Organization and participation in Southeast Asian irrigation systems

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PREFACE

Organizational forms of irrigated agriculture are nowadays widely discussed. Issues of participation of farmers in the management of irrigation systems and the intermediary functions of water users' associations form topics of scientific enquiry and experimentation. This book contains three case studies presenting new observations and insights in these issues within Southeast Asia. The introductory chapter gives an outline of the major themes explored by the three researchers.

A few lines of introduction on the contributing authors seems relevant here. Nenita E. Tapay is active in the field of irrigation studies in the Philippines. She is Assistant Professor at the Department of Social Sciences of the University of the Philippines at Los Baños. During her stay in Wageningen, as research fellow in the period 1986-1987, Dr Tapay wrote a paper on the organizational structure and management of large-scale irrigation in her country, which is now published in this book.

Aart Schrevel presents a paper on recent developments in Indonesia's irrigation sector, with special reference to the introduction of water users' associations and the role of the water master in the distribution of irrigation water. Drs Schrevel is project staffmember of the Institute of Social Studies in The Hague, and is currently on secondment to the Cidurian Upgrading Water Management Project in West Java as socio-economic adviser.

Geert Kalshoven participated in two field studies on social and economic issues of irrigated rice farming in West Malaysia. On reflection, he tries now to delineate the organizational framework of the Muda en Kemubu schemes, and to trace the causes of the weakly developed forms of participation within those schemes. Dr Kalshoven is staffmember of the Department of Rural Sociology of the Tropics and Subtropics, Wageningen Agricultural University.

The three authors express their thanks to the persons who commented on earlier versions of their papers. They owe a special word of appreciation to Jos Michel, who cheerfully operated the computer in preparing the contributions.

Geert Kalshoven
Editor

ORGANIZATIONAL CONSIDERATIONS OF IRRIGATION SCHEMES AND THE ISSUE OF PARTICIPATION

Geert Kalshoven

Until recently irrigation has been mainly regarded as a domain of engineers where technical data on planning and design are all that is necessary in order to construct viable irrigation systems. Nowadays there is a tendency to view irrigation as also being a socio-technical process in which human and physical elements are combined to make agriculture viable. Agronomists and other agricultural scientists are making important contributions to irrigated agriculture, in cooperation with economists, who view agriculture mainly as an enterprise in which production accomplishments occur.

In organizational terms efficient irrigation development is regarded as to be mainly dependent on the combined efforts of governmental agencies and project organizations. Gradually, however, the role of farmers is being appreciated, and considered to be a vital component in the distribution of irrigation water within the schemes (Small, 1985).

Objective of this book

This book focuses attention on a number of organizational issues with regard to the provision of irrigation water within large irrigation schemes, with emphasis on forms of participation (and non-participation) by water users. The analysis and description of these issues is based on recent field work conducted in irrigated rice farming areas in Indonesia, Malaysia and the Philippines. The geographical and socio-political 'nearness' of these nations gives a regional perspective to this publication.

The current interest in policy issues such as the involvement of farmers in various aspects of irrigation was another stimulus to the authors to present their contributions in one volume. Despite all the rhetoric about the participation issue, as reflected in government and international publications (e.g. FAO, 1985), little has been published on this approach. In this book the authors take a critical look at this issue, and present their findings and observations in a non-committed way.

Two main themes

Firstly we have tried to trace some common trends in the recent history of irrigation schemes, making use of a number of emerging insights in the new field of irrigation management. The main emphasis and analytical approach are focused on two major themes:

1) The first is the organizational aspect of irrigation systems. A short description is given of the rise of bureaucratic structures, such as irrigation departments, mainly interested in the management and the technical performance of the main and secondary canals. This bureaucratic framework fostered centralised decision-making and a top-down approach in setting development targets, such as achieving higher production outputs of rice.

2) The second and major theme is the rather recent phenomenon of coping with problems of uneven water distribution practices at the field unit level by promoting farmers' participation in water management and maintenance work. The ambiguities about the content and scope of farmers' participation as well as outdated government regulations complicate the satisfactory implementation of the new approach.

Technological bias

Following World War II the governments of newly independant Southeast Asian countries were motivated to safeguard rice supplies and therefore promoted large-scale irrigation systems. Common objectives were to stimulate higher rice yields and to increase the incomes of the farming population within the irrigated areas. There was an emphasis

on the building of new irrigation systems or the rehabilitation of existing irrigation systems, the design and construction period. On the other hand, little attention was paid to on-farm development and the management of irrigation water at field unit levels.

Massive engineering projects were undertaken, often with considerable financial and technical assistance from international agencies and engineering firms. From the start there was a bias towards the technical aspects of irrigation in the various stages of planning, design, and implementation (Eggink and Ubels, 1984). An underlying cause of this was the orientation and attitude of irrigation officials, who measured the efficiency of the system primarily on the basis of the effectiveness of the hydraulic infrastructure, i.e. against such technical criteria as water procurement, allocation and distribution.

The common notion was - and still is - that only through irrigation could rice yields be greatly increased. Furthermore, the creation of irrigation systems made it possible to introduce packages of new technologies, such as improved rice seed and chemical fertilizer combined with new methods of cultivation, all with the view to increasing the rice production. Newly developed technologies, it is argued, can only be applied in man-made environments such as irrigation systems, so that these are regarded as essential preconditions to modern rice farming (Barker and Herdt, 1985). Hence the preoccupation with irrigation schemes, which were often super-imposed on smaller existing systems. All these measures resulted in considerable changes within the social and economic life of the farm families concerned, and also gave rise to new organizational structures, needed to shape and implement the various activities and programmes (Coward, 1980).

Although in some instances trial projects were carried out, the main tendency was to push the new technologies forward and to transform the traditional ways of rice farming into more 'modern' approaches. The early investments made it possible to construct new irrigation systems in a short time. However, it was less easy to get the farmers to implement the new water schedules and cultivation methods.

The operation of an irrigation system requires a fairly high level of cooperation between farmers with regard to the distribution of water and coordination of cultivation practices. However, these is-

sues have proved very difficult to achieve (Chambers, 1980). Planting schedules were drawn up at regional headquarters and imposed on the farmers without prior consultation. The farmers were expected to carry out the various instructions blindly. Very little information was given to potential water users about water requirements. In many cases peasant farmers had good reasons to continue their old cultivation practices, and ignore the schedules of the irrigation bureaucracy (Hoogstraten, 1985).

Very few instances have been recorded where irrigation staff considered involving the water users in the planning or implementation phases of irrigation schemes. Generally, a number of factors existed that were counter-productive to such approaches. Firstly the staff were reluctant to look for opportunities of involving the farmers in the manament of the irrigation scheme. Furthermore, they considered themselves really the only competent people in the areas of operation and management (Chambers, 1980).

