population pressure, increasing over the generations on limited tracts of land suited to homestead plots in IM_2, have caused the expansion of farming activities into highlands *not* contiguous to the original holding. In IL_1 farms tend, on the other hand, to be spatially more compact, the dwelling house being surrounded by a much larger extent of crop land on which both perennials and annuals are grown. (Tree crops give shade in the immediate vicinity of the buildings, while open fields extend beyond). Although fixed fallowing is practised in each case, the physical contiguity to the farmhouse of plots put to field annuals may well have led to their classification in IL_1 as 'homegardens', thereby artificially inflating for this region the category 'smallholdings: mixed tree and other crops' comprised under class 3 in Table 2.1. It is thus probable that much more substantial tracts of the total land area are under cereals, vegetables and root crops in IL_1 than the available statistics indicate.

Chapter Three

MAJOR PROBLEMS CONFRONTING AGRICULTURAL DEVELOPMENT

The situation as just described in chapter 2 is not conducive to spontaneous agricultural development. The principal reason for this is that population is increasing steadily, while the natural resource base of the area is being almost fully exploited by the traditional methods available and technological innovations have not been introduced to increase productivity. More people have to live each year off the same amounts of land, there being few viable alternatives to smallholder agriculture.

For the sake of analytical convenience, we will deal with these problems under three different headings, although it might be plausibly maintained that demographic growth is in fact at the root of all the other difficulties encountered in the area under consideration.

3.1 POPULATION AND EXPANSION OF THE CULTIVATED AREA

In 27 of the 36 villages in which the research team carried out the exploratory survey officials and notables, as well as rank and file farmers, were agreed that the population had been increasing over the last decade. In four settlements in the driest part of the target area it was specifically stated that this growth was due to the inmigration of land hungry families. In only three villages was it said that there had been a decrease in the number of inhabitants. All three were situated close to major irrigation colonisation schemes. These may well have attracted a certain number of families eager to take advantage of this opportunity to expand their resource base. The four locations in IM_2, in which it was claimed on the other hand that the population had

remained stable, all lay in the more prosperous, wetter belt of that agro-ecological region. Individual interviews conducted in the course of the subsequent farm survey tended to confirm the team's initial impressions with regard to the geographical distribution of demographic growth.

Although this information may be regarded as a suspect insofar as it relies on the subjective perceptions of informants, it would seem to suggest, in the first place, that there is by and large most pressure on land in the Wet Zone and, in the second, that there is an influx of the landless into the drier south and east both from inside the district and from neighbouring Matara. The implications of this situation are numerous.

In the more densely populated west and north traditional extensive upland cultivation has in recent years given way to a more intensive pattern of land use. But because of the inexistence of an alternative cropping technology, highland is being utilised to grow the same traditional crops on the same plots more frequently than was previously the case. The result is decreasing fertility in the absence of remedial measures and increasing erosion of relatively friable and often steeply inclined soils.

In the less humid areas of IM_2 and IL_1, where there is room for the agricultural colonisation of what was formerly rolling jungle and forested mountain slopes, traditional methods of shifting rainfed cultivation continued until recently to act as a safety valve and absorb farming families searching for relief from the conditions of overcrowding characteristic of their native villages further west. The park lands covering the northeastern parts of IM_2 and much of IL_1 to the north and east of the Madampe-Timbolketiya main road have thus been settled, for the most part in the course of the last 10 to 15 years*.

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* The former area is still much less densely populated than the latter. There appear to be two reasons for this disparity: a scarcity of surface water for drinking and the presence of numerous steep escarpments hindering the construction of access roads may have made northeastern IM_2 less attractive to would-be settlers.

Settlement was however not achieved in a 'once for all' manner. Cultivation of *chenas* in these areas seems frequently to have been initially undertaken by people having their permanent residence in villages further to the west. Seasonal occupation by small groups of adult male farmers was at first the rule. Whole families only subsequently moved in to build durable housing for themselves and set up recognisable communities. Temporary inmigration for the purposes of shifting agriculture continued in many locations until government legislation was introduced some three years ago to curb it. The recent vigilance of the authorities in this respect was, for instance, the object of numerous complaints made to the exploratory survey team which covered the area known as Galpaya on the Kuda Oya (IL_1).

So, very large tracts of highland have been encroached in IM_2 and IL_1. Government concern to restrict new settlement comes at a time when the carrying capacity of the available land is beginning to be seriously taxed by the cropping systems known to farmers.

Prima facie evidence supporting this contention is basically of two kinds. On the one hand, shifting cultivation has consistently spread throughout the area onto the steeper upper slopes, where soils are usually rather shallow, heavily leached and frequently too immature. In many locations the survey teams noticed that *chenas* were being opened up on *patna* grasslands despite the fact that all farmers are well aware that the occurrence of this type of vegetation is a sure sign of very low soil fertility. On the other hand, highland plots are all too often planted to bananas with a very sparse intercrop of coarse grains. This is again an indication that initial fertility has been exhausted and that the farmer is 'hanging on' to the plot by dint of this rather undemanding crop association, because he has no other land to cultivate.

Population pressure on limited Wet Zone resources resulting in the permanent settlement of formerly unfarmed jungle lands in the Intermediate Zone has been the cause of very extensive erosion and a major decline in soil fertility, particularly where steep slopes are tilled. In the Wet Zone, the stability of settlement over longer

periods of time, the relative nonchalance of earlier administrations with regard to the illicit occupation or Crown lands and the greater profitability of the majority of perennial crops have had the combined effect of transforming most marginal highlands into areas fairly thickly planted to useful tree species (jak, mango, coconut, rubber, bread fruit, areca, etc.). This canopy and the associated root system have been instrumental in limiting soil erosion imputable to the direct impact of falling raindrops and runoff. The presence of substantial shade has also restricted the intensive cropping of hillsides with cereals and consequently preserved them from the soil mining effects frequently attendant upon this type of land use pattern in the humid tropics.

In the more recently settled drier areas the original tree cover is lacking wherever jungle was initially cleared for *chena* cultivation and the pressure upon land is increasing at such a rate that the climax vegetation has no time to regenerate during the ever shorter fallow periods. Survey teams found that *chena* plots were nowadays rarely fallowed for more than two or three years, whereas 15 to 20 years would traditionally have been regarded as optimal. The effects of erosion in terms of declining yields seem moreover to have been compounded by a greater incidence in recent years of plant diseases, which some farmers attribute to their no longer having thick jungle to burn off before the cultivation of bush fallows begins.

Although erosion is a less serious problem in much of the Wet Zone, a more intensive use of highlands in response to growing population density and to the concomitant need for greater food crop production has meant that natural soil fertility is nevertheless decreasing just as it is in the newly settled areas further to the south and east. A rise in productivity per hectare on paddy lands when improved rice varieties were introduced in the 1960s may have initially compensated for falling yields in the Wet Zone rainfed cropping sector. But the positive impact of innovatory paddy technologies soon began to diminish as erosion began to have an indirectly adverse effect upon the region's minor irrigation schemes.

In the more recently occupied eastern tracts of IM_2 and in IL_1 there are relatively few village tanks, while the modern medium sized anicut schemes are mostly not yet old enough to exhibit signs of substantial deterioration as a result of erosion. So, although inspection of farms on sloping terrain clearly shows that erosion is already a major hazard, the impact upon paddy cultivation is yet to come in these areas.

Homesteads in the more rugged localities have, however, for the most part been established in the course of the last decade or so and farmers have not so far ventured to plant thick stands of useful trees in the vicinity of their houses, as is the rule further west. Whether this is because, as encroachers, they do not wish to invest in land to which they have no firm title or else because the drier climate is inimicable to many types of fruit tree is still not evident. It may well be that homegardens will with time develop a dense canopy of tall trees, in which case erosion will in the long run - at least on house plots - decrease in severity.

If this occurs, population pressure is liable to rise simultaneously. There will emerge a greater stability of settlement patterns and a more intensive type of land use. The probability of such a scenario must be taken into consideration when planning research and extension activities with a view to developing new cropping technologies for highlands in IL_1 and IM_2, for expanding homegardens may preempt much of the acreage earlier earmarked for the commercial production of higher yielding field annuals.

3.2 INFRASTRUCTURE

Under this heading we group irrigation, roads and other social utilities.

3.2.1 Irrigation

During the exploratory survey carried out in late 1981 farmers were beginning to feel that they were in the grips of an abnormally severe drought. Subsequent events proved that they were right. This

lack of rainfall is however hardly exceptional insofar as most respondents recalled the past six to ten agricultural seasons as marked by recurrent periods of very low water availability. Many of them ascribed this phenomenon to the rapid deforestation that has been taking place in the wake of settlement in adjacent parts of the Intermediate and Dry Zones. Short of evicting tens of thousands of families and replanting vast expanses of woodland (which might just constitute a very long term solution at an incalculably high political and social cost) little can unfortunately now be done about this. Only palliatives can be proposed. We will detail these in the next chapter.

A specific category of farmer is however more obviously vulnerable to unexpected water shortages. This is the grower of irrigated paddy. Now, of the 19 villages visited by the exploratory survey teams, which enjoyed access to some kind of minor irrigation scheme, only five could take a crop of irrigated paddy in both *maha* and *yala*; seven could count on the irrigation of their whole tract in one or the other of the seasons; and the remainder could grow an irrigated crop only infrequently on part of the tract - or even never.

Questioning revealed that the reasons behind these bad levels of performance had as much to do with poor standards of infrastructural maintenance as with the actual quantities of rain which fall each year. Although litigation, the complexities of tenancy arrangements and political factionalism quite often appeared to explain why field channels were not kept up or cultivation calendars adhered to, we are inclined to believe that these aspects of the problem are merely indicative of a general state of insecurity inspired by the knowledge that silting has so impaired the efficiency of water storage or (in the case of anicuts) flow that the availability of sufficient water for all is unlikely in any given season.

Silting indeed seems to constitute a very considerable hazard. Where tanks lie within catchment areas characterised by steep upper slopes, on which shifting cultivation has caused the removal of almost

all the original forest cover, the problem is most acute. When funds are available, the Irrigation Department usually attempts to improve the situation by raising the bund by a few feet. This is of course not a long term solution, since silting continues and the investment is soon neutralised.

Nor is coordinated action at village level against *chena* cultivation more effective, for the dryland farmers responsible for the erosion not infrequently belong to a quite different community with no economic interests in the asweddumised land situated below the tank. This is the case, for instance, at Ambabila east northeast of Godakewela where the slopes draining into the very large but two-thirds filled in tank are mostly farmed by families from Kalatuwakanda.

It is thus the research team's opinion that the inefficiency of many minor irrigation schemes in the target area is to be seen in direct relationship to the growth of population and the pressures brought to bear on the traditional agricultural resource base as a result. Since the population of the area will not diminish in the foreseeable future, an effort must obviously be made to modify patterns of land use if further rehabilitation of the irrigation infrastructure is to yield tangible benefits.

3.2.2 Communications

Although the inhabitants of most villages not situated along a major asphalted highway tend to complain bitterly about the paucity of feeder roads, it should be pointed out that successive governments have made a very laudable effort over the last ten years to provide arteries of communication in many areas where population is as yet relatively sparse. Settlement of the drier parts of the district has however by and large followed the roads, so that extension of the network has caused the concentration of population in their vicinity.

The logic of this development insofar as agricultural marketing is concerned is obvious. But it has given rise to over-settlement in some microregions (eg. the south of IL_1, around Kolonne and the Kuda Oya valley), while others - like much of northeastern IM_2 - have little

permanent population. The areas worst hit by declining soil fertility and erosion are thus probably those in the east and south that are served by an asphalted road.

Despite the relative density of the road network in the more uniformly settled areas lying in the western part of the region, agriculturists are here also strongly affected by the geographical situation of their individual holdings: accessibility very much determines what a given farmer may grow. The further the plot is located from normal input supply and offtake facilities (i.e. an all-weather road) or the more precipitous the track, though it be short, leading to the latter the more limited will be the choice of feasible commercial crops. Bulky enterprises like sweet potatoes, red onions or coconuts are almost out of the question on farms not enjoying easy access to a reasonable road or where the absence of a bridge causes sporadic isolation in times of spate (e.g. on the right bank of the Rakwana Ganga between Pallebedda and Colombage Ara, as well as the left bank of the lower reaches of the Kuda Oya).

In outlying parts of the region farmers also claim that they are at the mercy of the vagaries of the CTB. The irregularity of bus services is said to be the cause of much frustration, particularly when farmers urgently need to obtain certain inputs. Whereas a failure to purchase seed or fertiliser in advance may be ascribed as much to farmers' nonchalance as to the malfunctioning of a given bus line on a specific day, it is true that efficient pesticide applications may be made impossible if the grower of an affected crop cannot reach the supplier straightaway.

3.2.3 Institutional infrastructure

The state institutions of most immediate significance to farmers in the target area are the Department of Agriculture, the Agrarian Services Department and the Multipurpose Cooperative Societies.

The first is officially the source of nearly all agricultural extension advice and a supplier of some inputs (particularly those used for paddy production, but also for a limited number of subsidiary

food crops). The ASD provides a fairly wide range of agrochemicals and fertilisers in its network of centres, which are well distributed throughout the countryside. The same Department is also responsible for coordinating the activities of farmers operating different plots in a single asweddumised tract. The importance of the Cooperative Societies is, in the eyes of the rural population, connected with the virtual monopoly they exercise over the distribution of article of basic household necessity to the recipients of food stamps. (This category of people constituted well over 60 % of the inhabitants in most villages we visited). MPC stores do, however, sell some agricultural inputs a few toolds, besides in certain areas buying paddy.

Although rural people make few demands upon the MPCs and are only too happy if their local branch stocks a couple of common fertiliser mixes or general purpose pesticides, public opinion concerning agricultural extension and the Agrarian Service Centres is on the whole rather more negative. In the course of our survey complaints were very frequently heard to the effect that neither the Department of Agriculture nor the ASD was always in a position to supply the inputs upon the timely availability of which farmers had been told that they could count. Growers had in such circumstances either to turn to private traders or else simply to go without. Recourse to the private sector was sometimes not attempted, since it involved long journeys by public transport. Rather higher prices practised by dealers were also a substantial diterrent in the case of the majority of poorer farmers.

Very little direct criticism of the Department of Agriculture was forthcoming in the course of the village interviews held by the survey teams. The reason for this is neither that the DA is in the eyes of the peasantry doing an irreproachable job nor that farmers are unwilling to express their opinions: they are merely in most instances quite unaware of the Department's major function as coordinator of extension services at field level. In eastern Ratnapura, as in most other Wet and Intermediate Zone areas of the country, agricultural extension is almost exclusively confined to the issue of advice on irrigated paddy cultivation. Almost nothing seems to have been done since the Training and Visit system was inaugurated some three years ago to bring about the officially

sanctioned unification of the several services set up to improve levels of husbandry in the case of such crops as coffee, pepper and coconut.

There are, it is true, a small number of field officers working under the auspices of the different boards and departments in the target area. But none of these can achieve much on his own in the vast acreages that each is expected to cover; nor are their efforts meaningfully co-ordinated.

The greatest problem can however be identified in the Department of Agriculture's traditional reluctance at the national level to face up to the whole issue of dry farming and the utilisation of asweddumised land for field crops other than paddy. Three factors go a long way to explaining why so little attention is paid to the development potential of cereals, pulses, tubers and vegetables (outside certain microregions which, like Welimada and part of Kegalle district, have been singled out for specialisation in vegetables and wheat growing). The first is the strong emphasis that has been laid in recent decades on the attainment of national selfsufficiency in paddy production. The second is the fear that any substantial official interest shown in improving the standards of rainfed farming in the Intermediate and Dry Zones will be interpreted as a *de facto* recognition of the legitimacy of encroachment on Crown lands. For it is indeed true that most field annuals other than paddy are grown in *chenas* or on highlands to which farmers often have, to say the least, dubious title. The third and perhaps most serious factor is the inexistence of a proven gamut of rainfed farming technologies suited to different soils, climatic and topographic conditions throughout the country (cf. Dimantha and de Alwis 1981: 8-3).

When questioned as to the frequency of their contacts with other government agencies involved in agricultural development, nearly all the farmers interviewed gave a negative response. An insignificant minority among the wealthier mentioned that they had accounts with rural branches of the People's Bank. An even smaller number revealed that they had floated loans for paddy cultivation through the Bank by demonstrating ownership of their land, offering it as collateral and subscribing to a crop insurance policy. Credit for enterprises other than paddy is appa-

rently never requested despite the fact that provision exists under national schemes for the prefinancing of certain high value crops like chillies. The risk inherent in growing commercial crops on highland or in paddy fields without irrigation discourages even solvent owner-cultivators from applying and courting the danger of falling deeply into debt.