Another assumption was that farmers were 'non-responsive' to new approaches in irrigation development, and lagged behind in adopting modern techniques for irrigated rice production. Then the dearth of leadership was recalled at the project level, delaying the required cooperation from the farmers' side. Strong cultural and political differences within irrigated areas also obstructed the formation of viable local organizations (Kalshoven et al, 1984). All these factors combined so provided the irrigation staff with arguments not to try actively to promote the farmers' involvement in the distribution of water. It was far more attractive for them to concentrate on their own areas of technical competence.

Organizational implications of irrigation systems

As the planning and design of irrigation systems were mostly the responsibility of established engineering departments, the organization of these new systems was based on the existing hierarchy. National governments and international funding agencies have consistently relied on centralized administration and project control (FAO,1985). Bureaucratic regimes - often 'left over' from the colonial era - emerged and were authorized to execute the various tasks of irrigation

development. In most instances, the purely technical requirements e.g. canal capacities and irrigation works, received top priority, and a technocracy was established to regulate and control the distribution of water throughout the systems.

The preoccupation with the construction of canals and civil works meant that the emphasis was on the technical aspects, to the detriment of the field staff and the operation and maintenance work (FAO, 1982). Ironically, the field staff are the ones who have the most contact with potential water users, but as they received little support from headquarters, it is understandable that they were not inclined to maximize their performance in the field.

In a later phase, when new agricultural techniques had to be introduced, other departments were called upon to give the necessary guidance and advice. Only in a few instances were these executive powers given to regional agencies, who were able to combine engineering and agricultural functions in one organization e.g. the Muda Agricultural Development Authority in West Malaysia. In spite of this an authoritarian management approach remained with the preliminary objective being an increased rice production, and farmers had to cultivate their fields in accordance with conventional principles of industrially based production (Walker, 1984).

While much attention was paid to the formation of these organizational structures, scant attention was paid to water allocation and distribution at field (or tertiary) unit level. This whole area of operations was left to the water users themselves, who were expected to make use of irrigation water in an efficient way. This gave rise to many problems as the users had not been consulted at the design stage. Furthermore, those responsible for the design and construction of the canal systems were not held responsible for management activities (Bottrall, 1981). Frequently, the agronomic consequences of rice cultivation were not fully anticipated, and severe losses of water and crops occurred.

> It is ... notorious that top-enders commonly receive more water than is needed for crop growth and receive it more continuously than necessary. Conversely, those in the lower reaches of command areas suffer from deliveries that are small, unreliable and untimely, if indeed they receive any water at all (Wade and Chambers, 1980: 109-110).

Re-orientation

Only recently there has been much interest shown in a more active role for the water users in the management of irrigation water and related matters (Uphoff, 1984).

> Such views disregard the fact that irrigation systems are not only of a technical nature; they are also of social character. Irrigation systems are therefore to be appropriately regarded as socio-technical systems, which can lead to the desired result only through effective cooperation between the people involved, using the available resources. Moreover, this cooperation is governed essentially by the specific situation in which a project is established (Walker, 1984: 20-21).

It is not yet clear as to what degree control in large systems can be decentralized. The evidence is strong that the participation issue is being advocated by outside observers and funding organizations, especially international agencies such as the FAO, World Bank and Ford Foundation. The interest by these international agencies is not so much public interest as well as an attempt to prevent the considerable water losses and improve the management of large scale irrigation schemes (FAO, 1985).

Barker and Herdt (1985) recall that national governments are beginning to provide more technical and financial assistance to small community systems. Apt examples are Indonesia's Sederhana programme, and the communal project started under the Philippine National Irrigation Administration.

> In the Asian context, irrigation systems management appears to be gradually evolving, with the more highly developed systems in East Asia becoming 'farmer oriented'. However, given the rapid development and growing importance of irrigation in South and Southeast Asia, this transformation seems to be well behind schedule (Barker and Herdt, 1985: 105).

Water users' associations

In discussing the role of water users' associations one should try to relate this to the activities undertaken by the irrigation organization. Furthermore, the role and tasks performed by these associations

should refer to technological factors inherent in the irrigation system and the degree of cooperation attitudes among the water users themselves. Bottrall (1981) could not find an exact demarcation of tasks of the water users. He thought there were three main factors that greatly influenced the formation and functioning of cooperative associations within irrigation units:

1) the technological complexity of the irrigation system
2) the relative shortage or excess of water, and
3) the social cohesion among water users (Bottrall, 1981).

One could reason that the simpler the irrigation system the better the water supply and the stronger the cohesion among the farmers, the greater scope for the water users to perform particular tasks in the allocation of water and maintenance of the system.

According to some social scientists, the optimal group size of such water users' groups is mainly dependent on the social structure of the local community. The effectiveness of the cooperating group also relies greatly on the degree of solidarity between its members. Therefore it is advisable to keep the association small, as there will be a better chance of establishing a common platform of interests.

Another issue is the role of the irrigation organization in relation to the water users' group. According to Bottrall, the fulfilment by water users of their set tasks will not occur spontaneously; the users have to be stimulated by the irrigation organization or a government institution. Chambers (1980) also suggests that for a better distribution organization forms should be developed at the local level. According to him, the government should play a leading role by creating educational facilities for water users and stimulating local leadership. This is also supported by Bottrall:

> It may seem a fairly elementary point that the management of irrigation projects should be considered as an evolutionary process, with a progression over time from a relatively high degree of central control towards increasing farmer participation and autonomy of decision making (Bottrall, 1978: 316).

This view presupposes a complete control over all aspects of irrigation by the irrigation organization at the outset and a gradual delegation of authority to water users if conditions are favourable.

Finally, one should address oneself to the issue of conflicts and their solution among the individual or groups of water users. The

solution to conflicts between water users within the same irrigation unit is largely dependent on the nature of the social cohesion of the local community and on the role therein of local leaders. If local institutions for the solution of conflicts are weak, individual water users generally expect the irrigation organization to play a more active role. Many observers consider the arbitration of conflicts as a step that should be taken by the irrigation organization. Chambers (1980), for instance, proposes that the task of solving conflicts and even 'policing' should be carried out by an agency compelling authority, if one wishes to realize a reliable and just water supply to the irrigation units. In many instances, however, the organization of this task seems beyond the capacity of the agencies. Moreover, as may be seen in the case of Malaysia, this task is considered undesirable. If the irrigation authority assumed full responsibility for the water distribution within the units, it would come under pressure from discontented farmers, whose complaints they could never settle satisfactorily (Kalshoven et al., 1984).

The issue of participation

In the following chapters the issue of participation is dealt with in more detail, but it seems appropriate here to make some introductory statements, with regard to this concept, which is widely used by progressive practioners and observers of rural development.

It is virtually impossible to distangle the concept of participation in irrigation from existing notions of rural development. In the past decade it has even become of considerable importance in debates on this subject, and in discussions within irrigation management circles. Uphoff (1985) stated that if participation could only be meaningfully incorporated in the development process, economic and social changes would occur which would benefit the farm families. In many discussions, participation is hotly debated as the 'missing ingredient' in development projects, something like an essential input to be injected into projects. Yet very few debaters undertake any analysis of a more fundamental nature, or take into consideration more concrete evidence of the various implications.

Frequently, popular participation has been understood in political

terms or at least in relation to phases of change and growth in a society, that are so emphatically underlined in many notions of 'development'. It becomes obvious from publications on the subject that the concept of participation is often congruent with issues of government intervention, whereby terms like 'mobilization' are used to clarify (or disguise) the nature of the process. Pearse and Stiefel (1979) went so far as to introduce the notion of participation in terms of a 'process of incorporation', whereby whole categories of the farmer population are gradually incorporated in the State.

Participation as a particular type of government intervention is also advocated as a necessary element in the planning process, with the well-known devices of planning objectives, budgets and control mechanisms. It seems indeed that many notions of participation in rural development are presented in the framework of the planning apparatus (Van Dusseldorp, 1981). Participation is thereby conceived as a kind of essential ingredient which can be injected into a project, and consequently help influence its outcome.

On the other hand, where participation emanates from 'below' or from 'the people themselves' it is characterized as being authentic and expressing local needs. In this respect it is not difficult to associate this notion of participation with the non-government sector approach. Within this context the emphasis should be on facilitating participatory processes and creating an organizational platform within which farmers might identify themselves (Oakley and Marsden, 1984).

The French sociologist Albert Meister (1984) made the useful distinction between organized and spontaneous participation. Organized participation is usually created by forces outside the local community, often with the purpose of bringing members in contact with values incorpor ted in society structures foreign to the local community. Spontaneous participation is a type of participation more innate to the group, where common values are shared and accepted as guidelines for behaviour. Spontaneous or voluntary participation is a process whereby certain social and economic needs are fulfilled within the immediate environment of the groups concerned.

Typical for this approach is the role of the community organizer (animator or 'change agent'), who is expected to promote participation at the 'grass root level'. However, one should remember that he/she is attached to an external agency, who employs him/her to stimulate

participation in order to achieve objectives set by the agency itself. Like the technician, the community organizer is a specialist, but his specialty is building up relationships between people. His technique is essentially one of persuasion, and his style semi-directive, sensitive, oriented to the awakening of potentials in his clientele.

The agents loyalty is split between his agency and clientele and neutrality is an illusion. In reality he is an 'awakener', instrumental to the views of his paymaster.

> Certainly, he can make himself believe that his recommendations are impartial, that he leaves the group to decide for itself, that he steps gracefully aside after having aided the members to better pose their problems, that he is nondirective and that he does not exert influence. All that can last for a moment, until the day when the group experiences a crisis (which is rather frequent in associations), when the struggle for power is made overt and all must show their cards (Meister, 1984: 135).

Case studies of organized participation

With regard to the main theme in these papers, it should be remembered that the authors refer to forms of organized participation within the framework of large-scale irrigation schemes inherent in which is that the organization is imposed on the local communities by agencies from outside. This method is chosen in order to comply with objectives stipulated by development policies.

The Philippines

In her case study on the Philippines Nenita Tapay describes the organizational structure of large-scale irrigation systems and the different farmer participatory approaches in recent years. She evaluates the impact of farmer participation on the performance of the irrigation systems concerned. Her research was directed to measure such factors as agricultural productivity, financial viability and efficiency.

In starting a number of pilot projects on farmers' participation the National Irrigation Administration made the following assumptions: 1) As the farmers have to pay for the construction costs of the

improvements on the system they should have a considerable say in what is built;

2) Farmers' involvement in the planning and construction develops their sense of ownership of the system and hence their desire to operate and maintain it properly;

3) Farmers' knowledge of local conditions can contribute to better planning and design of the system and facilitates acceptance of the improvements after completion.

It is of note that community organizers are important links between water users and the irrigation agency. The organizers are hired by the agency to initiate farmers' participation in operation and management activities; the approach can aptly be called organized participation.

It appears from Tapay's study that the promotion of participatory approaches is directed to increase fee collection and reduce the expenses of operation and maintenance. However, the prime objective of the farmers is to increase agricultural productivity, and here a discrepancy between objectives becomes apparent. The predominant position of the irrigation agency is apparent from the following observation:

> A prerequisite to choosing a strategy for achieving farmers' involvement in irrigation development is a basic, deliberate decision of the irrigation agency regarding the level of involvement it desires from farmer beneficiaries, of an irrigation system (Bagadion, 1985: 70).

Tapay concludes that the attainment of a higher agricultural productivity is the farmers' main criterion of success or effectiveness in irrigated agriculture. However, the decetralization policy of the National Irrigation Administration tends to promote the attainment of its own objectives (reduction of O&M expenses and increase of fee collection) by way of the farmer participatory approach. Moreover, a high degree of centralization remains because of set policies, and a highly 'programmed' decision making. The irrigation authority should better attune its policies to the needs and objectives of the farmers.

Indonesia

Since 1969 the Indonesian Government has given high priority to the improvement of irrigation systems. Rehabilitation of existing and enlargement of new systems have been undertaken. A later phase in one case in the development of irrigation included construction work of tertiary systems and the creation of water users' associations. The efforts to stimulate the farmers' participation at the farm-level water management culminated in the Presidential Decree no. 2 of 1984, in which the concept of the Water Users' Association was officially recognized.

Aart Schrevel analyses the various problems involved in establishing these associations. The appointment of a unit water master is instrumental to the functioning of water distribution and maintenance work within the unit. As such he replaces the person known as the village water master, who was originally responsible for irrigation and was also part of the overall village leadership. The new unit water master does not appear to have the prestige of a village elder, nor is his job easy. Socio-economic factors such as the heterogeneous composition of the farm families are often not very favourable to the intricate work of water distribution. The fact that many of the association members are part-time farmers is a complicating factor which makes reaching them and finding an effective way of coordinating the rice cultivation difficult.

According to Schrevel many water users, and in some instances the majority, do not live permanently in the villages near the rice fields. Many men are absent for long periods, leaving the cultivation of crops to their wives, children and neighbours. A further complicating condition is the ownership of land; a considerable proportion of the land is owned by people who do not cultivate the land themselves.

All these conditions have serious consequences for the composition of water associations. Persons who do not permanently live within the villages can be considered as 'floating members' of the association. There is little motivation for landowners who do not cultivate their land themselves to become involved in water management. Only the village-based landowners tend to take an active part in water management and they are the ones who are frequently chosen as members of the board.

Schrevel concludes that many approaches to modern irrigation management do not reflect the existing physical and socio-economic conditions at the unit level. The present tendency to forcably create water users' associations does not necessarily lead to great improvements in the water distribution at unit level. A minimal condition for improvements is to review and adapt management practices to existing social conditions at the field level. A more fundamental, but not very realistic, alternative would be to intervene in the existing agrarian structure within the major rice producing areas; a choice that requires political commitments and far-reaching measures.