Credit and the absence of other institutional means of obtaining it to finance anything but perennial plantations proved however to constitute one of the strongest constraints operating to restrict productivity. Although the availability of certified seed and appropriate high yielding varieties is in the case of some rainfed field crops rather limited, farmers insisted that what prevented them from launching into innovatory practices was more often a lack of working capital. Men who wanted to grow enterprises like red onions, soya and groundnuts pleaded poverty as the primary cause of their apparently 'conservative' adherence to traditional crop mixes: the initial investment in planting materials was beyond their means.

So it was that in certain villages specialising in sweet potatoes on asweddumised land or in rainfed onions, neither of which crops presents a high degree of risk, many farmers could simply not afford to follow the example of their neighbours despite their having access to the right kinds of plot. Until some solution is found to the present *impasse* in matters pertaining to agricultural credit, little progress will be made in introducing high value crops that allow the smallest grower to increase his profits per unit of area.

3.3 LAND TENURE

In the wetter western parts of the target region there obtains a bewildering variety of tenurial practices. Temples and shrines control very extensive tracts of both asweddumised and high land. Large scale traditional 'tenants' of the clergy sometimes hold substantial blocks of such land on a quasi-dynastic basis: their obligations to the religious institution are merely symbolic, their security of tenure is total, they pay no rent in either cash or kind and in fact themselves rent out numerous plots to subtenants on a mainly commercial basis. But the clergy also

extracts rent directly from its own smallholders.

The exemption of religious corporations from land reform legislation makes tenancy in areas ultimately controlled by temples and shrines fairly secure. Small tenants will invest on highland, because they are not unduly concerned at being evicted before their investment bears fruit. But the situation is quite different where *thattumaru* sharing occurs - mainly on asweddumised tracts - or where there is encroachment upon Crown lands. In both situations the cultivator is left in some degree of doubt as to whether he will be farming the plot in the following season.

Rotational share tenancy (*thattumaru*) robs the farmer of the residual effects of investment into an input as basic as fertiliser, while encroachment hardly encourages him to undertake improvements that eventual eviction by a government agency might cause him to abandon. It may be objected that most encroachers (with the notable exception of those on recognised forest reserves) feel much less insecure than it is often held. Government policies have in the past been so flexible with regard to that politically volatile category of the landless that relatively few squatters have in fact been forced to leave the *chenas* they have cleared. Our survey of land tenure in eastern Ratnapura bore this out: most encroachers do not feel unduly insecure.

It should nonetheless be stressed that mere continuity of occupation is not necessarily in the eyes of the farmer a convincing proof of his *right* to remain. Recourse by the authorities to the issuing of one-year, renewable cultivation permits to squatters on Crown lands in IL_1 and a sudden stern refusal (unexpected after decades of laxity) to allow outsiders to migrate seasonally into certain parts of the Uda Walawe catchment area have of late alarmed many smallholders.

Cultivation permits do not moreover state the area of the holding provisionally recognised in this manner; nor do they even detail the boundaries between one encroached plot and another. Farmers without leasehold arrangements or permanent formal title to the land they work are thus very chary of the future and are furthermore excluded from all

subsidy or credit schemes that require firm proof of ownership before a grower may qualify as a potential beneficiary.

So it is quite unrealistic to imagine that they will in such circumstances put labour and money into improvements such as the planting of slow maturing perennial crops or permanent structures designed to limit the effects of erosion. If some encroachers on highland do, even so, surround their homesteads with hardy, fast growing trees such as papaw and coconut, this is because very little labour is involved, fertiliser does not have to be applied, maintenance is not strictly necessary and planting materials cost next to nothing. Fruit and nuts - if and when the trees bear - are regarded more as a bounty of nature than as the product of deliberate effort.

Discontinuity of tenure (*thattumaru*) and absence of title to the land tilled do, then, seriously restrict the smallholder's propensity to invest and yields remain consequently rather low. Both factors also inhibit productivity at another level, for a farmer who cannot adduce proof of outright ownership cannot apply for institutional cultivation credit even in the case of field annuals. The tenant and the encroacher thus suffer a double disadvantage.

Numerous pieces of legislation have since the 1930s attempted to 'solve' the problem attendant upon the encroachment of Crown lands by squatter farmers. Some have provided for the leasehold occupation of virgin jungle and hillsides in exchange for a fixed rent over a predetermined span of time. Others have facilitated the freehold acquisition of the land worked by the farmer, who could either buy outright a deed of permanent property or else could aspire to ownership by the annual payment of instalments up to a fixed limit. The avowed intention in each case was to supply the operator of an encroached agricultural holding with security of tenure. This, it was thought, would act as an incentive for him to invest in and develop the land.

The efficacy of all such legislative enactments has been rather limited. Lack of staff to survey plots and the excessive complexity of the associated administrative procedures have discouraged many applicants

from going through with the 'regularisation' of their tenurial status. However, one factor seems more than any other to have given rise to a certain diffidence on the part of encroachers.

It has been a more or less consistent policy aim for the last 50 years to prevent, insofar as possible, the fragmentation of Crown holdings alienated to the occupier. Most distributive legislation has thus had built into a series of provisos restricting the right of beneficiaries to rent out, sell or mortgage any part of the holding acquired from the State. Grantees have moreover also been obliged to sign an undertaking not to leave their land upon their own death to more than one heir.

Such restrictive clauses have tended in the first place to prevent farmers from using their land as collateral for raising working capital and productivity has consequently stagnated or worse, in the absence of remedial fertilisation, declined. A second effect of these clauses has been quite simply to encourage recourse to innumerable evasive plays, so that alienated land is in reality operated by several heirs without this fact being legally recognised.

A third practice effectively respects the letter of the law without obeying its spirit: a single heir has taken over the whole farm at the death of the original grantee and runs it, with the sporadic help of close kinsmen, as a single management unit. By the terms of the law, the occasional assistance lent the farmer by brothers, cousins and so forth is to be regarded as remunerated agricultural labour provided by outsiders. This view of the situation however ignores the fact that, out of legal necessity, more persons than the members of one nuclear family are obliged to live off an agricultural resource base earlier designed to accommodate a smaller group of people.

Enactments concerning the alienation of Crown lands for agricultural purposes have always enshrined the principle that the farmer and his nuclear family should be enabled to enjoy a 'decent' standard of living by working the holding granted them. The issue of natural population increase within the family has never been satisfactorily dealt with by

the legislator. Where illegal fragmentation has not occurred as an immediate consequence, economic diversification within the extended family of heirs to the grantee has. During our surveys of land tenure and individual farms we thus frequently came across holdings that were only part of a cluster of family resources, which included activities as diverse as bus driving, gemming, school teaching, carpentry and mat weaving.

Legislation against fragmentation is obviously insufficient on its own to achieve the social objectives proposed. The aim of increasing rural incomes will in fact never be realised in the conditions of heavy pressure on land that exist in eastern Ratnapura until the introduction of more productive agricultural technologies is associated with the creation of downstream agroindustries. Growing employment opportunities constitute the only solution to demographic increase in this entirely rural area.

3.4 MARKETING

The marketing of paddy causes no problems. Prices on the free market are consistently above those offered by the Paddy Marketing Board; paddy is not a very perishable product; and most tracts where a commercial surplus is harvested can be easily reached by road.

The Multipurpose Cooperative Societies are authorised to act on behalf of the Paddy Marketing Board to purchase paddy at the guaranteed price. But most farmers see little interest in entering into such transactions whenever they can find an alternative outlet. Besides, MPC storage capacity is normally small and could never accommodate even a minor proportion of the paddy offered for sale by surplus farmers were the guaranteed price to become more attractive as a result of a national decision to align it more closely with that prevailing regionally in private trade.

The situation is quite different in the case of highland crops where, as already pointed out, bad communications can cause farmers to pass up the opportunity of growing perishable, high value enterprises because of the difficulties involved in getting them beyond the farm

gate. Even where villages are well served by an asphalted road and outside traders are willing to purchase local produce on the spot for bulk transportation in their own trucks to the urban centres further west, some controversy obtains as to whether such wholesalers give a fair price or not.

Many smallholders maintain that they are also being robbed by nearby boutique owners who group specific categories of produce for resale in semi-bulk to truck traders with whom they maintain a standing relationship. But then farmers frequently do not take into account the fare and the extra costs that are incurred by their taking half a working day off to bring their produce to the *pola* (fair held weekly or twice weekly in a few of the larger villages). Others assert that the low prices paid at the farm gate more than compensate for the dishonesty they can expect from the intermediaries who operate at the *polas*.

It is claimed that the scales used on the fairgrounds are rigged to give short measure and that visiting traders form a secret cartel to depress prices to an artificially low level. Whether such accusations are founded is difficult to ascertain. But our survey of *polas* did reveal that many traders were adepts at giving short change to farmers and that they were further inclined to include the weight of packing materials when weighing the produce.

It would also appear that informal sanctions are operative among traders to keep prices low: traders who increase the prices they offer above a certain level tend to find themselves the targets of massive pilfering, with the result that part of the produce they purchase disappears before they can even get it to their waiting trucks. The presence of new traders at *polas* is strongly discouraged by those already well established, so that effective competition between buyers is minimised and prices seldom rise as a function of passing demand on the local market place. If any sudden increase does occur, the phenomenon can usually be traced to a scarcity of particular products in the Pettah: *pola* traders then tend collectively to offer more in order to be in a position to meet an upward fluctuation in consumer demand in and around Colombo.

It is however already painfully apparent that the seasonally atronomic Colombo retail prices for certain high value commodities in strong demand - such as red onions and chillies - are not proportionately reflected in the purchase prices offered to farmers at the *polas* in the target area. The government controlled Marketing Department was initially supposed to act as a watchdog in this respect: as soon as prices fell locally on the open market to unacceptably low levels, it was to buy at well established floor prices in order to ensure that traders would fall in line if they were to remain in a position to purchase any produce at all.

The system unfortunately did not operate well - possibly because the Marketing Department was itself boycotted by urban distributors eager both to buy and sell at a high price so as to increase their turnover. According to farmers, the Department is frequently absent at *polas*. This may however merely mean that they personally have no contact with it. Some further affirm that the Department itself only deals with traders and never enters into relations with individual small growers.

Interviews with the managers of Marketing Department purchasing centres (of which there are four in Ratnapura district) suggest that these officials have almost no incentive whatsoever to fulfil their role as buying agents. Despite a reorganisation of the Department's local centres in May 1981, managers still have to bear the financial responsibility for any losses they may incur as a result of buying and selling activities: losses due to spoilage or unexpected price fluctuations are, in principle, deducted from their already diminutive salary, which is fixed. The payment of bonuses for competent stewardship does not seem to have been envisaged.

Managers consequently purchase as little as possible. When they do in periods of glut venture into transactions concerning vegetables, they tend to buy not from the farmers themselves but from smalltime 'collectors', who group the produce of numerous growers selling on one

day at the *pola* and then sell this in one bulk deal* to the manager in exchange for a very marginal profit. Hence, perhaps, farmer statements (already quoted) to the effect that the Department 'does not operate at *pola* level'.

Even in cases where growers can offer prime produce in quantities large enough to interest a manager (whose concern it is to be able quickly to fill a whole truck for rapid transport to the Pettah without incurring spoilage *en route*), farmers usually prefer to deal with private traders. The latter may pay cash on the nail. If they are the owners of village boutiques, they offer inputs on credit to be repaid in kind (albeit at unfavourable terms of exchange to accommodate a form of invisible interest payment by the farmer).

Credit transactions of this type with either boutique owners or visiting traders offering to prefinance crops seem to have the preference of farmers, as they substantially contribute to easing the small grower's cash flow problems. It was however impossible for us in the time available to measure with any precision the relative importance of cash as opposed to credit sales.

Although our information on marketing mechanisms remains admittedly patchy, our investigations seem to make it fairly clear that producers have no collective bargaining power and therefore find themselves in a buyers' market. Once they have harvested a crop and brought it from the field to a potential buyer, they have little alternative but to sell whatever the price offered. Transport to and fro of even non-perishable items (like coarse cereals or grain legumes) is so energy and time consuming that a refusal to sell can ultimately hardly be envisaged. The

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* Managers can do little else but buy in bulk where perishable produce is concerned, since they must have a large enough load to make it worth their while hiring a whole truck for transport to Colombo. Traders can, for their part, club together to rent a truck. For administrative reasons, no private dealer will envisage doing this with the Marketing Department as partner on a cost sharing basis.

tendency amongst farmers to cultivate traditional varieties of vegetables which all mature at the same time in a given microregion places them in a worse position by favouring the occurrence of seasonal gluts: the introduction of improved varieties of perishable vegetables with field lives of widely differing length would go some way to solving this particular problem. A wider dissemination by radio of wholesale prices prevailing in Colombo (as is already the case for upcountry vegetables) might also assist farmers in bargaining for better profit margins, since they are at present almost totally cut off from this kind of information.

Chapter Four

NEW ORIENTATIONS FOR AGRICULTURAL DEVELOPMENT

The problems we have outlined above fall into two main categories: those which are a result, direct or indirect, of demographic growth upon the agricultural resource base and those which are of an essentially institutional nature. The latter impinge strongly upon the former. A failure to ensure the timely introduction of innovatory technologies has further contributed to a general deterioration of farming the environment and diminished the productivity of the man-day. Yields have decreased without there arising opportunities for the profitable exploitation of land by dint of more labour intensive methods.

It is in Sri Lanka customary to look to the extension of irrigated areas and, failing that, to the rehabilitation of existing irrigation facilities to promote agricultural production and absorb an ever increasing rural labour force. Were this possible in eastern Ratnapura, we might still conclude from our own analysis that such a strategy would bypass the major issue - which is the ecological degeneration of highlands - and thereby, literally, prepare the ground for its own defeat: unless very serious measures are taken to reduce erosion in rainfed farming areas, the improvement of irrigated agriculture is in the long term likely to be of little avail; tanks and channels will silt up within a few years of their construction or rehabilitation.

The research team's proposals thus centre on ways of making highland production both more profitable and less exhaustive of existing resources. The prior success of soil conservation measures in the upper catchment areas of irrigation schemes it is proposed to rehabilitate or extend should be regarded as a *sine qua non* before work in connection

with asweddumised land can begin. The whole framework of institutional support to agriculture should be revised and methods elaborated to ensure that the very small farmer is in fact able to avail himself of the advice proffered and the inputs recommended. Rural industries should be developed to absorb as much of the surplus labour as possible, while the network of feeder roads should be extended to those areas in which it is anticipated that the highest levels of productivity using new ecologically 'safe' methods will be attained.

We will in the following sections attempt to give under each of these headings a brief outline of the kinds of action that might be envisaged. In a concluding chapter, we will subsequently describe the socio-agronomic research facilities and integrated extension programme that will be required to develop locally acceptable, efficient technologies aimed at stabilising the agricultural environment and increasing rural incomes.

4.1 HIGHLAND AGRICULTURE

The main thrust of any plan for the development of the agricultural sector in the target area must reside in the introduction of new dry farming technologies, for in terms of sheer geographical extent mixed highland cropping constitutes the dominant form of land use. Forestry could, it is true, profitably replace much of the fixed fallow farming on degraded steep slopes, which covers a high percentage of the total area particularly in IM_2 and some of WM_3*. The problem would then be what to do with the evicted farmers: the socio-political costs might exceed both the economic returns and the ecological benefits, for forestry is far from labour absorbent even when fast maturing species are chosen. Where rainfall is higher in the west and north rubber and, particularly, tea estates already occupy highlands. Steps taken to ensure their maximal development would have to be rather different. Finally, expanses of *patna* grasslands might be considered for conversion into pastures or for fodder production in view of a small dairy industry.

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* For a precise breakdown in hectares per land mapping unit of the areas in eastern Ratnapura suited to reafforestation see Dimantha and de Alwis 1981 and Dimantha 1982.

4.1.1 Mixed cropping

There are in the target area three distinct types of dry highland farming.

The most prevalent is that found on deforested rolling hills or steeply inclined mountainous slopes in the eastern half of IM_2 and in most of IL_1. Wherever human settlement occurs the land is either permanently cultivated or fallowed for very short periods before being replanted.

The second type, which is met with in the western and northern parts of the region, corresponds to what the Department of Agriculture classifies as 'homegardens'. It resembles a very sparse forest of useful species planted by man, which is intercropped with coarse grains, pulses, tubers and vegetables.

The third is more an ideal - or potential - type insofar as it at present comprises pure stands of coconut on smallholdings and minor estates situated in the major river valleys of the western half of the target area: these could for the most part be profitably interplanted with coffee, pepper and bananas*. Subsidies already exist for interplanting the first two enterprises. But little seems to have been done so far by the Department of Minor Export Crops to popularise this land use formula, which is both economically viable and ecologically sound in the majority of circumstances,

For the first two types of highland described no extension package has as yet been elaborated. Erosion is usually more accentuated in the case of the first than in that of the second, because of the absence of large trees. The presence of perennial vegetation with a deep root system also acts as a 'nutrient pump' so that the soils of Wet Zone highlands may prove marginally more fertile. But problems

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* For a recent feasibility study of various alternatives for the intercropping of coconut in Sri Lanka see Etherington and Karunanayake 1981.

with regard to the choice of suitable cropping systems, moisture and soil conservation techniques are similar in both ecotypes.

Farmers at present claim to grow what they can according to the availability of planting materials and the importance of their self-subsistence needs. They use little or no fertiliser on account of the cost, recognise no obvious rotations, and observe no juxtapositions in planting that would allow cereals, for example, to benefit from the nitrogen fixing capacity of adjacently placed pulses. Holdings seem comparable only insomuch as they exhibit the same degree of cropping anarchy. In this respect, it might be plausibly maintained that no real 'farming system' can be singled out as such on arable highlands in eastern Ratnapura.

Growers cannot identify most plant diseases and are therefore unable to choose the correct agrochemicals to deal with them. They are unconversant with ways of conserving soil humidity by appropriate tillage practices, the cultivation of cover crops or the incorporation of weeds and frequently allow unwanted vegetation to attain the seeding stage before cutting it back or uprooting it - this encourages weed infestation. They have little idea of the best spacing or plant density per seed hole to choose and almost always reuse their own or a neighbour's seed from a previous season. All these practices combined give rise to the very low yields observed.

So before anything else is done, highland farmers must be taught how to make the best of what they already have. Since, as we stated, little research has been carried out in Sri Lanka into the whole subject of rainfed farming systems, a first step would be to inaugurate an extensive programme aimed not only at developing new varieties specifically suited to the agroecological conditions prevailing in the target area, but also at elaborating cropping technologies designed to minimise risk and increase incomes in terms of returns to the man-day (see chapter five).

Sri Lankan varieties already exist that could be fairly rapidly adapted to circumstances in eastern Ratnapura. Three or four years of

adaptive research might suffice before slightly modified cultivars could be released. Attention would, however, have to be paid to the selection of plant types which do not demand heavy applications of fertiliser and which are resistent to prevalent diseases. First priority should go to upgrading cowpeas, manioc, chillies and red onions all of which occupy an important position in present cropping patterns. The first two are principally subsistence crops, while chillies and onions are mainly grown for sale.

Normally speaking, these enterprises are cultivated in association with local cereals - primarily *kurakkan (eleusine coracana)*, but also *meneri (panicum miliaceum)* and *thana hal (setaria italica)*. Although all these are extremely hardy and well suited to the environment, yields are uniformly low and their future development potential appears mediocre. The breeding of improved cultivars of bulrush millet, sorghum and maize has received considerable attention in recent years (millet and sorghum both in West Africa and, under the auspices of ICRISAT, throughout India; maize in Africa and at CIMMYT in Mexico). A large range of new drought and disease resistant varieties is being released, many of which would require only a brief screening before a preliminary selection could be made for the target area.

It is recommended that a considerable effort be made to introduce bulrush millet and sorghum into IL_1 and the drier parts of IM_2, while different varieties of composite (synthetic) maize would do well in all three of the agroclimatic regions with which we are concerned. The object of this innovation would be essentially to achieve notable increases in the yields currently expected from subsistence cereal growing without fundamentally changing the present cropping pattern. Although maize is already produced in small quantities on highland farms in eastern Ratnapura, it is hardly regarded as a staple. It is however an attractive smallholder crop in that it can be consumed fresh, when family food stocks are low some weeks before other cereals attain maturity. Much energy would therefore have to be put into demonstrating that not

only maize* but also bulrush millet and sorghum constitute viable high yielding alternatives to the local cereals and that all three are at the same time perfectly palatable.

The mere proposal of new varieties to supplant the traditional ones and the replacement of certain cereals by others is, of course, unlikely to have much effect unless accompanied by other measures. The introduction to peasant smallholders of any new cultivar will never succeed unless it can be integrated as an obviously profitable innovation into the complete farming system. To realise their maximal potential the new varieties selected will have to be presented as components of a technological package which can, initially at least, guarantee substantially higher yields without there being any necessity to greatly increase the level of purchased inputs. For although labour does not appear at present to constitute a major constraint on upland smallholdings, a paucity of working capital certainly does.

The precise recommendations to be included in this package will have to be worked out in detail by the researchers developing the varieties to be introduced. We can, however, briefly indicate some guidelines.

The first preoccupation of researchers should be to design tillage systems that suit the crops concerned but also promote soil and moisture conservation. Manioc might be planted in mounds or, like maize, on ridges, the furrows between which can be tied with temporary bunds to capture and hold as much rainwater as possible. Similar techniques might be applied to chillies and onions (e.g. broad raised beds, as is already usual in the case of the latter). Cowpeas might be encouraged as a cover crop between very widely spaced cereals to fight erosion and supply atmospheric nitrogen to the root system of the associated crop. (Cowpeas are at present frequently planted in pure stands on the grounds that they

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* In the case of maize, a major extension effort will have to be devoted to weaning farmers away from the presently widespread practice of dibbling three or more seeds in one hole and not subsequently thinning to one seedling: improved varieties require space if they are to outyield the present local cultivars, which commonly produce only one ear per plant.

suffer from excessive shade). Numerous types of mulching might be proposed to promote moisture conservation and inhibit erosion due to the 'splash effect' of heavily falli.g rainwater or to unoff. The establishment of grassed waterways around and down the plot might also be attempted (though the scarcity of cropland might cause farmers to ignore such a recommendation so apparently 'wasteful' of space where small plots are the rule).

The suggestions made so far are but improvements to an already existing cropping pattern. Although no real innovation has been proposed, much effort will have to be put into demonstrating to farmers that it is worth their while adopting the practices recommended. In the absence of some legislative enactment to convince encroachers that they will be entitled to stay on their land for at least ten years, it will be difficult to arouse any enthusiasm for these short term solutions. Really telling results will only be achieved, however, if more thoroughgoing innovations are developed and introduced in the form of a whole gamut of technological packages specifically designed to suit a wide range of local circumstances.

Since shifting cultivation is obviously on the point of disappearing and has in most areas already given way to fixed fallow systems because of the absence of vacant land of adequate fertility for clearance, innovatory packages will have to obey the twin objectives of improving the physical quality of the farming environment and increasing smallholder incomes. This involves, on the one hand, such measures as selecting enterprises and rotations that contribute to raising soil fertility, enhance its structure and provide valuable byproducts. It implies, on the other hand, a search for crops that will not only be the source of financial profit to the grower but will also help to absorb underemployed family labour during a longer period each year.

At present, few farmers in the drier parts of the target area venture to grow anything but very drought resistent sesame in *yala*. In the wetter west and north vegetables were still possible in this season until the onset in the early '70s of the now prevailing spate of droughts. A typical grower response has been to fall back on manioc,

which can carry over from *maha* well into the following year and be harvested at will when the farming family is most in need of calories. But manioc is a crop which requires almost no labour after an initial weeding, whereafter it tends to shade out competition if plant density is high.

Obvious choices to ensure ground cover over a longer period and thereby combat erosion, but also to enhance farmer incomes and absorb labour, would be cotton and tobacco. The former could be planted in IM_2 and IL_1 in early October and harvested over several weeks from late February onwards. Tobacco could be transplanted towards mid-November and picked over an extended period also from February onwards. Cotton demands considerable labour at the initial weeding stage, for spraying and, above all, picking and grading. Topping, pruning, picking and the onfarm processing of tobacco are also very labour consuming. The principal disadvantage of both crops is that they require a very sustained extension and marketing effort on the part of specialised agencies. Both are further susceptible to numerous diseases - particularly cotton.

While tobacco is already the object of an apparently well organised commercial interest on the part of the Ceylon Tobacco Company in other parts of the Intermediate Zone*, cotton has been sporadically grown in Sri Lanka for the last 70 years with very uneven results. Local production satisfied only 2.5% of national lint requirements in 1977 (Farrington 1979: 15). The same source however estimates that small improvements in varietal selection and cultivation practices would permit 50% of the island's needs to be covered by home grown cotton.

The chief technical obstacles to encouraging the large scale adoption of these enterprises in eastern Ratnapura are, in the case of tobacco, the necessity to have access to well or stream water for the

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* A recent decision by the Government to go ahead with plans to build a tobacco redrying plant opens the way to greatly increasing production on an islandwide scale: the redrying of village cured leaves will greatly contribute to improving the quality of the harvested product so that much larger quantities of superior grade can be grown for export after satisfaction of the domestic demand.

establishment of nurseries, besides fuel for curing, and, insofar as cotton is concerned, the availability of viable seed, effective pesticides and ultralow volume (ULV) sprayers. It must, however, again be stressed that neither crop stands even a remote hope of being taken up by farmers unless a large scale operation is launched to ensure the provision of all inputs on credit that can be reimbursed in kind at harvest time. Such a stipulation naturally implies that the promoting agencies will in each case enjoy an effective monopsony when the crop is marketed. There are several African examples that demonstrate the viability of such an approach, *if* the political will exists to prevent the development of parallel markets.

While different varieties of tobacco would do well in all three agroecological regions, cotton growing would have to be restricted to the drier eastern half of the target area. Pigeon peas *(cajanus cajan)*, which are as yet almost unknown in Sri Lanka but are cultivated in much of the southern half of the Indian subcontinent, would also serve the purpose of prolonging the growing season well into *yala* and keeping the soil protected from erosion over a longer period. This plant would suit all three agroecological regions.

The pigeon pea is a leguminous bush that fixes nitrogen with great efficiency in the soil and is consequently very advantageously planted in association with coarse grains. It requires little attention once sown, bears within six months a pulse which can be transformed into a very palatable *dhal*, has a pronounced tap root which enables it to avoid competing with cereals by allowing it to seek ground moisture at a lower level and provides abundant woody branches that can be used for fuel. It can also be occasionally ratooned after a first harvest and subsequently used, principally as a fodder plant, for three to four more years*.

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* Occasional attempts to introduce pigeon pea growing to the island are said to have in the past met with failure owing to destruction of the crop by pod borers. But trials were on a small scale; and it may well be that the appropriate insecticides could not be applied in time or else that the very high rate of insect infestation was due to isolated experimental plots attracting the entire borer population of a much larger area.

Another crop rarely tried in Sri Lanka, but which might prove a useful high value adjunct to subsistence cereal cultivation is the chick pea *(cicer arietinum)*. Small quantities are at present imported from India and sold at astronomical retail prices (around Rs. 40 per kg) in urban centres, where the Tamil population regard it as a traditional delicacy. The main reason for low levels of domestic supply is that most varieties demand cool, humid nights. But recent research at ICRISAT has resulted in selections which would probably adapt well to conditions in IM_2 and IL_1. Apart from its nitrogen fixing qualities, the chick pea provides good anti-erosive ground cover in association with tall cereals like maize, sorghum and bulrush millet. It has however a rather shorter field life (4-6 months) than the more hardy pigeon pea.

A last crop* which could be much more widely grown on highland in all three agroecological regions is groundnuts. This leguminous plant is already cultivated on a small scale in the south of IL_1 in the area surrounding Panamure. Light soils are preferable, though a very wide range of types are feasible. Like pigeon peas, groundnuts thrive on a fairly wet stage during the first two-thirds of their field life, which then tails off into a substantially drier period. This means that they do not have to be put in with the first *maha* rains and can be held in reserve for interplanting with half grown cereals when there is a lull in the labour requirements immediately after the second weeding. The scarification that accompanies the removal of weeds is all the tillage they need. In common with other leguminous species, groundnuts further require no nitrogenous fertiliser and can in most conditions do without either phosphates or potassium. The haulms constitute a valuable high protein fodder, but are at present burnt by most producers.

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* Soya is not at present recommended because of problems involved in industrial processing: hardly any domestic market as yet exists for soya products and the construction of a processing plant of economic dimensions would therefore constitute a very risky investment. Pilot processing units are apparently being set up in certain areas of the northern Dry Zone and a market may consequently develop in the course of the next two or three years. But certified seed is still too expensive in the opinion of farmers interviewed, while maintenance of seed viability from harvest until the time of replanting is difficult in the absence of refrigeration, according to the agronomist in charge of the soya programme at the Angunakolapelessa research station near Embilipitiya.

Cotton, tobacco and groundnuts are all cash crops that can be promoted on a large scale only if the appropriate industries are prepared to buy up almost the entire crop. The problems with cotton and tobacco are of a mainly organisational nature, for there already exists an industrial infrastructure at the national level.

In order that groundnut cultivation attract the peasant farmer, offtake facilities would have to be provided throughout the target area and a small oil extraction plant would have to be built in the vicinity. Fuelling would cause no difficulties, since the furnaces are designed to run on the discarded shells. Groundnut oil and cattle cake are in high demand on the international market. But to ensure that both farmers and the body investing in the construction of a processing facility work to each other's mutual advantage, it would be advisable that seasonal contracts be offered to growers. Groundnut planters would benefit from the stability of prices for different grades established in advance and possibly some extension input, while management could be certain of the delivery of sufficient quantities to guarantee that the plant functions at a reasonable level of economic viability.

The industrial crops proposed would encounter one major difficulty in that they are all fairly bulky and could therefore not be grown anywhere which was not within easy reach of at least a cart track. Now, ease of access is not the rule in very many highland areas in eastern Ratnapura. Where communications are the obstacle, farmers would be inclined to continue to concentrate on high value, easily transportable crops. Pulses (e.g. *dolichos lablab*, cow-, pigeon- or chick peas) for sale in the dry shelled state might here provide an appealing alternative to or intercrop for subsistence cereals and manioc.

The planting of *ipil ipil* (a leguminous fodder tree) might serve the multiple purposes of simultaneously increasing forage production, combating erosion, providing fire wood and upgrading the nitrogen status of the surrounding soil. Cloves, pepper and coffee are all high value perennials improved varieties of which could be promoted on highland smallholdings, especially in WM_3. Like

papain*, extracted from the papaw fruit widely grown in home gardens in the eastern half of the target area, these tree crops offer the considerable advantage of being light to transport. Processing does, however, present a problem insofar as current methods are rather inadequate and give rise to an end product which fetches a low price in comparison with the market potential.

Mulberry cultivation, already begun on a modest scale, might also be extended in WM_3 and IM_2 if religious objections to silk worm production can be overcome. Cashew growing could provide an important long term source of smallholder income in the drier east and south. The national Cashewnut Corporation might be persuaded to launch a scheme for the introduction of this tree crop on smallholdings. But the apparent inability of the Corporation to compete with private traders, who at present offer almost double the price per kilogramme, and the general inefficiency, with which the issue of subsidies has been handled by the Corporation in neighbouring Hambantota district, do not suggest that these are the best auspices under which to encourage the planting of such a long term crop in the target area.

In the southeast, grafted mangoes developed in the African Sahel (Mali, Upper Volta, Niger) would prove equally suitable and would probably sell at very high prices given their quality, which is infinitely superior to that of all varieties at present grown in Sri Lanka. A strong and high flexible marketing organisation would have to be brought into operation during the mango season, if this very perishable product is to reach an essentially urban based buying public in prime condition.

Some consideration might also be given to the encouragement in WM_3 of the cultivation of short lived perennials like cinnamon and

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* Papaw was until a couple of decades ago fairly extensively grown on an estate scale in the lower areas of IL_1. Violently fluctuating prices in the export market have tended in recent years to make papain production an extremely risky enterprise. An economic study of market prospects and the potentially stabilising influence of government intervention upon the export trade might allow the formulation of legislation that would favour a renewal of interest in the crop.

cardamom. Both are already grown locally on a small scale. While the marketing of large quantities of cinnamon might be hazardous given the traditional instability of prices at the national level, there might be quite some scope for cardamom at the higher elevations.

Since any expansion of the area under tree crops represents a welcome addition to the depleted forest reserves of the region, every effort should be made to foster security of tenure, which is a *sine qua non* for such long term investment. Bananas, which are already widely grown and for which there is a persistent domestic demand, should be systematically intercropped with coffee and a leguminous cover in WM_3 to achieve a more economically rewarding land use. As in the case of this mixture, attention should be given to the frequently unexploited possibility of combining crops of different canopy height and root depth on the same plot so as to make the most of both the photosynthetic and the groundwater requirements of various plants living in symbiosis.

An important restriction with regard to the planning of tree crop developments is that farmers will on the whole be reluctant to plant even the most lucrative perennial enterprises at any distance from their homestead: young plants would be difficult to establish without initial access to water for emergency irrigations when drought strikes in the first years; and there obtains the often justified fear that such crops are somewhat vulnerable to thieves. The crops that can be taken on outfields are similarly limited in certain less densely settled areas by the existence of wild boar and monkeys which not infrequently destroy the standing plants. Fencing is too expensive and too labour consuming to construct, though security of tenure does encourage peasants to grow thick hedges. These are, even so, inoperative in the case of monkeys against which the only protection is sometimes to grow exclusively tubers. The introduction of regulations to facilitate the issue of gun licences might go some way to solving the problem - at least for those farmers who can afford to purchase a firearm and ammunition.