Malaysia

Heavy investments in the infra-structure and organizational framework of the rice farming areas were made when two large irrigation schemes in West Malaysia were started. In his case study Geert Kalshoven traces the origins of a bias towards the technical components of irrigation in the planning, design and implementation stages. The provision of irrigation water combined with the introduction of new rice technologies and new cultivation methods has increased productivity in rice farming.

As the operation of the irrigation systems is the responsibility of two regional scheme authorities, the organization and management of those systems are founded on existing lines of authority. While much attention has been given to the creation of organizational structures in administrating irrigated agriculture, the actual arrangement of water distribution at the field unit level is left entirely to the farmers.

No instances have been recorded where irrigation staff contemplated the involvement of water users in the planning or implementation of these schemes. Recently some pilot projects have tried to stimulate participation by the farmers in the management of irrigation water and related services. On the whole farmers are uninterested in such propositions and expect the irrigation authorities to organize these activities in an effective way.

"Farmers' organizations", government sponsored and supported institutions, do not result in active contributions by the farmers

themselves. Degrees of social cohesion seem very weakly developed between rice farmers, and social conditions generally are not very favourable to the formation of water associations or similar institutions. It can be concluded that the creation of large irrigation schemes stimulates the formation of bureaucratic structures rather than organized forms of local participation.

Concluding note

The overall impression of these cases of participation in irrigation management is, that the processes develop along predetermined lines and reflect the formal objectives of established institutions. In most instances of organized participation the rules of conduct have been previously outlined and participation is conceived as a manageable input. The majority of rural people, however, remain excluded from any informed or systematic involvement in events that affect their livelihood. Also, the very broad concept of participation in terms of decision-making, implementation, sharing of benefits and involvement in evaluation of rural development projects -as formulated by Cohen and Uphoff (1977)- does not apply. This notwithstanding, it seems relevant to undertake further research activities and experiments in order to trace and test alternative ways of involving water users in irrigation management.

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ORGANIZATIONAL STRUCTURE, MANAGEMENT AND EFFECTIVENESS OF LARGE-SCALE IRRIGATION SYSTEMS IN THE PHILIPPINES: FOCUS ON FARMER PARTICIPATION

Nenita E. Tapay

Rice production and rural income are expected to improve in Southeast Asia because of the heavy investment in irrigation. Earlier irrigation development has been concentrated to the construction of large-scale, state-operated systems. However, recently there is a growing demand for measures to improve system performance or effectiveness. In countries where irrigation systems are already in place, national government and donor agencies focus their attention on investments that will improve organizational structure and management of the systems. The Philippine response is the decentralization of management in a large-scale system. That will allow farmer participation in system design, management, and control of segments of the system.[1)] Decentralization, undertaken through a policy of bureaucratic reorientation and formation of irrigation organizations is locally known as the participatory approach.[2)]

A major issue now in the Philippines and other Southeast Asian countries is whether the new mode of management transformations in large-scale, state-operated irrigation systems that emphasize decentralization of control can improve irrigation effectiveness.

This chapter aims to document the form and characteristics of large-scale irrigation organization structure and the mode of transformations of farmer participatory approach; and to evaluate the impact of farmer participation on irrigation system performance with concrete measurements of agricultural productivity, financial viability, and efficiency.

This study defines the extent of the impact of farmer participation. It shows the form of organization structure that defines farmer control over certain parts of the system, and the extent of the technical, financial, and management support that could be provided by the

national irrigation authority.

This study can be useful to policy makers, planners, and administrators of national government irrigation authority and international aid agencies. It provides information on the extent of decentralization in management and control of high-capital investment infrastructure such as irrigation. Moreover, it documents the extent of improvement in performance due to change in organizational structure and management that allows greater farmer participation.

Features of Philippine Large-Scale Irrigation: The National Irrigation Systems

The major irrigation systems in the Philippines fall into three categories: national, communal, and pump systems. This study concerns only the large-scale, centrally managed national irrigation systems. Table 1 shows a total of 25,914 irrigation systems and about 1.2 million hectares of irrigable area.

Table 1. Existing Irrigation Systems in the Philipines, 1977.

Systems	National		Communal		Pump		Total	
Areas	No.	Irrigation area	No.	Irrigation area	No.	Irrigation area	No.	Area (ha)
Cagayan Valley and Ilocos	21	85,733	2,281	162,654	4,046	32,941	6,348	281,328
Central Luzon	18	207,262	652	130,756	8,141	45,001	8,811	383,019
Southern Luzon and Bicol	36	56,505	844	95,913	4,918	37,232	5,798	189,650
Visayas	24	68,062	828	69,158	2,199	3,226	3,051	140,446
Mindanao	15	48,530	574	152,199	1,317	2,533	1,906	203,262
TOTAL	114	466,092	5,179	610,680	20,621	120,933	25,914	1197,705

Source: P. Ongkingco and J. Galvez, (1978)

The national systems are large gravity systems built, operated and maintained by the National Irrigation Administration (NIA), a government corporation. The average size is about 3000 ha; the two largest are about 100,000 ha each, namely the Upper Pampanga River Integrated Irrigation System (UPRIIS) and the Magat River Irrigation System (MARIS). As of 1977, the country had a total of 114 national systems with an irrigable area of 466,092 hectares (Table 1). Southern Luzon and Bicol had the highest number of national systems but an irrigable area of only 56,505 hectares. In contrast, Central Luzon had a very extensive area of 207,262 hectares but only 18 systems (Ongkingco and Galvez, 1978).

The physical features of a national irrigation system (large-scale) include permanent concrete diversion dams, earth distribution canals, gated concrete distribution and control structures, gated permanent turnouts for water delivery to farmer's groups and farm-level facilities with varied intensity depending on local conditions. Where seepage is excessive, parts of main and tributary canals are lined with concrete. The new national systems constructed since 1970 as well as the old systems that have been improved are equipped with access and farm-to-market roads built on canal embankments that have been widened for that purpose (Bagadion, 1985).

Before the policy of bureaucratic reorientation is adopted, the distinctive feature of the national organization is the division of responsibilities between the water users and the authorities. Individuals who staff a national system (central bureaucracy) are not farmer-users of the system; and farmers who use the water tend to be uninformed on the technical requirement of the irrigation infrastructure. Operation and maintenance (O&M) is subsidized by the government. The problem is the lack of communication between irrigation managers and the farmer-users. To remedy the inadequate management, new institutional arrangements in the form of farmer organizations or the "participatory approach" are implemented.

The National Irrigation Administration (NIA)

The agency in charge of construction, operation, and maintenance of the national systems in the Philippines is NIA. NIA evolved from the

Bureau of Public Works Irrigation Division, which was created in 1908 in accordance with Act No. 1854. Its main function at that time was to develop and maintain irrigation systems. The administration and construction of irrigation were vested in the Bureau of Lands. Upon the passage of Act No. 2152 known as the "Irrigation Act" in 1912, the administration of irrigation development was taken over by the Bureau of Public Works' Irrigation Division.