There is scope for greatly expanding highland manioc production

throughout the target area. If cash crops, like cotton and tobacco, do eventually catch on, there is nonetheless a danger that manioc will to a large extent supplant the growing of cereals, which require much more attention and labour than do tubers. This is a tendency which has been noted in the course of the evolution of most tropical shifting systems into stabilised mixed farming (see Ruthenberg 1976). Manioc offers substantially more calories per hectare and per man-day involved in its cultivation when labour is required for cash cropping operations. But it provides a much poorer diet if relied upon as a family staple and can be the indirect cause of major public health problems.

The discussion has so far centred on the development potential of highland arable smallholdings under conditions of stable tenure. A fairly large extent of the target area is however devoted to small and medium sized, privately owned estates of rubber and, particularly, coconut. These lie mainly in WM_3 and IM_2. Although the density of plantation usually conforms quite closely to nationally recommended norms, standards of management are mostly low and the intensity of land use far from optimal.

A subsidy scheme exists, as already mentioned, for the interplanting of coconut with pepper and coffee. Very few owners have ventured to take it up. The reasons for this seem to be the absence of any systematic extension and follow-up effort, as well as the disorganised state of arrangements for spice and beverage crop marketing. Both pepper and coffee require extensive care during the juvenile stage and subsequent pruning. Little or nothing is at present done to satisfy these technical requirements.

To increase the productivity of interplanting coconut with these crops it will be necessary to remedy the paucity of extension personnel, to improve their technical competence and to restructure subsidies to meet farmers' needs. A similar programme could be launched to cater for smallholder production at the homegarden level.

New high yielding, yet hardy varieties have been developed by

specialists working at the Matale minor export crops research station but also running varietal trials and acclimatising imported cultivars at lower altitudes as well. These should be made more readily available in the wetter areas of eastern Ratnapura. The traditional predominance of pepper and coffee should not however obscure the potential for other spice crops like cloves, ginger and turmeric. Cloves could well be planted progressively to replace senile individual coconut palms and rubber trees. In this manner ageing plantations of marginal viability would be gradually transformed over a long period of time into very valuable clove plots.

Areas under rubber should nevertheless not be drastically reduced because of the labour absorbing nature of this enterprise. Instead, thought should be given to ways of remuneratively employing more labour in coconut plantations. Apart from pepper and coffee, it would appear from a recent analysis (Etherington and Karunanayake 1981) that bananas would constitute a very lucrative intercrop, while pineapple is not to be neglected. Ginger might be tried experimentally, though turmeric is not fond of shade and would do better grown as a garden crop.

The introduction of more systematic, labour intensive forms of intercropping on highland smallholdings and minor plantations must constitute the main thrust of any viable programme for the development of agricultural production in the target area. This will involve a major research and subsequent extension effort. Eastern Ratnapura comprises, however, large extents of highland which fall into neither of these two categories. Since they require very significant levels of investment to foster their development above present levels we will deal with them only cursorily. For our information is, in comparison with that gathered on smallholder farming, very incomplete and a coherent plan would have simultaneously to take into account a multiplicity of factors, whereas a more gradual and piecemeal approach is feasible in the case of peasant agriculture.

4.1.2 Dairy farming

There are in the target area, particularly in the south and the east, very large extents of *patna* grassland (e.g. the Bulutota massif). These tend to clothe the upper slopes and ridges and are often interspersed with rocky outcrops. The dominant grasses are unpalatable to cattle. In places, where pressure on the better land is heavy, farmers desperate for some kind of subsistence crop do resort to tilling *patna* and using the plot for a season or two. Thereafter bananas are often planted and left in until yields fall off to almost nothing. But there is apparently no future in such lands for arable farming*.

The only agricultural alternative would seem to transform them into more productive grazing by planting them to high quality grasses or leguminous fodder crops. Both solutions involve the ploughing up of fragile soils and exposing them to erosion during the hand planting of grass cuttings or sowing of legumes. Heavy rains during this process could spell disaster. The cost of such an operation on the scale required is moreover prohibitive in terms of the labour necessary to create enough pasturage to carry an economically viable herd.

Given religious objections to the breeding of cattle for beef, the vocation of such pastures would seem restricted to the raising of dairy animals. The production of milk in industrial quantities is however for the present moment of very dubious profitability: fresh

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* Whether this frequently heard assertion is true or not remains to be proven (see chapter five). Even cursory inspection of IL_1 and IM_2 suggests that many of the steeper hillside plots have been carved out of *patna*, lighter patches in wide expanses of grass also bear testimony to their recent cultivation. If *patna* lands are in reality only marginally fertile after a lengthy fallow, the questions to be answered are: 1) under precisely what conditions and why farmers open up *chenas* on them at all; 2) what more profitable alternatives could be offered them (e.g. by way of intensification of their agriculture on more fertile soils lower down the slopes); and, finally, 3) what could in the long term be done to make *patna* lands productive in the event of dairy farming not providing a viable solution. Reafforestation may ultimately turn out to be the only economic strategy in this case.

milk prices re very low, while impc ted powder still ndercuts doemstic production costs, because concentrates are locally comparatively expensive. If any attempt were made to improve the patna glasslands, investment would be massive and standards of managment would consequently have to be extremely high with strict rotational grazing and large vaterinary inputs. Only a well financed corporation could support such costs. But few entrepreneurs would be tempted by the prospects.

It would seem wiser in the circumstances to direct efforts to the development of milk production in the smallholder sector along zero grazing lines. Produce would be mainly for family consumption or sale within the local community. Cattle could be largely stall fed using manioc chips, crop residues, the second growth of ratooned cereals or leguminous fooders introduced into the rotations proposed for dry arable farming. Manure would greatly contribute to the improvement of highland soils and ploughing with bullock power could be encouraged on certain types of land. Though it should be noted that such an integration of cattle keeping into smallholder farming involves much transport of bulky materials and therefore the existence of car tracks.

4.1.3 Tea Estates.

The tea sector is geographically limited to the northern and southern parts of WM_3 with only one estate of some importance (Wikiliya) located in the Intermediate Zone. There is apparently quite some privately owned tea to the north of Balangoda, whereas most of the higher lying plantations are government managed.

There is obviously scope as in most tea areas of the country, for the upgrading of existing stands, replanting and the improvement of manufacturing facilities. These could form the focus of a sectoral plan. Care would however have to be taken that resultant increases in production do not exceed the market potantials for certain types of tea. A study of export market trends should be undertaken to this end.

The research team is of the opinion that all the land presently devoted to tea growing is not necessarily vest employed in this manner. Greater social utility - labour abosrption and income - might be derived

from the partial or complete conversion of certain marginal tea estates and smallholdings to other patterns of agricultural production.

State plantations might encourage their resident labour force to transform run down divisions into intensive homegardens, where the emphasis could be placed on citrus, cardamom or passion fruit growing. Vegetable production might also prove a lucrative alternative if the livestock economy, in which many estate labourers engage, could be more closely geared to manure requirements (nighttime folding on the plots themselves or stabling in adjacent sheds).

Any reconversion of estate lands should not neglect the needs of local villagers, who often constitute an important proportion of the labour force. A case came to our notice in Wikiliya where land was badly needed for village expansion, but people unconnected with the local community had been favoured in the redistribution of resources.

The planned introduction of smallholder mixed cropping onto degenerate tea lands should take into account the necessity for soil rehabilitation and conservation. The undertaking of the measures required (terracing and the respect of specific cropping patterns) might constitute one of the conditions upon which plots may be distributed on long leases by the government.

It should be noted that the National Agricultural Diversification and Settlement Authority has since 1980 been engaged in the conversion of mid-country tea estates. NADSA has accumulated quite some experience in this domain and has sponsored research into the design of optimal tree cropping models for homegardens one hectare in extent. One such demonstration is being conducted near the town of Gampola by minor export crop specialists stationed at the research station near Matale.

Marginal tea lands could be replanted, as is indeed traditional practice, to sugar cane. Around Haldummulla, to the northeast of the target area and just outside Ratnapura district, cane production and the manufacture of jaggery are quite significant. Any plans for the extension of this type of activity should however take into account the

need for a viable heavy transport network to bring the cut cane from the fields to the crusher and the necessity for investment in conveniently located refining facilities.

Similarly, run down tea acreage could be replanted to smallholder managed citronella. But here again the problem of establishing processing plants poses itself, while citronella oil prices are at present rather unfavourable.

4.2 ASWEDDUMISED LAND

Once the technical problems of highland cultivation and the stabilisation of erstwhile *chena* farming are well on the way to being solved as a result of agronomic research, extension and the regularisation of tenure, it can be hoped that highland erosion will begin to decrease. The rate at which irrigation works will silt up will show a concomitant deceleration and it will be possible to design a concerted programme for their phased rehabilitation.

It may nonetheless be asked whether such an undertaking is either economically feasible or politically opportune. Although some rehabilitation will always continue in order that the inhabitants of certain particularly volatile rural electorates be placated*, it may not be government policy to make more than locally symbolic gestures in this domain, when national priorities lie predominantly in achieving the objectives of the accelerated Mahaweli programme. Nor may it be sound economics to spend millions on the desilting and reconstruction of minor schemes, when tenurial arrangements discourage the small farmer from aiming at the attainment of maximal yields. The first issue is highly relevant but remains outside the purview of the present paper. We shall deal therefore only with the second.

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* Some tanks in IL_1 and IM_2 with a command area of over 8 ha may thus come in for major repair under the national Village Irrigation Rehabilitation Project.

Before any refurbishing of tanks, anicuts and field channels can be entered upon it will be necessary to carry out an indepth study of the manner in which different categories of tenants and landowners are liable to react to an increase in the productive potential of their land when the supply of irrigation water is eventually made more plentiful and more reliable. Some unregistered tenants, who are nonetheless now tolerated by the landowners because of the marginal viability of the plot under present conditions, may find themselves evicted without recourse. Others may have tenurial arrangements such that they are hardly motivated to produce more, as this would only allow them a negligible gain in overall income despite inputs of disproportionately more labour and working capital. *Thattumaru* share cultivators may shy away from achieving full productivity, because they would lose the benefit of residual effects in the following season of fertiliser applied to the land. Landlords and traders able to dispossess tenants and very small farmers by strongarm tactics and foreclosure on mortgaged land might, on the other hand, tend to consolidate their holdings and introduce capital intensive mechanised methods with a view to achieving much higher yields and profits than in the past.

If such reactions are not foreseen, rehabilitation of the irrigation infrastructure could result in social disaster and much unrest, or merely a net loss to the national economy caused by the inappropriate investment of scarce funds.

Much of the asweddumised land located in the target area is at present irrigable only once a year or, sometimes, once in three or four seasons. Sections of some tracts may be thoroughly watered only in pluriannual rotation, because poor rainfall and silting have diminished the overall availability of water. Farmer response to this situation has in some cases been to undertake the *maha* cultivation on asweddumised land of crops requiring a humid bed but no standing water. Producers in the area around Godakawela have thus specialised in sweet potatoes. But by no means all tracts in this location are so used and much of the irrigable surface remains without a crop in *maha*.

The reasons for this are threefold. The first is that large buffalo owners frequently have the power at village level to enforce fallowing of the tract when irrigation water is not sufficient to grow a paddy crop: the fields are grazed by their animals. The influence of such men resides partially in their ability to refuse draught power in a subsequent paddy season to those who counter them by cultivating against their wishes. The second is that *thattumaru* share partners cannot always agree to the utilisation of asweddumised land for purposes other than paddy production. Finally, the cost of putting up fencing around individual plots to keep out cattle may be prohibitive, if only a minority of the farmers in the tract decide to go in for non-paddy enterprises: economies of scale cannot be achieved unless the whole asweddumised area is protected by a single continuous barrier constructed around the perimeter.

The problem with buffalo owners is intractable. It is often linked with the local exercise of political influence. Measures could however be taken to ensure that *thattumaru* sharing does not constitute an obstacle to the non-irrigated use of paddy lands. Economic motivation might, for example, be strong enough in the case of very high value cash crops to ensure that partners agree to the dry planting in *maha* of certain enterprises such as cotton and tobacco, which would thrive in humid, but not waterlogged soil conditions.

Even so, much effort would have to be deployed to demonstrate the economic viability of such innovations and, hence, the rationality of collective investment in seasonal fencing. One warning should further be pronounced. Peasants have a tendency to evaluate the profitability of a crop in terms of monetary return to the man-day of labour rather than overall income derived from a season's risk and work.

So the revenue per hectare may well be considerable, but few farmers will launch into a new enterprise if the number of working days to be expended on a crop is expected to be inordinately high. Leisure can in this case become a preferred allocation.

4.3. EXTENSION AND FARMER MOTIVATION

In eastern Ratnapura, as in most other areas of the country which do not fall within the jurisdiction of a settlement authority, most farmers have very little (if any) contact with the field representatives of the various agricultural extension services. The main reason for this is that the vast majority of operators do not grow sufficiently large expanses of any one crop which falls within the purview of a given specialised agency. Paddy and coconut constitute partial exceptions, But neither presents any agronomic problems that most farmers cannot handle without outside advice; and extension is in the case of coconut confined to ensuring that a very few recommended practices have been followed before rehabilitation and replanting subsidies are paid.

A second, complementary reason for the paucity of extension activities in the target area is that the vast majority of farmers eke out a livelihood on crops in connection with which no innovatory technological package has as yet been elaborated. Field officers of the Department of Agriculture are hardly more knowledgeable about the cultivation of pulses, tubers, coarse grains and fruit than are the producers themselves. If they are able to proffer a little advice in the domain of vegetable production, it is usually limited to recommendations concerning the selection and application of appropriate agrochemicals. They are moreover so thin on the ground that they can adequately cover but a very small part of their official range.

There is then obviously an urgent need to increase the number and enlarge the competence of extensionists entering into direct contact with farmers. Little hope can be placed in the capacity of the island-wide Training and Visit system to achieve these ends: it is now generally recognised that this approach is not suited to the organisation of farming communities in the Wet and Intermediate Zones. Extensionists must thus be trained to deal with the predominance of dry farming and tree crops in the target area (see Gunawardana and Chandrasiri 1981).

Before such training can be begun, it will however be necessary

to complete a considerable amount of adaptive plant breeding and research into the different ecosystems prevailing in the target area along the lines indicated in section 4.1.1. above. Models of improved highland farming in a variety of environments will have to be constructed and tested in the field. Considerable attention will have to be paid to smallholder management skills and to identifying, by a series of socio-economic studies, the principal constraints in terms of labour bottlenecks, economic opportunity, cash flow, input availability and marketing that the smallholder has to face. The extension packages that are finally proposed to the farmer clientele will have to be so conceived as to take the entire holding and the operator's personal priorities into account.

Extension should not be viewed as a mere retailing to the farmer of a simple descriptive list of innovatory practices that he may take or leave at will. It should start as an attempt to analyse typical clusters of problems that occur with some regularity on specific categories of holdings and should continue as a bid to convince farmers to adopt one or the other of a series of systematically structured alternative solutions, which simultaneously provide answers to a number of interrelated difficulties. The need for this kind of holistic, management oriented approach was frequently stressed by respondents during the initial survey.

Extension that concentrates on problems of an agronomic order alone is very unproductive in the type of farming environment met with in eastern Ratnapura. Not only must each holding be regarded as a management unit that can accommodate some, though by no means all, of the improved practices proposed, but care must be taken to ensure that innovations will enjoy the institutional support necessary for their success at farm level.

The supply of planting material, fertilisers and agrochemicals must be dependable. Retail agencies, such as the Agrarian Service Centres or MPCs must be within easy reach. Offtake facilities, crop insurance and inexpensive credit must be readily accessible. Any planning effort should cater for the upgrading of these vital agricul-

tural supporting services and their reorganisation away from nationally imposed norms, in order that they should be able to show a more flexible response to specifically local needs.

Steps must be further taken to ensure that traders make no more than a reasonable profit; floor prices must be established for more crops, frequently readjusted (in the case, for instance, of vegetable production) and amply publicised in order that they should have the desired effect of increasing the bargaining power of growers. But perhaps most important of all, regional production must be planned in relation to probable fluctuations in demand to avoid gluts and a loss of interest in certain crops by farmers unaware that a better phasing of planting and sales might greatly enhance their net margins.

4.4 TRANSPORT AND RURAL INDUSTRIES

Any increase in agricultural production beyond subsistence level will be necessarily related to the existence of roads: the cultivation of bulky industrial crops and smallholder dairying will naturally tend to be taken up first in areas with easy access to markets. It may therefore be inferred, on the one hand, that rural processing industries must be situated in strategic positions at the centre of a communications network reaching back into a hinterland most suited to growing the crops they purchase. On the other hand, the construction of new roads should be undertaken to open up subregions in which it is felt that there is a definite future for an economically attractive enterprise which will feed rural industry.

Soils and farming potentials, besides the motivation of growers, should thus be thoroughly investigated before it is decided to set up any kind of processing plant at a particular location. The opportunity of extending the road network should be similarly weighed as a function of probable future production and not merely judged with regard to the relative isolation of existing communities.

Precisely which rural industries it will be appropriate to set up depends entirely upon the popularity met with by certain of the crops

proposed in section 4.1.1. If cotton is eventually grown on an extensive scale, it may not be necessary to build ginning mills in the target area, as sufficient capacity is already installed at the Wellawatte Spinning and Weaving Mills in Colombo, the National Textile Corporation establishment in Hambantota and at the River Valleys Development Board facility in Angunakolapelessa (Farrington 1979:64-65).

The crops which could most advantageously be treated near their place of production would be groundnuts and maize - both for oil extraction, but the latter also for numerous starch based compounds that are eagerly sought after by a wide range of manufacturing industries. The residue that remains after groundnuts have been pressed can be sold as a very high quality cattle cake. Since the target area is so far from a major port, it may be possible to use this concentrate locally to promote smallholder dairying instead of selling it on the international market. A manioc pelleting plant might cater for the same clientele as well as exporting feed to other parts of the country.

Milk production might thus reach levels that would warrant the construction of a small factory which would specialise in the turning out of butter and cheese for sale in the urban centres of the western coastal belt.

Tobacco curing and coffee processing by the superior wet method could be organised in numerous localities either on the basis of growers' cooperatives or, in the case of tobacco, by the private firm involved in its purchase for resale in the form of cigarettes. Citronella oil extraction might present yet another possibility.

There are, finally, those old standbys of rural planning: coir plants, brick or tile factories, and power loom workshops. All three presently occur in the target area. None appears particularly prosperous.

It should be stressed that the types of industrialisation suggested have been picked out as appropriate to the resource base that already exists or may be developed in the not too distant future. None of them (apart from the coir industry - but even then coconut will remain rela-

tively unimportant in the area) is very labour intensive. The effect of their establishment on employment will be minimal. Nor is it anticipated that more sophisticated, labour absorptive industries, like electronic component or garment production, will follow in their wake: skilled labour is not available, while both the sources of material inputs and markets are too distant.

Chapter Five

APPLIED INVESTIGATION AND DEVELOPMENT

We have described the difficulties encountered by farmers in the target area. We have proposed a number of piecemeal solutions selected on the somewhat tenuous grounds that they have been successful in similar circumstances elsewhere. Agriculture is however a field of applied science in which the fixed parameters are few, but the operative variables remain, literally, innumerable in the complexity of their interaction. All the solutions we have put forward must then, of necessity, be only tentative until they are proven viable in the context of existing farms producing under conditions of 'normal' uncertainty.

The purpose of the many agricultural research stations with which Sri Lanka has equipped itself since Independence has been to select economically attractive crops, to screen them for viability in the agroecological regions to which each cultivar appears most suited and, ultimately, to proceed to a thorough testing under field conditions in chosen areas to ascertain the wisdom of releasing planting materials to farmers. This kind of classical, 'upstream' research has met with resounding success in the case of paddy. But few, if any, of the non-plantation crops developed so far have been able to kindle anything resembling the same degree of positive response on the part of farmers.

Cotton, which holds out enormous potential, has been largely boycotted by growers both under irrigated and under dryland conditions. The popularity of tobacco has been restricted by marketing constraints and an initially mistaken choice of variety to very limited areas of the country. Cashew nuts have not prospered because of factors hindering access to subsidies. Chillie varieties have been bred for the Dry Zone

only and therefore present a considerable risk owing to their susceptibility to cryptogamic diseases when commercial production is contemplated in the wetter regions. Groundnuts have been the object of very little development work and have not been considered for introduction as a major crop in the Intermediate Zone. Soya has in recent years attracted attention, but again only for districts characterised by a relatively low rainfall. Coarse grains, most pulses and manioc have been by and large neglected because, it would seem, of their low commercial value.

This somewhat negative appraisal of the concrete results of agricultural research in terms of the very modest increases registered in overall productivity per land unit does not constitute an indictment of the ability of the scientists involved. It is to be interpreted rather as a criticism of the policies behind research orientations, which have emphasised the primacy of the Dry Zone with its supposedly greater productive potential in the non-plantation sector and the attainment of national selfsufficiency with regard to the most widely consumed food crops. The concentration on paddy, then chillies and soya, is the result of political options that have marked the course of the last two decades.

The expansion of areas planted to subsistence cereals other than paddy, legumes, root and vegetable crops has been left to the initiative of farmers responding to fluctuations in demand. Very little effort has been spent on developing appropriate technologies and teaching farmers how to improve their income from these enterprises. What little has been accomplished has stressed the modernisation of medium or large sized production units and has quite consistently ignored the potential of both the Wet Zone and neighbouring relatively high rainfall areas.

The key regions covered by the present report thus fall quite outside the purview of any ongoing agricultural research thrust. The very small size of most holdings furthermore precludes the majority of farmers from applying, even in modified form, almost all the recommendations formulated for other regions by scientists working in the context of the island's agricultural research network: recommended practices are usually for pure stands on fairly even terrain and seldom take into

consideration the constraints experienced by the smallholder, which drive him to pursue an intercropping, risk averting strategy to cater primarily for selfsubsistence needs.

Research capacity in Sri Lanka is simply not geared to providing solutions to the problems confronting the peasant farmer on fragile, unirrigated soils. There is little familiarity with the hidden constraints he has to face (labour availability, social imperatives, cash flow), while very little attention has been devoted to the more visible problems - such as the maintenance at low cost of soil fertility, erosion control by biological rather than labour intensive means, the achievement of timely cultivation by introducing light mechanisation, the neutralisation of drought risks by appropriate tillage techniques, and so forth.

It is true that the CIDA dry farming project based on Maha Illuppalama did broach some of these issues; the IITA/Sri Lanka zero tillage project has been active in the same domain. But the former could not manage to make its socio-economic component truly operational and petered out prematurely before cogent results could be attained, while the latter is purely technological in character and is apparently unable to surmount the constraint posed to farmers by the excessive cost of the main input, weedicide.

It is for all these reasons that we propose the setting up in eastern Ratnapura of a completely different type of pilot agricultural research programme, the principal traits of which will be:

i. interdisciplinary cooperation;
ii. heavy reliance on sustained two-way communications with as many farmers as possible; and
iii. officially sanctioned reciprocal relations with representatives at every level of the region's agricultural support infrastructure, with which the project will seek maximal assimilation.

5.1 FARMING SYSTEMS AND RESEARCH (FSR)*

A recent research publication has defined what is increasingly called a 'farming system' as '... the totality of production and consumption decisions of the farm-household, including the choice of crop, livestock and off-farm enterprises, and food consumed by the household' (Economics Program 1980:9). In some 20 developing countries around the world research programmes have been inaugurated over the last two decades with a view to gaining a holistic understanding of such decision making entities, of their interrelationship within a given agricultural region and the nature of their dependency upon socio-economic factors beyond the farmers' direct control. The collection and analysis of this kind of data has come to be regarded by many researchers as the only sound foundation for the modernisation of traditional peasant agricultures.

It has been plausibly argued that agricultural research might, ideally, be conceived of as a smooth continuum of activities inter-connecting as follows:

i. analysis of the existing situation;
ii. initiation of basic lines of research;
iii. elaboration of broadly generalisable solutions;
iv. adaption to specific situations of those solutions which have been proven most nearly appropriate;
v. implementation of action programmes;
(Gilbert, Norman and Winch 1980:22).

An articulation of activities on this pattern has, however, in practice often come up against difficulties of a mainly institutional nature: international research institutes, like CIMMYT in Mexico or ICRISAT in India, have had to concentrate their efforts on their mandatory crops and have had little opportunity to adopt a truly holistic approach; elsewhere there has often existed an administrative hiatus

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* This section relies heavily upon information published in Gilbert, Norman and Winch 1980, which comprises an extensive recent bibiliography on FSR. See also Economics Program 1980.

between research and extension, so that little or no continuity has marked the process of technological improvement from the preliminary stage of research priorities identification right through to ensuring farmer adoption.

This latter case is that of Sri Lanka. Despite the existence of an islandwide project providing for the integration of all research and extension activities under a single organisational umbrella (World Bank 1979), these two aspects of agricultural development have remained almost entirely independent, as have also the various agencies responsible for the promotion of particular clusters of crops.

Experience in other countries has tended towards the same impasse. Although efforts have been made in Colombia, Senegal and Nigeria to adopt an FSR approach, the final linkup between microlevel investigations leading to the formulation of recommendations, on the one hand, and large scale extension, on the other, has not fully materialised. In Guatemala, the relationship between FSR and implementing agencies has been much closer, since commitment to this research and development strategy took the form of a political decision to carry out a thoroughgoing reorganisation of the Ministry of Agriculture.

The Guatemalan Instituto de Ciencia y Tecnología Agrícolas (ICTA) was vested from its inception in 1973 with the authority to perform both research and extension functions. This, we would hope, is the kind of dual responsibility that would be assumed by a pilot development project to be set up for the key regions in eastern Ratnapura.

As it turned out, the methodology used by ICTA in its exploratory survey and farmer interview procedures is very similar to the one we ourselves employed to gather the materials analysed in chapters 3 and 4 of the present report. We did not however learn this until our own surveys were already completed. ICTA's resources were, even so, more substantial than our own and it was possible for that institute to use the services of a greater variety of specialists, who would furthermore stay attached to the projects identified for several years following the commencement of operations. We tend to agree with ICTA exponents

(Gilbert, Norman and Winch 1980; Hildebrand 1981) that the same personnel should preside over all five of the stages in agricultural research and outreach that we enumerated at the beginning of this section: this is the best way of ensuring that a truly interdisciplinary balance should obtain until the project draws to a close.

ICTA's *sondeo* or exploratory survey method is slighly more refined than our own. It differs principally in that it concentrates, one at a time, on target areas that are much smaller than our key regions (40-150 km^2, as opposed to some 220 km^2 for IL_1 and 360 km^2 in WM_3 - see Hildebrand 1981:426); and that each team of about 10 members comprises experts ranging in speciality from agriculture and soil science, through entomology and veterinary medicine, to economics and social anthropology. Working for six to 10 days in a single area this group produces a joint report on the prevailing gamut of farming systems, which resembles our own review of conditions in eastern Ratnapura and provide the bases both for the identification of research priorities and the design of an outreach oriented, multitiered programme for the gradual transfer of results from upstream adaptive trials to the fields of an eventual majority of adopting farmers.

5.2 IMPLEMENTATION AND OUTREACH

With an admittedly small agronomic input and the aid of land classification maps specially commissioned by the ARTI/Wageningen Project, the team has already identified the major agronomic potentials offered by the key regions. A further rapid appraisal by a senior agronomist experienced in other analogous ecosystems of south and southeast Asia would no doubt help to sharpen priorities and to point to recently developed varieties of promise as yet unknown in Sri Lanka. We are however already aware of the most important areas upon which research should be brought to bear.

These are, in summary, cropping patterns, soil science (including fertility, tillage, and erosion control), weed science, entomology, livestock integration and the vast, but amorphous field of socioeconomics. The first and the last domains mentioned in this list should act as the

templates into which the others should be slotted as and when feasible or required. But cropping pattern research should not proceed other than in close association with those responsible for the socioeconomic investigations, who should provide guidelines to the agronomists with respect to the probable acceptability of the innovations the latter are developing.

5.2.1 Infrastructure and staffing

The programme outlined so far differs little from the classical, upstream approach whereby natural scientists based at a major research station with central laboratory facilities make sporadic visits to trial plots 'in the field' and have occasional cordial, but brief exchanges with the socioeconomist in charge of a wideflung 'monitoring' operation. The monitoring is normally conducted by dint of questionnaires periodically administered to a statistically representative sample of farmers; it unfolds as an almost entirely independent activity and is largely ignored by the 'hardedged' scientists.

To avoid this otherwise virtually inevitable divergence of professional purposes and the consequent oblivion into which all but a favoured minority of potential beneficiaries - the farmers - always fall, we propose that the research programme be conceived as an almost entirely 'downstream' effort: all but plant breeding activities and soil analysis (both requiring sophisticated equipment) would be carried out within the target area itself at three agricultural substations - say, Panamure (IL_1), a spot on the road between Pallebedda and Godakawela (IM_2), and another somewhere to the north of Balangoda (WM_3). Each of these would be equipped with simple laboratory and storage facilities, besides offering overnight accommodation to researchers. They would further each be endowed with enough land on representative soils and terrains in the vicinity to enable the running of intermediate level field trials on materials released by plant breeders operating out of the major station already existing at Angunakolapelessa in the south of DL_1. Tightly controlled experiments on tillage, rotations, intercropping, fertility, green manuring, harvesting techniques and smallholder livestock development could be run on these plots in each of the agroecological regions.

Given the short distances involved, a core staff of, to begin with, no more than one soil scientist, one livestock specialist, two agronomists and a part time entomologist would be required. The soil scientist would probably all but terminate his long term work on fertility and erosion control within the first two or three years and could thereafter assist in specific contexts as and when needed. One of the agronomists would be more particularly in charge of breeding and screening activities based at Angunakolapelessa. But he would frequently liaise with his field colleague to select specimens for advanced laboratory treatments at the research station. An agrostologist would be necessary on a consultancy basis to gather some definitive data on the fertility of *patna* lands and to formulate proposals as to the best means of putting these to good use. Such a specialist is apparently available at the Postgraduate Institute of Agriculture in Peradeniya. A weed science input could also, at a point to be determined by the agronomists, prove invaluable.

This enumeration of staff leaves out the socioeconomist, his investigators and a certain number of field assistants necessary to the other specialists mentioned. For it is by no means intended that all the work will go on in and around the three substations. An essential component in the design of a farming systems research programme is that as many as possible of the activities take place in farmers' fields.

Here, the socioeconomist assists in identifying potential collaborators and sees to an on-the-spot monitoring, in his domain, of the farm family as it tends trials closely managed by the researchers or, ultimately, tests on its own and spontaneously adapts recommendations immediately prior to their final approval for general release. The socioeconomist is a key figure inasmuch as his professional sensibility to labour, marketing and other specifically social constraints (perceptions of value, leisure, prestige, etc.) suits him to occupy the role of 'broker' between the project and the farmers it is to serve. He will try to enter into the confidence of respected or merely able growers and to give them a feeling of their own importance to the success of the project, so that they agree to carry out trials and tests in their fields.

It is the socioeconomist who will orchestrate the *two-way* flow of

information between farmers and scientists, in order that modernisation be not exclusively a top-downwards affair, as it all too often has been elsewhere. He will encourage villagers to communicate the benefit of their firsthand experience of local conditions to the researchers. He may involve them in the scientific process by getting them to keep their own farm records for feedback into the ongoing economic and statistical analysis of the total farming system.

5.2.2 Delivering the goods and value for money

Governments that have in the past subscribed to an FSR approach have sometimes been convinced that the physical removal of scientific personnel from the research station to the field would make for faster, cheaper results. When after a few years costs have not dramatically decreased and innovations have not been adopted by farmers with the expected enthusiasm, financial support has been withdrawn; the programmes have withered away. The reasons for apparently disappointing performance are twofold.

In the firstplace, it has not always been realised that FSR is a very gradual process, which gathers momentum and stimulates increasing output only after a long period of adaptation to the farming environment and the progressive demonstration to a growing number of producers that remunerative technical innovation is within their grasp. Programmes have thus occasionally been terminated before they attained the critical point of 'takeoff', at which the spread of new technologies becomes an almost selfsustaining phenomenon. Difficulties often arise when an initial stock of simple innovatory practices has been experimented and released to provoke a minor agricultural revolution. Upgrading research capacity and passing into a phase of modernisation that entails more complex interactions and more sophisticated inputs may take a proportionately much longer period of time before the farmers' situation again manifestly improves.

The second cause of slow farmer adoption or even the outright failure of FSR projects to have any discernible impact upon agricultural production is the absence of any solid cooperation between researchers and the staff of government institutions employed in extension, marketing and

input supply at local level; rural bureaucracy is often fairly fixed in its ways and unwilling to collaborate with 'outsiders' unless specifically invited to do so by the administrative apex, which is usually located at some distance in an urban milien.

If the FSR approach to agricultural development outlined in the preceding section (5.2.1.) is to have any chance of success in the key regions of eastern Ratnapura, a considerable amount of energy must be devoted to securing the collaboration of the supporting infrastructure that already exists and actually involving its field personnel in ongoing research. Cooperation between researchers and the agricultural bureaucracy can be introduced at two levels.