NIA was created in 1964 by Act No. 3601. The act granted a corporate status to NIA; conferred expanded powers, functions and objectives; and made provisions for its organization and capitalization. This act also provided the transfer of the Irrigation Division of the Bureau of Public Works and the Irrigation Unit of the Bureau of Lands, with the Friar Lands Irrigation Systems under it, to NIA, including all the personnel, unexpended appropriation, records and equipment.

The need for expanded irrigation development during the early 1970s prompted the issuance of Presidential Decree No. 552 in 1974. Under this decree NIA's mandate to organize water users was sustained and its annual capitalization was increased from 30 million to 2 billion pesos. The amended law also authorized the agency to borrow from foreign sources, thus allowing investment in large irrigation projects. In 1975 a large-scale irrigation project -the Upper Pampanga River project- was completed at a capital cost of US$ 105.5 million. It covers a command area of 83,000 ha and costs US$ 1,270 per hectare. All irrigation activities undertaken by the irrigation service unit of the Presidential Assistance on Community Development and other government agencies were also taken over by NIA under a government reorganization.

In 1980, Presidential Decree No. 1702 increased the authorized capital stock of NIA to 10 billion pesos to be subscribed and paid entirely by the Philippine Government. All amounts collected by the agency as irrigation fees, administrative charges, drainage fees, equipment rentals, and proceeds from sale of unserviceable equipment and materials, and all other income were added to its operating capital by virtue of the decree. NIA was further authorized to impose an administrative and engineering overhead charge of five percent for the total cost of projects it undertakes and use those funds as part of the operating capital.

In December 1980, NIA started implementing the farmer participa-

tory approach in national systems.

National Irrigation Systems Organizational Structure

National Irrigation Administration responsibilities

NIA handles the management of large national irrigation systems. It has the following powers and responsibilities related to the management aspect.

1. Investigate and study all available and possible water resources in the country, primarily for irrigation purposes.
2. Plan, design, construct and/or improve all types of irrigation projects and appurtenant structures.
3. Operate, maintain and administer all national irrigation systems.
4. Supervise operation, maintenance, and repair, or otherwise administer temporarily, when necessary, all communal and pump irrigation systems constructed, improved and/or repaired wholly or partially with government funds.
5. Delegate partial or full management of national irrigation systems.
6. Charge and collect irrigation fees or administrative charges from the beneficiaries of systems constructed or administered by NIA.
7. Construct multipurpose water resource projects that give other benefits aside from irrigation.
8. Impose an administrative and engineering overhead charge of 5% of the total cost of projects it undertakes.

National Irrigation Administration objectives

As the country's agency in charge of irrigation development, NIA aims to provide adequate and timely water resources for irrigation. NIA's objectives, particularly during the 1980s, are as follows:

1. Support the government policy of self-sufficiency in the staple food.
2. Maintain a satisfactory level of service.
3. Catalyze development in rural areas.

4. Operate the agency as a viable corporation in a cost-effective manner, particularly in implementing its capital investment construction programme, operating the systems, and administering the agency.

The National Irrigation Administration

NIA is governed by a six-member board of directors. Management of the agency is vested in the administrator who is appointed by the President of the Philippines. The administrator has four assistant administrators: the assistant administrator for operation, an assistant administrator for finance and management, an assistant administrator for project development and implementation, and an assistant administrator for administrative services.

The NIA corporate structure has 14 departments, 2 staffs, and 12 regional offices.

Regional offices

The main function of a regional office is to construct irrigation projects and supervise the activities of national irrigation superintendents and the provincial irrigation engineers.

The irrigation superintendents take charge of O&M of national irrigation systems and collect irrigation fees from the irrigation users. The provincial irrigation engineers construct communal irrigation systems, undertake small pump distribution programmes, and oversee activities of NIA-assisted communal irrigation systems.

Figure 1 shows the six divisions under the regional office: engineering, system management, farmer assistance, equipment management, administration, and finance and management.

National Irrigation Systems

A typical organization chart of a local large-scale irrigation system is seen in Figure 2. The system office is headed by the irrigation superintendent: under him is the supervising assistant engineer. The system management is divided into the O&M and the administrative

divisions. The O&M division consists of one watermaster, one gatekeeper, and eight ditchtenders. The administrative section has a disbursing officer, collection representatives, billing clerks, and others who assist in the preparation of bills and fee collection.

Foreign-assisted national systems are generally larger than local systems and have a more complex organizational setup, as shown in Figure 3.

The national system's operation function is to deliver water in the proper quantity at the right time for farmers to raise satisfactory crops. This function is accomplished at the system level through final action by the gatekeepers and watermasters, with assistance from other members of the system staff. The irrigation superintendent has complete responsibility for the collective activities of all the system personnel. Corollary to good operations are irrigation system facilities that are well maintained. Proper maintenance, another function of the national irrigation systems, is the operation performed in preserving irrigation and drainage canals, hydraulic structures, service roads and works in good or near-original condition without increasing their capital costs (NIA-MC, 1975).

Elements of the organizational structure

The need for an organization form to improve irrigation performance has been emphasized in previous research. However, identification of the characteristics and dimensions of organizational structure has been overlooked. This section of the paper considers the elements of irrigation organization such as size, vertical differentiation, decentralization, and formalization.

Analyses of 18 large-scale, state-operated irrigation organizations (locally called national river irrigation systems) showed variations in structural characteristics (Table 2). The sample irrigation organization had 127 employees, reflecting the number of full-time and part-time (full-time equivalent) employees in an irrigation organization. Part-time employees included farmers who render services to the

Figure 1. Organizational Chart of National Irrigation Administration Regional Irrigation Offices

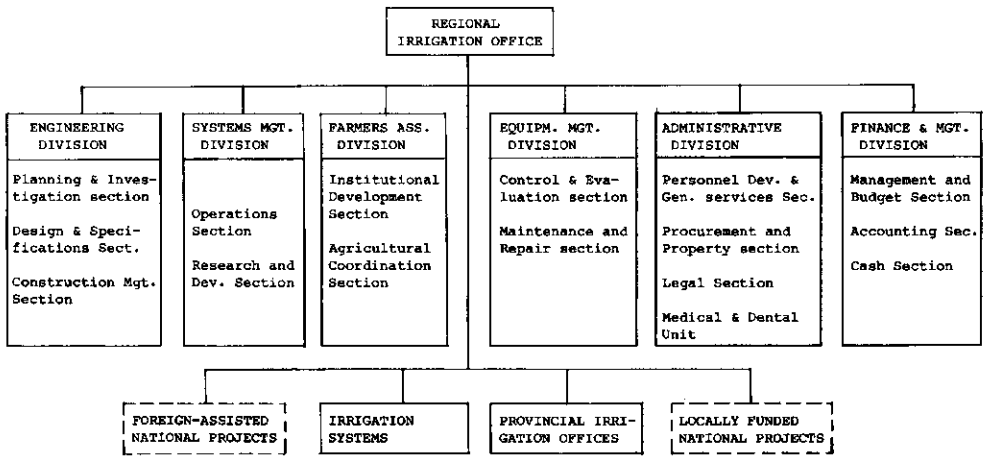
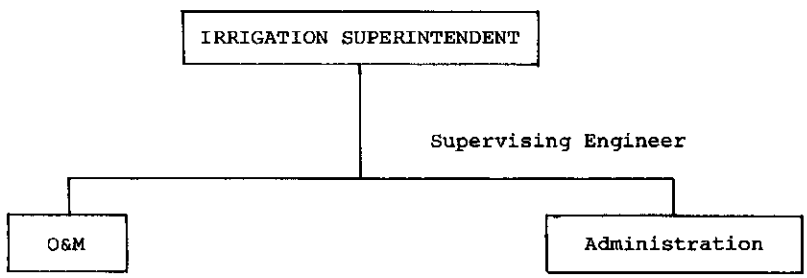