It is suggested that the key regions pilot project be presided over by a collegial directorate comprising the socioeconomist, the senior agronomist and the local heads of all the government agencies providing assistance to the farming community. This committee would be vested with decision making powers and would be chaired by the socio-economist, who would also serve as the project's executive manager. The choice of this particular specialist as coordinator is dictated by the fact that he is liable to be the least partisan of all *ex officio* members of the committee: his discipline is so wide ranging that he is likely to have a more comprehensive grasp of problems and less axes to grind than any other single appointee.

On another level, it will be necessary to enlist the cooperation of all those government servants engaged in agricultural extension, input supply and marketing. The tasks normally performed by these officers must be redefined to fit in with project activities. They should be trained by the project to carry out monitoring duties, to supervise field trials and to tailor commercial functions to circumstances as they evolve under conditions of increasing production. All should be made aware of their importance as link men between the research staff and the farming community. They should be encouraged not only to transmit messages from the top-downwards, but also to act as the vectors of farmer opinion alerting researchers to possible reticences and expressing their own perceptions as to the viability of the technological innovations proposed.

Here too a collegiate approach should be adopted. An enduring attempt should be made to break down the barriers between different government services and to bring all concerned into a generalised exchange of information. To this end frequent seminars and field days should be organised to get officers from different agencies to understand the essential complementarity of their efforts. It must however be realised that this kind of collaboration will never be forthcoming unless it receives the positive sanction of the relevant higher authorities at departmental level in Colombo, Kandy or Peradeniya. Securing this approval should be regarded as an important objective of negotiations attendant upon setting up the project.

But whatever the amount of training dispensed and administrative reorganisation undertaken, the proposed agricultural development along farming systems research lines will achieve little or no impact unless steps are taken to ensure that farmers are attracted by the solutions put forward and, further, both able and motivated to experiment with cropping patterns of increasing complexity. It is in this context that the project's socioeconomic component comes to the fore as the lead discipline.

Its principal objective should be in a first phase to draw up a typology of farm types in which the operative criteria are not only size, soils, terrain and location, but also labour availability, capitalisation, attitudes to modernisation and the propensity to indulge in ancillary, income generating activities (e.g. gemming). This typology will underpin the technical scientists' delineation of recommendation domains based on factors like climate, attitude and the distribution of pest populations. The aim of such an effort is to discern patterns of resource allocation on different categories of farm, in order that it may be possible to design a whole gamut of packages of management practices to suit the circumstances and limitations impinging upon individual agricultural entrepreneurs.

To foster the management skills necessary for the insertion of innovatory technologies into existing farming systems has seldom been a goal of agricultural extension among smallholders in developing

countries. Lack of attention to the satisfaction of this need has been known to block at a certain threshold the progress of target crop oriented development programmes that had proven highly successful in their first few years of operation*. The clusters of management practices elaborated by the socioeconomics component must be stereotyped enough to remain easily comprehensible and applicable for extensionists and farmers alike. They must nonetheless incorporate an element of flexibility to accommodate the idiosyncrasies of interested farmers. This is an exceedingly difficult undertaking and may warrant the services on a consultancy basis of an expert in the preparation of extension materials.

If the measures suggested do result in the progressive constitution of a body of appropriate recommendations that can be adopted either individually or in package form by farmers in the key regions, it remains for the socioeconomist to elaborate an extension methodology that will be cost effective. Much store has in the past been set by 'pilot', 'model' or 'contact' farmers and their ability spontaneously to influence others living in the same community. Except where such farmers have been freely elected by members of preexisting voluntary associations, the success of this approach to extension has been very limited: the farmer frequently tends to hoard the information received for his own ends and sees little reason to divulge it to his neighbours, who are, after all, also his nearest competitors. Where a great heterogeneity of crop mixes and environmental conditions prevails, as in eastern Ratnapura, the method is even less advisable, for few farmers have even approximately the same resource base or concentrate on exactly the same range of enterprises.

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* For a discussion of the reasons why groundnut production began to stagnate in Senegal after an initial period of rapid growth under the auspices of the SODEVA, a regional organisation for agricultural development in the Groundnut Basin, see Black-Michaud 1978: farmers had attained a rudimentary level of technical excellence, beyond which they could not proceed without recourse to more sophisticated management of their existing resources and carefully phased reinvestment in light mechanisation.

The socioeconomist should therefore devote a considerable amount of time to analysing channels of communication within the farming community and designing a series of pedagogies to exploit them. Although recommendations must of necessity be tested by a few smallholders in their own fields* under some supervision by researchers before they can be judged satisfactory for general release, we do not advocate employing these same farmers as models upon which to base extension activities. A more appropriate strategy might be to tap the farming community where it congregates at *polas*, near the temple on religious festivals, and so on.

Field days and demonstrations could be organised anywhere as long as the operator of the land is not always the same in any one locality and care is taken to select holdings farmed by both the poor and the better off, as well as by representatives of all significant caste groups in the vicinity. In this manner it will be possible to avoid alienating those who do not belong to the same social category as the demonstrating farmer. By choosing holdings in all stages of modernisation extensionists will moreover be able to point up how recommendations can be applied individually or, alternatively, in more complex interaction, for it is important that packages should not be so 'lumpy' as to remain beyond the financial means and manpower potential of the less well endowed.

5.3 DRAWING FALSE CONCLUSIONS

The research and implementation project outlined above may create the deceptively attractive impression of being simple and cheap. If eventually carried out, it will be neither.

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* Because of the substantial risk of failure involved in performing field trials on farmers' holdings, the latter should be guaranteed a minimal remuneration approximately equal to the average value of the traditional crop that they would normally have taken on the same plot. Both CIAT in Colombia and CIMMYT in Mexico have had recourse to this strategy for motivating farmers to collaborate. Any surplus in excess of the agreed floor value is shared equally between the farmer and the project.

It is true that it makes no call upon high technology and that it does not entail the construction *ex nihilo* of a costly infrastructure. But a relatively large number of scientists is involved at one stage or another and constant mobility will be the key not only to their success, but also to that of the large body of support staff to be enlisted on a cooperative basis from agencies already serving agriculture in the target area.

Transport will therefore be an expensive item. A considerable fleet of motorbicycles, light trucks, and jeeps will have to be made available, as well as two or three small buses to provide for the attendance of farmers at field days. The proximity of sophisticated laboratory facilities at Angunakolapelessa will, on the other hand, contribute to diminishing costs on that account.

The project will not be simple to execute precisely because it does not set out to be an hermetically closed organisation endowed with all the administrative machinery associated with the classical, territorially defined development authority: it will have skeletal administrative and general services; but the complexity of its relations with other governmental agencies already operating in the key regions will be great. The drawing up of several interagency service contracts will be a necessary preliminary to its commencing work in the field.

Just how difficult it is to design modular packages of recommendations for smallholder farming systems where several disciplines and numerous crops are concerned is demonstrated by ICRISAT's annual reports: no two departments of this institute seem to be able fully to combine their efforts. Some encouragement may however be sought in the relative degree of success met with by the Institut sénégalais de recherches agricoles' Unités expérimentales and, particularly, by ICTA in the work referred to above (5.1.).

Whether such a project can in fact be brought to fruition will depend in the last analysis, however, to a very large extent upon the previous experience, leadership and endurance of the socioeconomist, who will act as coordinator. It is recommended that the person selected

be thoroughly conversant with ongoing farming systems research in other areas of the tropics, that he be familiar with (if not exactly an expert in) agronomy and that his initial contract be for a minimum duration of five years: continuity is essential in such an undertaking. Any change in leadership would thus have to be gradually ushered in during a period of prolonged transition.

If the project is to develop a methodology which can be applied in other regions of the country, thorough testing and verification of the results may take 10 years. Given the present state of non-plantation agriculture in the Wet and Intermediate Zones and the plight of the population in these regions, whose living standards are sinking steadily, an investment in time, manpower and money of these proportions may well be warranted.

REFERENCES

ARTI/Wageningen University Research Project in Agricultural Planning (1982a). Integrated rural development in Kurunegala: viability and replicability of project management. 81 + annexes. Colombo: Agrarian Research and Training Institute. (Report No. 3 in 'Regional Planning for Agricultural Development in Sri Lanka').

ARTI/Wageningen University Research Project in Agricultural Planning (1982b). Reduced Planning efforts: the key region approach in Ratnapura. + annexes. Colombo: Agrarian Research and Training Institute. (Report No. 5 in 'Regional Planning for Agricultural Development in Sri Lanka').

Black-Michaud, Andrée and Jacob (1978). Encadrement du paysannat et vulgarisation agricole au Sénégal: éléments dune évaluation et perspectives. xi, 191. Nogent-sur-Marne, France: Ecole supérieure d'agronomie tropicale.

Dimantha, S. (1982). Land use survey of Wet Midland 3 agro-ecological zone of Ratnapura district. 11 + supplement on Land suitability evaluation. Colombo: Land Use Division, Irrigation Department.

Dimantha, S. and de Alwis, K.A. (1981). Land suitability evaluation and land use study of the Dry and Intermediate Zones of Ratnapura district. Colombo: Land Use Division, Irrigation Department.

Economics Program (1980). Planning technologies appropriate to farmers: concepts and procedures. 71. México: Centro Internacional de Mejoramiento de Maiz y Trigo.

Etherington, Dan M. and Karunanayake, K. (1981). 'An economic analysis of some options for intercropping under coconuts in Sri Lanka'. Sri Lanka Journal of Agrarian Studies, 2(1):1-25.

Farrington, J. (1979). Cotton: the economics of expansion in Sri Lanka X, 83. Colombo: Agrarian Research and Training Institute. (Research Study Series No. 30).

Gilbert, E.H., Norman, D.W. and Winch, F.E. (1980). Farming systems research: a critical appraisal. xi, 135. East Lansing: Department of Agricultural Economics, Michigan State University. (MSU Rural Development Paper No. 6).

GUNAWARDANA, A.M.T. and CHANDRASIRI, A. (1981). The Training and Visit system of extension: a paper based on experiences in the Training and Visit system of extension under the Kurunegala Rural Development Project. 47. Colombo: Agrarian Research and Training Institute. (Occasional Paper Series No. 26).

HILDEBRAND, PETER E. (1981). 'Combining disciplines in rapid appraisal: the sondeo approach'. Agricultural Administration, 8(6):423-432

RUTHENBERG, Hans (1976). Farming systems in the tropics, 2nd ed. xviii, 366. Oxford: Clarendon Press.

World Bank (1979). Sri Lanka: staff appraisal report, agricultural extension and adaptive research project. iii, 101 + maps. (Washington): South Asia Projects Department, World Bank.

ANNEX 1

FOCUSES FOR FURTHER RESEARCH AND CONCOMITANT DEVELOPMENT
(see chapter five)

1. Erosion control on highlands:
   potential for
   - enhancing dryland yields
   - rehabilitation of minor and medium irrigation schemes

2. Adaptive agronomic research on highlands:
   emphasis upon striking an appropriate balance between subsistence and cash crops

3. Cultivation of crops other than paddy on asweddumised land:
   - vegetables (low country)
   - cotton
   - tobacco

4. Livestock:
   - agrostological investigation of natural grazing resources
   - smallholder dairying
   - draught power
   - light mechanisation of tillage operations

5. Agroindustries:
   - groundnuts
   - manioc
   - maize

6. Tea smallholdings:
   - improved husbandry
   - input supply
   - marketing
   - adequacy of local factory capacities

7. Conversion of marginal tea estates:
   - dairying
   - minor export crops
   - fruit
   - vegetables (upcountry)

8. Feeder road construction as a function of:
   - input supply and marketing constraints/potentials
   - creation of agroindustries

9. Regularisation of highland tenure (encroachments)

10. Drinking water supply

ANNEX 2

CHECKLIST OF TOPICS TO BE COVERED IN THE COURSE OF THE OPEN ENDED INTERVIEWS HELD WITH GROUPS OF VILLAGE NOTABLES IN THE TARGET AREA IN DECEMBER 1981.

Colombo, 7 December 1981

RATNAPURA DISTRICT FARM SURVEY

Interview no. 1 : Village notables

N.B. A circular letter was sent out by the Additional Government Agent (Ratnapura) requesting the following to be present:

Grama Sevaka	Cultivation Officer
Head Priest	KVS
Head Teacher	Special Services Officer

Member of the Gramodaya Mandela

Ascertain who among those present covers each of these offices.

Items marked * should be checked in advance against the Basic Village Statistics. Discrepancies between the BVS and information provided by respondents should be emphasised and briefly discussed in an effort to explain them.

Subjects for investigation :

1. Population

* 1.1 Number of families in the village
* 1.2 Average number of members in each
* 1.3 Number of landless families (i.e. families that neither farm their own nor work rented land - some of these may nonetheless farm chena to which they have no title)

1.4 Number of families in receipt of food stamps

1.5 Increase/decrease in population in recent years

ANNEX 3

CHECKLIST OF TOPICS TO BE COVERED IN THE COURSE OF THE OPEN ENDED INTERVIEWS HELD WITH GROUPS OF VILLAGERS IN THE TARGET AREA IN DECEMBER 1981.

2. Land

2.1 Number of acres in the village territory of _

2.1.1 asweddumised land

2.1.2 highland : permanent fields and perennial plantations (excluding homegardens)

2.1.3 chena (both in present use and lying fallow)

2.2 Distribution of asweddumised land (smallest and largest areas farmed by a single family in each case)

2.3 Chenas : length of both fallow and cultivation periods (longest and shortest cycle for each)

3. Off-farm activities : frequency and implications for on-farm labour supply

3.1 Plantation labour

3.2 Seasonal agricultural labour migration

3.3 Gemming

4. School attendance : its effects upon the availability of family labour in peak farming periods (identify bottlenecks, if any)

5. Livestock : number of neat cattle and buffaloes in the village

6. Health : endemic diseases/nutritional deficiencies and their seasonality

7. Communications infrastructure

8. The village's biggest problems in the general area of agricultural production

Colombo, 7 December 1981

RATNAPURA DISTRICT FARM SURVEY

Interview no. 2: farmers, labourers and non-cultivators

N.B. The criteria for selection of respondents in this groups were:

farmers owning simultaneously asweddumised land, homegardens and highland
farmers operating only highland
farmers operating only asweddumised land
farmers operating only homegardens
farmers operating only encroached lands

Check whether representatives of each category are in fact present and make sure that each person is addressed at appropriate points in the questionnaire.

1. Population
   1.1 Number of families in the village
   1.2 Number of months to feed in each family (ask each person present the number for his own family)

2. Physical
   2.1 Acreage of village farm lands in the following categories
      2.1.1 asweddumised
      2.1.2 plantation (rubber, tea, coconut, cinnamon, cloves)
      2.1.3 highland (field annuals)
      2.1.4 chena (shifting: length of periods under cultivation and subsequent bush fallow)

2.1.5 homegarden

2.2 Principal crop mixes and sequences according to

2.2.1 season (single/double cropping)

2.2.2 mixes interplanted

2.2.3 mixes relay planted

3. Water and soils

3.1 Adequacy/excess of rainfall during principal cropping season(s)

3.2 Distribution of rainfall

3.2.1 adverse effects of too much/little rain (e.g. too few tapping days)

3.2.2 propensity of certain categories of land to flash flooding

3.3 Reliability/sufficiency of irrigation water at village tract/farm level

3.4 Permeability of asweddumised land

3.5 Suitability/limitations of soils on highland/chena

4. Cropping

4.1 Crops/varieties: criteria for choice as per type of land and season

4.1.1 availability of planting material

4.1.2 length of field life of particular crops/varieties

4.1.3 resistence to known pests/diseases

4.1.4 suitability to specific local conditions (soil,water)

4.1.5 subsistence/consumer preference (taste)

4.1.6 Conservation qualities

4.1.7 Commercial value

4.2 Prevalence and means of fighting

4.2.1 diseases

4.2.2 insects

4.2.3 birds

4.2.4 wild animals (monkeys, wild boar, etc.)

4.2.5 stray cattle (cost/theft of fencing, field guards)

4.3 Land preparation

4.3.1 manual

4.3.2 buffalo (ploughing and/or puddling) - own or hired

4.3.3 tractor - own or hired

4.3.4 existence of a preference for preparation by buffaloes or tractor on asweddumised land (which? why?)

4.4 Intercropping, relay cropping or pure stands: criteria for choice

4.4.1 higher yields

4.4.2 greater stability/security of yields over time

4.4.3 pest/disease control

4.4.4 weed control

4.5 Rotations and fallow patterns

4.6 Alternative uses of highland: criteria for choice

4.6.1 perennial crops

4.6.2 field annuals

4.7 Weed infestation as a constraint

4.7.1 timing of cultivation

4.7.2 rotations/fallows

4.7.3 weed control: manual/chemical/none (as per type of land and crop)

4.7.4 source of labour bottlenecks

4.8 Yields per crop and category of land (try to distinguish intercrop from pure stand yields)

4.9 Risk perception

4.9.1 crops or varieties feasible for their land that farmers would like to grow, but do not because of the risk involved.