Figure 2. Organization chart of Agus Irrigation System, a simple national system model



1 - Watermaster
1 - Gatekeeper
8 - Ditchtenders

1 - Disbursing Officer
2 - Collection Representative
3 - Billing Clerk
1 - Acctg. Clerk
1 - Clerk
1 - Driver
1 - Security Guard
1 - Janitor

canal system, 4. exercise of administrative control by established procedures, and 5. responsiveness to political pressures. On the other hand, uppermost for farmers who depend on the national irrigation organizations is the growing of preferred crops regardless of alternative opportunities.

Robinson (1982) advances three critical goals felt by national-system type officials and farmers. The goals are distinctly different. The NIA officials value irrigation service fee payment rates most highly, implicitly equalizing or spreading water distribution throughout the system. Farmers, on the other hand, value high yields above all else. Other major interests are the convenience and security provided by an ample water supply. Little concern is given to the total area that the system covers. If water is available, fee payment is not of interest to the farmers.

There is a need to agree on measures of irrigation organization effectiveness that policymakers, researchers, officials of large-scale irrigations, and farmers can commonly respond to and understand. The study of Tapay (1983) in the Philippines defined irrigation organization effectiveness in terms of goal attainment: the ability of the irrigation organization to achieve its goals and objectives. An irrigation organization may have different operational goals at different times of the year.

At the beginning of the cropping season, which is June for the wet season and November for the dry, the irrigation organization is most interested in irrigation effectiveness based on delivery of service to the farmers and measured as the ratio of total irrigated area to total service area. But at the end of the cropping season, the concern is with productivity, which is measured as the total yield per hectare. Subsequently, at the end of the fiscal year, interest is in the ratio of fees collected to fees due and the ratio of O&M irrigation expenses to irrigation fee collection.

Analytically, the major goals of large-scale irrigation organization in the Philippines are productivity and expansion of the irrigated area. Those are the general purposes of the organization as put forth in the charter, annual report, public statements by key executives, and other authoritative pronouncements (Perrow, 1961). On the other hand, operative goals designated the ends sought through the actual operating policies of the organization: what the organization

is trying to do, regardless of what the official goals are. Irrigation fee collection and expenditures effectiveness are operative goals with the assumption that a large-scale irrigation organization can provide better service if it can increase fee collection and decrease O&M expenditures (Tapay, 1983).

A study of 18 large-scale irrigation systems in the Philippines indicated the different measures of effectiveness (Table 3). The national irrigation system exhibited a mean fee collection ratio of 0.57 or 57%, and an O&M ratio expense ratio of 172 or 172%. The range of O&M expense ratio was high because of high administrative overhead of national systems, which employed mostly paid irrigation staff. The agricultural productivity mean is 7.74 tons per hectare per year, which is similar to the country's national average.

Table 3. Concept and measurements of effectiveness of 18 national irrigation organizations

Effectiveness/ Goal	Concrete Measurements	Mean	Standard deviation	Range
Productivity	Average yield (tons/ha/year)	7.74	0.81	6.50-9.50
O&M expense ratio	Ratio of O&M expenses to fee collection	1.72	0.81	0.89-4.27
Irrigated area ratio	Ratio of total irrigated area to total service area	0.71	0.19	0.35-0.95
Fee collection ratio	Ratio of fees collected to fees collectibles	0.57	0.19	0.18-0.96

Source: Tapay (1983).

Farmer irrigation organization: Participatory approach

As a result of the current budget crises, national governments and donor agencies have placed greater importance on delegating the management of large national schemes to farmer irrigation organizations. This is evident in the recent Philippine irrigation authority strategy to involve farmers in physical rehabilitation work and management activities. This is done in large irrigation schemes where design and construction had been made without farmer participation. The farmer participation programme is locally called the "participatory ap-

proach." It is undertaken through formation of formal irrigation organizations aimed at active and effective O&M and collection of irrigation fees.

The discussion of the historical development and types of participatory approach shows the mode of transformation of farmer participation in large national irrigation schemes.

Historical background of farmer organizations in national systems: Participatory approach

The development of farmer irrigation associations or organizations in the national system (large-scale irrigation) can be traced to the 1968 technical assistance agreement between NIA and the Asian Development Bank (ADB). The NIA programme to organize water users, which was funded by ADB, began in the Angat River Irrigation System (ARIS). The first water users' association in a NIA large-scale system was set up in ARIS in August 1969. NIA's mandate to organize water users was sustained by the issuance of Presidential Decree No. 552 in 1974. This decree empowers NIA to delegate the partial or full management of national systems to duly organized farmer irrigator cooperatives or associations.

In ARIS, the farmer associations are called compact farms, and in the Upper Pampanga River Integrated Irrigation System (UPRIIS) they are called irrigators' group (Robinson, 1982). The associations were organized at the turnout level and were a requirement for the implementation of the rotational method of water distribution.

The water users' association was organized by the water management technicians (WMTs) in UPRIIS and by the personnel of the system's Agricultural Development Division (ADD) in ARIS. The earlier associations were organized by WMTs who had little background in organizing farmers. It is suspected that many of the earlier water users' organizations were identified rather than organized. Possibly, in most cases identification also applied to officers of the associations, who may have been named on the spot by the WMTs rather than elected by the "members" (Robinson, 1982).

The successful experience in communal irrigation organization and the above conditions prompted NIA in 1980 to initiate a pilot project

in the Lalo River Irrigation System. This participatory approach, called Irrigation Community Organization Programme (ICOP), was implemented in a foreign-assisted rehabilitation project of 3,000 ha. The ICOP aims to form the organized farmers into a strong and cohesive association and to involve the members in system construction and rehabilitation so as to develop decision making capability in O&M. This approach fielded professional irrigation community organizers. In this approach, the farmer organization at the turnout was strengthened and a group of turnout organizations served by a common water source (lateral and sections of main canal) was federated into an irrigation association (IA). The IAs were registered with the Securities Exchange Commission. The O&M activities including irrigation fee collection in their respective areas were turned over to IAs (Mejia, 1985).