4.9.2 nature of the risks:

unreliable rainfall

flooding

price fluctuations

sporadic input supply

others

5. Tenure

5.1 Proportions of total village lands (2.1.1-2.1.5)

farmed under

5.1.1 direct ownership

5.1.2 encroachment

5.1.3 sharecropping or renting out contracts

5.1.4 contract to a temple or shrine

5.1.5 rotational tenure (kattimaru/ thattumaru)

5.1.6 conditions of unresolved ownership as a result of land litigation (e.g. inheritance)

5.2 Varieties of rental/sharecropping contract: forms of payment

5.2.1 cash

5.2.2 produce

5.2.3 tradeoff: more produce for some inputs in advance

5.2.4 social obligations (e.g. labour presentations)

6. Labour

6.1 Endemic diseases as a constraint on labour supply

6.2 Main periods of labour shortage (as per crop and operation)

6.3 Hired labour

6.3.1 sources

6.3.2 prices of a man-day in 1981 as per season and type of work (what meals included?)

6.3.3 idem for a woman-day

6.4 Exchange labour

6.4.1 sources

6.4.2 contexts in which it is resorted to

6.4.3 frequency

6.4.4 overall significance of the phenomenon

6.5 Competition between gemming and on-farm activities

6.6 Labour deplacement as a result of the use of machinery

6.6.1 number and type of machines

6.6.2 extent of use

6.6.3 identity of owners and users

7. Off-farm

7.1 Importance of family incomes from

7.1.1 out-migration (seasonal)

7.1.2 gemming (in the vicinity)

7.1.3 other sources (permanent employment, commerce, craft, medicine, etc.)

7.2 Schooling: extent to which schooling competes with on-farm labour demand

7.3 Ceremonial/religious activities: unremunerated labour offered as alms on temple lands

8. Institutional infrastructure

Farmers' use of and/or contact with

8.1 Agrarian Service Centre (where?)

8.2 Agrarian Service Department (minor irrigation maintenance)

8.3 Extension service (KVSs, AIs)

8.4 Agricultural Development Authority

8.5 Irrigation Department

8.6 Cooperative Society (where?)

8.7 Tea Smallholdings Development Authority

8.8 Rubber Advisory Services Department

8.9 Department of Commodity Purchase and Marketing

8.10 Agricultural Insurance Board

8.11 Paddy Marketing Board

8.12 People's Bank

8.13 Bank of Ceylon

9. Input supply

9.1 Types of inputs

9.1.1 suppliers

9.1.2 location of suppliers

9.2 Reliability/timeliness of supply

9.3 Recurrent unavailability of specific needed items

9.4 Needed items so highly prices as to remain inaccessible

10. Processing and marketing

10.1 Processing at farm level

10.1.1 crops and operations involved

10.1.2 workforce

10.1.3 payment (in cash or kind)

10.2 Off-farm processing

10.2.1 crops and operations involved

10.2.2 location

10.2.3 payment (in cash or kind)

10.2.4 market linkages

10.3 Sale of produce

10.3.1 buyers

10.3.2 location of sale (farm gate, village, town)

10.3.3 cultivation credit granted in exchange for promise to sell a specific part of the crop at a fixed price

11. Farmers' development proposals

ANNEX 4

QUESTIONNAIRE USED FOR THE DETAILED SURVEY OF 83 FARMS IN THE TARGET AREA CARRIED OUT IN APRIL-MAY 1982.

ARTI / LH Wageningen Research Project on Agricultural Planning

REDUCED PLANNING EFFORTS: SOCIO-ECONOMIC SURVEYS IN THE KEY REGIONS, WM_3, IM_2 AND IL_1 OF THE RATNAPURA DISTRICT

SURVEY SCHEDULE FOR STRUCTURE OF HOUSEHOLD AND FARM SURVEY

Regional Planning for Agricultural Development in Sri Lanka

April, 1982.

CONTENTS

A CODES FOR " INTERVIEW / LOCATION "

1. FARM NUMBER
Consists of 3 Digits. The first two indicate the land mapping units (e.g. 03 or 20). The last one a sequence number. Fill in Farm Code only once for each group of Questions

7. VILLAGE
See list of Village Codes

8. G.S. Division
See list of G.S. Division codes

9. INTERVIEWER
1 = Black Michaud
2 = Madhavi Malalgoda
3 = Polman
4 = Scrapper
5 = Thio

10. INTERVIEWEE
1. = Head of Household
2 = Spouse
3 = Other member of Household.

21-24 NAME OF
.....
Write names of head of Household, Village and Grama Seraka Division in appropriate spaces.

26. DATE
Give date of interview.

B CODES FOR " HOUSEHOLD COMPOSITION "

9. SEX/AGE CATOGARY

A. HEAD AND SPOUSE

SEX	AGE (YRS)
1 = Female	10 - 15
2 = -do-	16 - 54
3 = -do-	≥ 55
5 = Male	10 - 15
6 = -do-	16 - 54
7 = -do-	≥ 55

B ADULT NUMBERS (Age 16-54)
2 = Female
6 = Male

10 NUMBER
For children and members over 54 years: Give number in each Catogary; for head, spouse and adults the number is precoded as one (1)

13. YEARS IN VILLAGE
Indicate number of years the head of the Household has been in residence in present Village

15. GRADES PASSED OR LITERACY RATING
Give grades passed (0 to 12) or, if head has not passed a single grade and if he tells himself (do not ask) a literacy rating
50 = Illiterate
51 = Read slightly
52 = Read well
53 = Read & Write

17. DAYS IN YEAR IN RESIDENCE
Give approximate number of days in last year (01-03-'81 to 28.02.'82) That head, spouse or adult members were in residence in Village.

18. DAYS IN YEAR AVAILABLE FOR FARM WORK
Give approximate number of days in last year (01.03-'81 to 28-02-'82) That head, spouse or adult members were available for work on Farm of the Household.

19. TYPES OF OFF-FARM WORK
01 = None
10 = Agriculture
11 = Estate
12 = Agricultural seasonal labour away from home area
20 = Construction
30 = Public Service
40 = Commerce / Trading
50 = Cottage Industry
60 = Domestic / Servant
70 = Mining
71 = Gemming
90 = Other

C CODES FOR " FARM "

9. NUMBER OF FRAGMENTS
Give number of Topographycally separated pieces of land under management of Household

10. DISTANCE TO MARKET
Give distance to nearest market in miles. write its name in space provided for.

11. ALTITUDE (FEET).
Give altitude of Home garden according to Topographycal Map.

D CODES FOR "MONTHS OF YEAR : LABOUR SHORTAGE"

7, 10, 13 and 16) MONTH
Indicate month (s) in which Household labour is/are short

01. January	07 = July
02 = February	08 = August
03. March	09 = September
04. April	10 = October
05. May	11 = November
06 = June	12 = December

9, 12, 15 and 18
USE OF OUTSIDE LABOUR
(In month of short Household labour)
1. = No,
would like to do but;
Hired labour:
2. = Not available
3. = Too expensive;
exchange labour:
4. = Not possible
5. = Yes
or, more Specific
6. = Hired labour
7. = Exchange labour.

A INTERVIEW / LOCATION

	FARM NUMBER	PEIORD TYPE	VILLAGE	G.S. DIVISION	INTER VIEWER	INTER VIEWEE	NAME OF HEAD OF HOUSE HOLD	DATE MONTH	DAY	YEAR
	1	2	7	8	9	10	21 22 23 24	26		
	02 03 04	06 07 08	09 10 11 12	13 14	16	25	38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53	78 79		
		1 0 0								
							NAME OF VILLAGE			
	-do-	1 0 1								
							NAME OF GRAMA SEVAKA DIVISION			
	-do-	1 0 2								

NOTES

B HOUSE HOLD COMPOSITION

	FARM NUMBER	RECORD CODE	HOUSE HOLD MEMERS	SEX/ AGE CODE	NUMBER	YEARS IN VILLAGE	GRADES PASSED OR LITERACY RATING	DAYS IN RESIDENCE	IN YEAR: AVAILABLE FARM WORK	TYPE OF OFF-FARM WORK
	1	2		9	10	13	15	17	18	19
	02 03 04	06 07 08		15 16	18	25 26	29 30	33 34 35	36 37 38	39 40 41
		1 1 0	Head of the Household	0	1					0
	-do-	1 1 0	Spouse	1	1					0
			Adults, Age 16-54 Yrs							
	do	1 1 0	1.	9	1					0
	do	1 1 0	2.	9	1					0
	do	1 1 0	3.	9	1					0
	do	1 1 0	4.	9	1					0
	do	1 1 0	5.	9	1					0
	do	1 1 0	6.	9	1					0
	do	1 1 0	7.	9	1					0
	do	1 1 0	8.	9	1					0
			Children, Age 10-15 Yrs.							
	do	1 1 0	Male	1 5						
	do	1 1 0	Female	1 1						
			Children, Age 0-9 Yrs							
	do	1 1 0	Male	1 4						
	-do-	1 1 0	Female	1 0						
			Member over 54 Yrs							
	-do-	1 1 0	Male and Female	9 8						

NOTES

C FARM

	FARM NUMBER	RECORD TYPE	NUMBER OF FRAG-MENTS	DISTAN-CE TO MARKET (MILES)	ALTITUDE (FEET)
	1	2	9	10	14
	02 03 04	06 07 08	15 16	17 18	34 35 36 37
		2 0 0			
	Name of Nearest Market Place				

NOTES

D MONTHS OF YEAR IN WHICH HOUSEHOLD LABOUR IS SHORT

	FARM NUMBER	RECORD TYPE	1st PERIOD MONTH	1st PERIOD USE OF OUTSIDE LABOUR	2nd PERIOD MONTH	2nd PERIOD USE OF OUTSIDE LABOUR	3rd PERIOD MONTH	3rd PERIOD USE OF OUTSIDE LABOUR	4th PERIOD MONTH	4th PERIOD USE OF OUTSIDE LABOUR
	1	2	7	9	10	12	13	15	16	18
	02 03 04	06 07 08	12 13	26	29 28	31	32 33	36	37 38	41
		1 2 1								

E

CODES FOR "CAPITAL ITEMS AND CONSUMER DURABLES"

12. NUMBER

Give the number of each item which the Household owns

17. CONDITION

Indicate wether the item (s) are in a working condition (3) or wether it does not work (6):

3 = Operative / Works

6 = Inoperative / Out of order

F

CODE FOR "CHARACTERISTICS OF MAIN HOUSE"

8.9, and 10. MATERIAL FOR ROOF, WALLS AND FLOOR OF HOUSE

10 = Wattle / Daub
11 = Kabuk
12 = Mud Bricks
13 = Wood
14 = Straw
15 = Palm leaves / Cadjan
16 = Stones
17 = Concrete / Cement
18 = Bricks
19 = Metal
20 = Plastic
21 = Tiles
22 = Asbestos shields
23 =
24 =
25 =
26 =
27 =
28 = Other
29 = Undetermined

11. NUMBER OF ROOMS

Count number of Rooms, including Living Room.

NOTES

G

CODES FOR "LIVESTOCK: NUMBER OF ANIMALS AND MANAGEMENT"

3. PURPOSE FOR KEEPING

Indicate for the adult cattle and Buffaoles (Male as well as Female) the purpose for keeping

1 = Power / Draft
2 = Breeding
3 = Milk / Manure
4 = Meat
8 = Multi-purpose
9 = Undetermined

8. MANAGEMENT PRACTICE

Indicate the type of management that is followed:

2 = Herding
3 = Grazing on own land
5 = Permanent paddocks
7 = Stall fed
8 = Mixture of above
9 = Other

12. NUMBER OF ANIMALS

Give the number of each type of animal that the Household owns

H

CODE FOR "LIVESTOCK: PRODUCTION OF MILK AND EGGS"

9. FREQUENCY

The milk and egg production has to be noted on a daily basis, there for a one (1) is pre-coded!

10. SEASON

Indicated wether the milk and/or eggs are produced in Maha (1) or Yala (2) or both (0):

0 = Whole Year
1 = Maha
2 = Yala

12. AMOUNT PER DAY

Indicate the number of bottles or eggs produced on a "Normal" day In the season given under 10)

E — CAPITAL ITEMS AND CONSUMER DURABLES

FARM NUMBER	RECORD TYPE	ITEM CODE	NAME OF ITEM	NUMBER	CONDITION
1	2	7		12	17
02 03 04	06 07 08	22 23 24		41	74
	410	100	House(s) (Permanent, Main)		
do	410	601	Two-Wheel Tractor (s)		
do	410	612	Four-Wheel Tractor (s)		
do	410	651	Water pump (s)		
do	410	701	Plough (s) for animals		
do	410	731	Hand sprayer (s) for insecticides		
do	410	150	Live stock shed (s)		
do	410	403	Bicycle (s)		
do	410	401	Radio (s)		
do	410	402	Sewing Machine (s)		

F — CHARACTERISTICS OF MAIN HOUSE

FARM NUMBER	RECORD TYPE	CODE FOR HOUSE	ROOF MATERIALS	WALL MATERIALS	FLOOR MATERIALS	NUMBER OF ROOMS
1	2	7	8	9	10	11
02 03 04	06 07 08	22 23 24	26 27	28 29	30 31	32 33
	420	100				

NOTES

G — LIVESTOCK: NUMBER OF ANIMALS AND MANAGEMENT

FARM NUMBER	RECORD CODE	LIVESTOCK TYPE	PURPOSE FOR KEEPING	AGE/SEX	MANAGEMENT PRACTICE	NUMBER OF ANIMALS
1	2		3	7	8	12
02 03 04	06 07 08		09 10 11	22 23 24	25 26	36 37 38
		CATTLE				
	310	Young, Immature < 3 Yrs	509	920	0	
do	310	Adult Male, Productive > 3 Yrs	50	236	0	
do	310	Adult Female, Productive > 3 Yrs	50	130	0	
		BUFFALOES				
do	310	Young, Immature < 3 Yrs	529	920	0	
do	310	Adult Male, Productive > 3 Yrs	51	230	0	
do	310	Adult Female, Productive > 3 Yrs	51	130	0	
		GOATS				
do	310	All	539	990	0	
		POULTRY				
do	310	All	579	990	0	

H — LIVESTOCK: PRODUCTION OF MILK AND EGGS

FARM NUMBER	RECORD TYPE	ANIMAL TYPE	PRODUCT CODE	PRODUCT NAME	FREQUENCY	SEASON	AMOUNT PER DAY (BOTTLE/EGGS)
1	2	3	7		9	10	12 13
02 03 04	06 07 08	09 10 11	22 23 24		30	31 32	38 39 40 43 44
	700	503	031	Milk, Daily	1	9	32
	700	513	032	Milk Daily	1	9	32
	700	579	500	Eggs, Daily	1	9	50

(2.2)

I CODES FOR "LAND TYPES AND THEIR CHARACTERISTICS"

7. TENURE	10. AGRO-ECOLOGICAL REGION	11. LAND MAPPING UNITS	12. AREA
1 = Owned 2 = Thattumaru/ Kattimaru 5 = Rented in, Fixed rent 6 = Rented in, share Cropping 8 = Crown	WM_3 = 123 IM_2 = 222 IL_1 = 311 with regard to predominant contract	Put land mapping unit number. (check on map in which land mapping unit the type of land is located)	Put area of each type of land as specified per type of Tenure in acres and decimal acres.
16. IRRIGATION 21 - Anicut 51 - Tank 97 - Bucket, etc.	17 to 22 see below under 7 to 13		**23. EROSION SUSCEPTABILITY** Give farmer opinion on erosion susceptability 1 = None 2 = Slight 3 = Moderate 4 = High 5 = Very High

J CODES FOR "LAND TYPES AND THEIR CHARACTERISTICS, CONTINUED"

7 to 13

As to the data of the land suitability Evaluation:

- IM_2 and IL_1 as to the generalized Data of each land mapping unit
- WM_3 as to the (soil) samples

* leave blank during field survey!