With the success achieved in the pilot projects, ICOP was expanded to 12 irrigation systems under rehabilitation, funded by the World Bank in 1982. Further expansion took place in 1983 to cover some marginal irrigation systems being converted into communal systems. The marginal systems are smaller systems with O&M expenditure higher than fee collection.

The other participatory approach, called Farmer Irrigator Organizing Programme (FIOP), was also implemented in mid-1983. Its primary aim was to reduce cost by utilizing farmers in the organizing work. At present, it covers two pump systems and a gravity irrigation scheme.

The ICOP and ACD/ADD participatory approaches currently implemented in the national systems are analytically discussed in this paper.

Types of participatory approach in the national irrigation system

The NIA desire for a suitable type of farmer irrigation organization resulted in the implementation of pilot projects, locally called the participatory approach, in the communal systems in 1976 with Ford Foundation support. Success in the communal system prompted NIA in 1980 to implement the participatory approach in a large national system. Three types of participatory approach are being tried as pilot projects to organize farmer irrigators in the national systems:

the ICOP, ACD/ADD Farmer Irrigator Association (FIA), and FIOP.

1. Irrigation Community Organization Programme (ICOP)

ICOP was initiated in 1980 through a pilot project in the Lalo River Irrigation System. At present, ICOP is implemented throughout the country in 31 systems distributed in all NIA regions under the National Irrigation System Improvement Project (NISIP). ICOP covers an aggregate area of about 9,279 hectares.

ICOP utilizes the services of professional organizers called irrigation community organizers (ICOs). ICOs are considered part of the project staff of the particular irrigation system and are hired by NIA on contractual basis. The programme is managed by a group of contractual employees, called Programme Secretariat (PROSEC), who report directly to the Assistant Administrator for Operations of NIA. Field activities are supervised by the Irrigation Organization Specialists backed up by the Programme Supervisor, who are members of PROSEC.

The system covered by ICOP had been constructed and operated solely by NIA in the past, without farmer participation in design, construction, and O&M. Most of the physical facilities are already in place. Thus, ICOP adopted the strategy of developing a farmer irrigation association for rehabilitation and operation activities in a zone of 250 hectares. This is done by first developing small, informal groups at the turnout level (20-50 hectares).

The farmer irrigators' associations in the national system function just like the communal farmer irrigator association. They manage the water and maintain the system within their zones, hire their own personnel, collect fees and mobilize voluntary group maintenance work. The main difference is in the extent of decentralization of control and responsibility of certain segments of the canal. In the large national scheme, control of and water allocation at the main canal remain with the national irrigation system personnel. Thus, the farmer irrigators association in the national irrigation system receives water from the main canal managed by the NIA. On the other hand, the farmer irrigators association in the communal system has full control and responsibility for water drawn from a river and distributed throughout the irrigation system. NIA provides technical

assistance to both systems.

At present NIA provides both national and communal irrigation systems with technical assistance on big repair and maintenance work as well as machinery to do the job, but the farmer irrigator association pays for the labour and fuel. This is the delineation of task and sharing of power control between the central bureaucratic agency and the farmers.

2. ACD/ADD Farmer Irrigator Association

This type of participatory approach in a large national system is organized by the Agricultural Coordinating Division or Agricultural Development Division of NIA. The programme utilizes the assistance of the water master or the water management technician and ditchtenders in the organizing work. At the early stage of implementation, the FIAs are organized by turnout in preparation for the rotational method of water distribution. At present, the irrigators are organized at the water source (main canal outlet, lateral canal). The farmer irrigator associations by water source are federated into one farmer organization in an irrigation system.

3. Farmer Irrigators Organizing Programme (FIOP)

This programme utilizes selected farmers as farmer irrigator organizers (FIOs). The FIOs are provided with incentive allowance and quarterly job enrichment training. The programme is managed by the Regional Institutional Development (RID) and the field activities by the irrigation system staff. At present, the programme has been utilized in two systems: Porac Gumain RIS and Angat Maasim RIS. The FIOP was not included in this evaluation study.

Stages of turnover

After farmer irrigator associations have been organized through ICOP, ACD, or FIOP approaches, they are encouraged to take over O&M res-

ponsibilities. The turnover of O&M responsibilities for national irrigation systems is done in three stages.

Stage I. The farmer organization enters into a contract with NIA and agrees to maintain a length of a canal for a fixed annual payment from NIA. For a canal with a capacity of about 2 m^3/second, the annual payment is about 2,000 pesos per kilometer. Major repair beyond the capacity of the association is undertaken by NIA. The association, in addition, assists the NIA watermaster in water distribution and collection of irrigation fees. As incentive, the association is entitled to 2.5% of the collection in its area or 3% if collection is 100%.

Stage II. In stage II, O&M are turned over to the irrigation association (IA) and remuneration is a percentage of irrigation service fees (ISF) collected. This is done after deducting O&M costs of the main conveyance systems (headgate of main canal and lateral), which are continuously operated and managed by NIA. The most common arrangement is 50% for IA. The IA members agree to maintain the canals within their sector averaging 250 ha. They do minor repairs, distribute water (lateral canals, turnouts and farm ditches) according to an agreed upon schedule, collect irrigation fees, and remit the collection to NIA. The agreement stipulates the obligation of both parties.

Stage III. In stage III, all the O&M responsibilities for the entire system are turned over to the IA including collection of ISF. Instead of paying ISF, the IA pays amortization to NIA. This stage converts small national systems of about 2,000 hectares or smaller into communal systems over a period of 10 years.

Characteristics of farmer irrigators organizations

The greater emphasis on FIOs requires identification of their characteristics. Tapay, et al. (1986) evaluated 70 FIOs in a large national irrigation system. The result shows variations in the FIO structure in the national systems. The organizational structure consists of the general assembly of farmers, the board of directors, elected officials such as the president, vice president, secretary, treasurer, business

manager, sector leaders, different committees, and the maintenance divisions. Other characteristics are demonstrated in the following sections.

Membership

Membership in irrigation associations and organizations is exclusive to farmers within the boundary of the irrigation system. Farmer members are required to pay annual dues or fees of 5 to 10 pesos.

The FIOs in the national system are organized at the water source (main canal outlet, lateral canal) of about 250 hectares. The ACD/ADD participatory approach has the highest number of average membership (279), followed by ICOP (172).

Committee membership

One common feature of FIOs in the participatory approach in large national systems is the formation of working committees for O&M.

The O&M committees were formed to maximize member participation in different aspects of O&M. The committees are Education and Training, Finance and Development, Irrigation and Management, Audit and Inventory, Agricultural Supervision, and Complaints and Grievance. All the committees followed the NIA organizational setup model.