16. LENGTH OF USE 17. LENGTH OF FALLOW	18 AND 20. NUMBER OF MAHA/YALA SEASONS WITH ADEQUATE RAIN IN LAST FIVE YEARS	19 AND 21. EFFECTS OF TOO LITTLE RAIN	22. HAZARDS OF FLOODING 23. EFFECTS OF FLOODING
Give length of present use and last fallow in years; for land other than Home Garden or Asweddumized land only. 99 = In use for a long, long time.	Put 0, 1 ..... , 5 as to the number of Maha/Yala seasons with adequate rain	1 = None 2 = Replanting 3 = Loss in yield 4 = Complete lost crop 5 = In Yala no paddy but Vegetables 8 = Combination of two or more of 2 to 5	22. 1 = No 2 = Yes 23. 1 = None 2 = Replanting 3 = Loss in yield 4 = Complete lost crop 6 = Bunds washed away 8 = Combination of two or more of 2 to 6

NOTES

I LAND TYPES AND THEIR CHARACTERISTICS

	CHARACTERISTIC	COLUMS	TYPE OF LAND: ASWEDDUMIZED LAND — OWNED	ASWEDDUMIZED LAND — THAT./KATT	ASWEDDUMIZED LAND — RENTED IN	HOME GARDEN	LAND OTHER THAN HOME GARDEN OR ASWEDDUMIZED LAND — OWNED	LAND OTHER THAN HOME GARDEN OR ASWEDDUMIZED LAND — THAT./KATT.	LAND OTHER THAN HOME GARDEN OR ASWEDDUMIZED LAND — RENTED IN	LAND OTHER THAN HOME GARDEN OR ASWEDDUMIZED LAND — CROWN
1	Farm Number	02-04		do	do	do	do	do	do	do
2	Record Type	06-08	210	210	210	210	210	210	210	210
5	Type of land	10-13	1000	1000	1000	2000	3000	3000	3000	3000
7	Tenure	14	1	2			1	2		8
10	Agro-Ecological Region	21-23								
11	Land Mapping Unit	25-26								
12	Area (Acres)	32-35								
16	Irrigation	57-59	9	9	9	9	9	9	9	9
* 17	Drainage	60-61								
* 18	Depth of water table	62-63								
* 19	Topography	64-65								
* 20	Soil texture	66-67								
* 21	Soil colour	68-69								
* 22	Soil depth	70-71								
23	Erosion susceptibility	73								

J (I. CONTINUED)

1	Farm Number	02-04		do	do	do	do	do	do	do
2	Record Type	06-08	211	211	211	211	211	211	211	211
5	Land Type	10-13	1000	1000	1000	2000	3000	3000	3000	3000
* 7	Soil Type	22-23								
* 8	Soil PH	24-27								
* 9	Cation exchange capacity	30-34								
* 10	Base Saturation	37-41								
* 11	Avail. water holding cap:	44-48								
* 12	Pres: Weatherable minerals	49-50								
* 13	Rockyness	51-52								
16	Length of use (yrs)	59-60								
17	Length of Fallow (yrs)	63-66								
18	Number of Maha seasons with Adequate rain in last 5yrs	67								
19	Effects too little Rain	69								
20	Number of Yala seasons with Adequate rain in last 5yrs	70								
21	Effects too little rain	72								
22	Hazards of Flooding	73								
23	Effects of Flooding	75								

NOTES

K

CODES FOR "CROPS ON ASWEDDUMIZED LAND

CROPS

IDENTIFICATION

3. CROP OR MIXTURE CODE

(A) If single crop (pure stand):
Put crop code as given in "crop codes", leave 4) crop of mixture blank

(B) If crop of a mixture :
Put code for mixture (Code range: 400-499), each mixture having a unique code; Put crop code as given in "crop codes" in 4) crop of mixture; make one line for each crop of the mixture

4. CROP OF MIXTURE CODE

(A) If single crop (pure stand) : Blank

(B) If crop of a mixture : Put crop code as given in "Crop Codes"

5B. PLOT

Give each (pure stand) crop or mixture a unique Plot number.

5C : SEASON

0 = Whole Year
1 = Maha
2 = Yala

SIZE

9. PURPOSE

1 = Food supply
3 = Mixed food/sales.
4 = Input to other activity
5 = For sale

12. AREA

Area of Plot in acres and decimal acres.

CULTIVATION

SOIL PREPARATION (Ploughing)

13. METHOD

1 : By Hand only
2 = Ploughed by animal
3 : Ploughed by two-wheel Tractor
4 = Ploughed by Four-wheel Tractor

26. DATE

Give month (01 - 12) in which soil preparation was done.

PLANTING

7 VARIETY

4 = Local
5 = Improved
6 = Old Improved (Paddy)
7 = New Improved (Paddy)
9 = Undetermined

14. METHOD

1. Broad Cast
2. Seeds put into the soil
3. Transplanting
4. Planting

15. DATE

Give month (01 to 12) and week (1 ... 4) in which planting was done.

CARE

8. FERTILIZER

1 = No
2 = Chemical Fert.
3 = Manure
4 = Both

35. INSECTICIDE

1 = No
2 = Yes

17 WEEDICIDE

1 = No
2 = Yes

PRODUCTION

10 AND 11 HARVEST DATES

Indicate harvest period in months :

10. From ..... 11) To

eg: April ..... May
04 05

18. AMOUNT

Give total physical production of crop in appropriate units of measurement (and decimal units)

13. UNIT OF MEASUREMENT CODE

33. Bushel

40 = Kg
41 = Metric Ton
43 = Pound (454 grs)
44 = Hundred weight

50 = Units

SALES

12. AMOUNT

Give physical amount sold (or to be sold) of crop in appropriate units of measurement (and Decimal units)

15. VALUE OR PRICE

Give either total value of sales or price per unit of measurement (Rupees and Cents) Indicate under 17 wether value (0) or price (1) was entered.

17 V/P CODE

Value or Price Code:

0 = Value
1 = Price

(41)

K

CROPS ON ASWEDDUMIZED LAND

FARM NUMBER	RECORD CODE	NAME OF CROP OR MIXTURE	CROP OR MIXTURE	CROP OF MIXTURE	LAND TYPE	PLOT	SEASON	PURPOSE	SIZE: AREA (acres)	SOIL PREP. (Ploughing): METHOD	SOIL PREP.:	SOIL PREP.: DATE MONTH	PLANTING: VARIETY	PLANTING: METHOD	PLANTING:	PLANTING: DATE MONTH WEEK	CARE: FERTILIZER	CARE: INSECTICIDE	CARE: WEEDICIDE	CARE:	HARVEST DATES MONTH: FROM	HARVEST DATES MONTH: TO	PRODUCTION: AMOUNT (UNITS OF MEASUREMENT)	PRODUCTION: UNIT OF MEASUREMENT CODE	SALES: AMOUNT (UNITS OF MEASUREMENT)	SALES: VALUE OR PRICE (Rs.)	V/P CODE	
1	2		3	4	5A	5B	5C	9	12	13	25	26	7	14	25	26	8	15	16	25	10	11	12	13	12	15	16	17
02 03 04	06 07 08		09 10 11	13 14 15	18	19 20	21	26	39 40 41 42	45	76 77	78 79	22	54	76 77	78 79 80	25	63	70	76 77	31 32	33	38 39 40 41 42	43 44	38 39 40 41 42	52 53 54 55 56	57	58
		MAHA 81/82:																										
	2 3 0	PADDY	0 0 2		1	0	1				1 1				1 2					1 3							6	
		YALA 81:																										
do	2 3 0	PADDY	0 0 2		1	0	2				1 1				1 2					1 3							6	
		OTHER CROPS																										
do	2 3 0				1	0					1 1				1 2					1 3							6	
do	2 3 0				1	0					1 1				1 2					1 3							6	
do	2 3 0				1	0					1 1				1 2					1 3							6	
do	2 3 0				1	0					1 1				1 2					1 3							6	
do	2 3 0				1	0					1 1				1 2					1 3							6	
do	2 3 0				1	0					1 1				1 2					1 3							6	
do	2 3 0				1	0					1 1				1 2					1 3							6	
do	2 3 0				1	0					1 1				1 2					1 3							6	

(4.2)

L

CODES FOR "CROPS IN HOME GARDEN"

ALL CROPS

IDENTIFICATION

3. CROP OR MIXTURE CODE

(A) If single crop (pure stand)
Put crop code as given in "Crop Codes"
leave 4) crop of mixture blank

(B) If mixed cropping
Put code for mixture (code range: 400-499)
each mixture having a unique code;
Put crop code as given in "Crop codes"
in 4) crop of mixture; Repeat for each
crop of a mixture, giving one line to each
crop of a mixture

4. CROP OF MIXTURE CODE
A. If single crop (pure stand): Blank
B. If mixture: crop code

5B. PLOT
Give each (pure stand) crop or mixture
an unique plot number.

5C. SEASON
0 = Whole year
1 = Maha
2 = Yala

SIZE

9 PURPOSE
1 = Food supply
3 = Mixed food/sales
4 = Input to other activity
5 = For sale

12. AREA
Area of plot in acres and decimal acres

18. NUMBER OF TREES
Perennial crops only:
Number of trees on Plot

26. IMPORTANT
Indicate which crop is important* enough for farmer to ask remaining Questions
1 = Not important
2 = Important

* Income or Home consumption wise

IMPORTANT CROPS ONLY

CULTIVATION

7 VARIETY
4 = Local
5 = Improved
6 = Old Improved
7 = New Improved
9 = Undetermined

8. FERTILIZER
Is a fertilizer used for this crop
1 = No
2 = Chemical fert.
3 = Manure
4 = Both

10. AGE OF TREES
Perennial crops only:
Age of trees in years

26. PLANTING DATE
Annual crops only:

MONTH		WEEK OF MONTH
01 Jan.	07 Jul.	
02 Feb.	08 Aug.	1: 1st
03 Mar.	09 Sep.	2: 2nd
04 Apr.	10 Oct.	3: 3rd
05 May	11 Nov.	4: 4th
06 Jun.	12 Dec.	

PRODUCTION

10 AND 11 HARVEST DATES
Indicate harvest Period in months:
10. From ..... 11. To
e.g: April ..... May
04 05

12. AMOUNT
Give total physical production of crop in appropriate units of Measurement (and decimal units)

13. UNIT OF MEASUREMENT
CODE
31 = Liter
32 = Bottles
33 = Buchels
40 = Kg
41 = Metric Ton
42 = Pounds (454 gms)
48 = Hundred weight

50 units

SALES

12 AMOUNT
Give amount sold or to be sold of crop in appopriate units and decimal units.

15. VALUE OR PRICE
Give either total value of sales or price per unit of Measurement (Rupees and cents)
Indicate under 17 wether value (0) or price (1) was entered

17 V/P CODE
Value or price Code:
0 = Value
1 = Price

(5.1)

L.

CROPS IN HOME GARDEN

ALL CROPS

IDENTIFICATION

FARM NUMBER	RECORD CODE	NAME OF CROP OR MIXTURE	CROP OR MIXTURE CODE	CROP OF MIXTURE CODE	LAND TYPE	PLOT	SEASON
	1		2		3	4	5A / 5B / 5C
	01 02 03 04		06 07 08	09 10 11	13 14 15	18 19 20 21	
			2 3 0			3 0	
	do		2 3 0			3 0	
	do		2 3 0			3 0	
	do		2 3 0			3 0	
	do		2 3 0			3 0	
	do		2 3 0			3 0	
	do		2 3 0			3 0	
	do		2 3 0			3 0	
	do		2 3 0			3 0	
	do		2 3 0			3 0	
	do		2 3 0			3 0	
	do		2 3 0			3 0	
	do		2 3 0			3 0	
	do		2 3 0			3 0	
	do		2 3 0			3 0	
	do		2 3 0			3 0	
	do		2 3 0			3 0	

SIZE

PURPOSE	AREA (ACRES)	NUMBER OF TREES	IMPORTANT
9	12	18	26
26 39 40 41 42		72 73 74	80

NOTES

IMPORTANT CROPS ONLY

ACK FOLLOWING QUESTIONS IF CROP IS IMPORTANT FOR FARMER (INCOME OR HOME CONSUMPTION WISE)

CULTIVATION

VARAITY	FERTILIZER	PERENNIAL CROPS ONLY: AGE OF TREES (YEARS)	ANNUAL CROPS: PLANTING DATE MONTH	WEEK
7	8	10	25	26
22 25	28 29	76 77	78 79 80	
		1 2		
		1 2		
		1 2		
		1 2		
		1 2		
		1 2		
		1 2		
		1 2		
		1 2		
		1 2		
		1 2		
		1 2		
		1 2		
		1 2		
		1 2		
		1 2		
		1 2		

PRODUCTION

HARVEST DATES: From	To	AMOUNT (UNITS OF MEASUREMENT)	UNIT OF MEASUREMENT CODE
10	11	12	13
31 32	33	38 39 40 41 42	43 44

SALES

AMOUNT (UNITS OF MEASUREMENT)	VALUE OR PRICE (Rs.)	V/P CODE
12	15	16 17
38 39 40 41 42	52 53 54 55 56	57 58

NOTES

M CODES FOR CROPS ON LAND OTHER THAN HOME GARDEN OR ASWEDDUMIZED LAND

ALL CROPS

IDENTIFICATION

3. CROP OR MIXTURE CODE

(A) If single crop (pure stand)
Put crop code as given in "Crop Codes"
leave 4) Crop of mixture blank

(B) If mixed cropping
Put code for mixture (Code range: 400-499)
each mixture having a unique code;
Put crop code as given in "Crop codes"
in 4) Crop of mixture; Repeat for each
crop of a mixture, giving one line to each
crop of a mixture

4. CROP OF MIXTURE CODE

A. If single crop (pure stand): Blank
B. If mixture : crop code

5B. PLOT

Give each (pure stand) crop or mixture
an unique plot number

5C. SEASON

0 = Whole Year
1 = Maha
2 = Yala

SIZE

9. PURPOSE

1 = Food supply
3 = Mixed food/sales
4 = Input to other activity
5 = For sale

12 AREA

Area of Plot in acres and decimal acres

18. NUMBER OF TREES

Perennial crops only:
Number of trees on Plot

26. IMPORTANT

Indicate which crop is important* enough for farmer to ask remaining Questions

1 = Not Important
2 = Important

* = Income or Home consumption wise

IMPORTANT CROPS ONLY

CULTIVATION

7. VARIETY

4 = Local
5 = Improved
6 = Old Improved
7 = New Improved
9 = Undetermined

8. FERTILIZER

Is a fertilizer use for this crop
1 = No
2 = Chemical fert
3 = Manure
4 = Both

10. AGE OF TREES

Perennial crops only:
Age of trees in years

26. PLANTING DATE

Annual crops only:

MONTH		WEEK of MONTH
01 Jan.	07 Jul.	
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PRODUCTION

10 AND 11 HARVEST DATES

Indicate harvest Period in Months:
10 From ..... 11 To
e.g: April ..... May
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12 AMOUNT

Give total physical production of crop in appropriate units of Measurement (and decimal units)

13 UNIT OF MEASUREMENT

31 = Liter
32 = Bottle
33 = Bushels

40 = Kg.
41 = Metric Ton
42 = Pounds (454 gms)
43 = Hundred weight

50 = Units

SALES

12 AMOUNT

Give amount sold or to be sold of crop in appopriate units and decimal units

15 VALUE OR PRICE

Give either total value of sales or price per units of measurement (Rupees and Cents)
Indicate under 17 wether value (0) or price (1) was entered

17 V/P CODE

Value or price Code:

0 = value
1 = Price

M.

CROPS ON LAND OTHER THAN HOME GARDEN OR ASWEDOUMIZED LAND.

ALL CROPS

IDENTIFICATION								SIZE			
FARM NUMBER	RECORD CODE	NAME OF CROP OR MIXTURE	CROP OR MIXTURE CODE	CORP OF MIXTURE CODE	LANDTYPE	PLOT	SEASON	PURPOSE	AREA (ACRES)	NUMBER OF TREES	IMPORTANT
1	2		3	4	5A	5B	5C	9	12	18	26
02 03 04	06 07 08		09 10 11	13 14 15	18	19 20	21	26	39 40 41 42	72 73 74	80
	2 3 0				3	0					
do	2 3 0				3	0					
do	2 3 0				3	0					
do	2 3 0				3	0					
do	2 3 0				3	0					
do	2 3 0				3	0					
do	2 3 0				3	0					
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do	2 3 0				3	0					
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do	2 3 0				3	0					
do	2 3 0				3	0					
do	2 3 0				3	0					
do	2 3 0				3	0					

NOTES

IMPORTANT CROPS ONLY

ASK FOLLOWING QUESTIONS IF CROP IS IMPORTANT FOR FARMER (INCOME OR HOME CONSUMPTION WISE).

		CULTIVATION			PRODUCTION				SALES			
VARIETY	FERTILIZER	PERENNIAL CROPS ONLY: AGE OF TREES (YEARS)		ANNUAL CROPS: PLANTING DATE MONTH WEEK	HARVEST DATES: MONTH FROM	TO	AMOUNT (UNITS OF MEASUREMENT)	UNIT OF MEASUREMENT CODE	AMOUNT (UNITS OF MEASUREMENT)	VALUE OR PRICE (RS.)	V/P CODE	
7	8	10	25	26	10	11	12	13	12	15	16	17
22	25	28 29	76 77	78 79 80	31 32	28	38 39 40 41 42	43 44	38 39 40 41 42	51 53 54 55 56	57	58
			1 2									
			1 2									
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NOTES

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