The committees are temporary in nature and their existence depends on the need of the association. In this study, only the existing functional committees are documented. The results indicated that the ACD/ADD participatory approach had highest average number of O&M committees, with a mean of 5. The ICOP approach registered a mean of 2 functional committees. It seems that in spite of NIA effort to establish committees during organization, the farmers retained only the committees that they considered relevant and important. The two retained committees most often are complaints and grievance, and audit and inventory committees.

Official position of members

The officers of the association are elected by the general membership. This procedure gives participation the flavour of the democratic process, member self-management, power equalization, and bottom-up approach. These are topic labels that appear to designate similar content areas - participation. However, the participation of irrigation association members in the large irrigation schemes is confined to the voting privilege during election of officers in addition to participation in decisions on design, planning, rehabilitation, and O&M. The main functions of the officers of the organization are to assure the proper functioning of the association, take active leadership in the negotiation with NIA on the extent of responsibility in the management of certain parts of the system, legislate policies for the approval of the general membership, and implement system management or O&M activities.

The ACD/ADD approach exhibited the highest mean number of 42 members holding official positions in the association; ICOP had a mean of 16.

Number of meetings and attendance

Communication in the farmer irrigator association is a vital source of internal coordination. Formal communication in the irrigation association is in the form of regular and general assembly meetings involving members and officials of the associations and the Board of Director (BOD) meetings involving the Board Members and the officials of the association.

The ACD/ADD participatory approach had a higher number of regular meetings (mean of 9) than ICOP (5). Both approaches showed a similar mean of 11 BOD meetings. In terms of total attendance at regular and BOD metings, ACD/ADD showed 82% while ICOP had 76%.

These formal meetings are in addition to the informal spontaneous contacts of the officers and members of the organization. The regular and general assembly meetings are vital in the functioning of the association. It provides the members with information on procedures and practices in O&M and other activities to be undertaken by the

associations. This also serves as the feedback mechanism for members and officials in solving internal problems. The general assembly meeting increases the flow of information from the officials to the general membership, which is vital in the coordination process to allow accomplishment of task-related activities. Although in most general assembly meetings, very few members voice out their opinion, high attendance at meetings assures the flow of information, which will strengthen the solidarity of the group in the long run. The viability of the FIO is one of the major aims of NIA.

Establishment and turnover of association

The ICOP, ACD/ADD, and FIOP participatory approaches in the national irrigation system has been established at the average of 3 years at the time of the study. The O&M turnover to farmers has been undertaken for one year. The ICOP participatory approach in national systems started as a pilot project in 1980. Implementation on a massive scale throughout the country occurred in 1982.

Dimensions of organizational structure

Organizational structure is defined as the "distribution, along various lines, of people among social positions that influence the role relations among these people" (Blau, 1974). This definition implies division of labor: people are given different tasks or jobs within the organization. Another implication is the existence of ranks or a hierarchy: the positions that people fill have rules and regulations that specify behavior in varying degrees.

The dimensions of irrigation organizational structure provide organizational control, delegation of authority from the officials of the association at the top. The more specific elements of organization considered are size, vertical differentiation, horizontal differentiation, decentralization of decision making, and formalization of rules.

Size refers to the number of personnel available to the organization. The ACD/ADD participatory approach had a mean of 139 employees,

ICOP had 72.

Verticial differentiation shows the number of job positions between the top and bottom of an organization authority structure. ACD/ADD had a mean of 11 supervisors, and ICOP, 9.

Horizontal differentiation reflects the subdivision of tasks among the organization members. It was measured as the number of divisions or departments in the irrigation organization. Tasks are highly differentiated in ACD/ADD, with a mean of 22.

Decentralization was measured as the number of persons usually involved in making operational decisions regarding O&M. The number of persons involved in decision-making was higher in ICOP (78) than in ACD/ADD (53).

Formalization is needed when an organization's objectives require coordination of activities or when members of the organization no longer maintain direct social contact. Such a situation requires explicit procedures for behavior (Blau & Scott, 1962). Hence, formalization refers to the use of rules in an organization. It is measured by the number of rules actually used in operation, maintenance, and fee collection. ACD/ADD had a formalization mean value of 6 while ICOP had 4.

Issues in farmer participation in irrigation

Issues have arisen as a result of the recent emphasis on greater farmer participation in the management of a large national irrigation system. There is lack of consensus on the definition, measurement, cause and end issue, and top-down and bottom-up approaches in farmer participation in irrigation. Empirical results based on the study of Tapay, et al., (1986) are presented.

Definition of farmer participation in irrigation

There is little agreement on the definition of farmer participation in irrigation. Recently, participation was defined as the active involvement from the initial stages of assistance from the irrigation agency. This means active involvement in the design, planning, con-

struction, and operation. However, in a large national scheme in the Philippines where the irrigation system is already in place, farmer participation is in terms of physical rehabilitation and O&M. It took the form of active partnership of the water users' association or organization with agency personnel in water management activities. Thus, farmer irrigation participation in the study refers to the decision-making and actual involvement of farmer members in such irrigation management activities as water allocation, operation, maintenance, and fee collection.

Measurement of participation

One of the methodological controversies is the need for an appropriate measure of farmer participation in irrigation organization.

Four measures of participation were conceptualized: total membership in the irrigation organization, average attendance at regular and general assembly meetings, number of farmers participating in decision-making, and attendance in group work.

Membership represents a degree of involvement of the individual in the group but does not represent a very active form of participation. Attendance at meetings represents a type of social interaction through which people exchange ideas to affect each other's decisions but not to implement an action. Lastly, the number of members involved in decision-making and attendance in O&M group work represent a social interaction in which the group comes to a decision and implements an action.

The sample irrigation organization shows that the ACD/ADD approach had a higher membership (279), average attendance at meetings (82), and attendance in group work (232) than ICOP. However the ACD/ADD approach registered a lower number of farmer participation in decision-making than ICOP(54 vs 78 farmer-members involved in decision-making).

Causes and consequences of the issue of participation

There is little agreement in terms of the relationship of the theoretical aspect of participation with the process of rural development in different societal contexts (Cohen and Uphoff, 1979; Castillo, 1983). One of the major disagreements is the importance of distinguishing participation as a means to development and participation as an end in itself. Castillo (1983) pointed out that the means-ends distinction will avoid the pitfall of substituting "participation" for the tangible benefits expected from development programmes, where benefits have not been realized. If it is regarded as an end, the question is asked: is farmer participation in the participatory way an achievement in itself? On the other hand, scholars who have viewed participation as a means would ask this question: is farmer participation a means of intensifying rice production? (Goodell, 1978).

Participation as an end

To illustrate that participation is an end in itself, the levels of satisfaction and responsibility were determined. The officials of the organization were asked about member satisfaction in participation in O&M activities, level of responsibility in doing O&M, satisfaction with decision-making participation, and satisfaction with benefits from the irrigation organization.

Level of satisfaction in O&M participation.

The objective in the formation of a farmer irrigation association is for the members to undertake O&M. Hence, farmer-member level of satisfaction was determined as an indication of participation. The officials of the association in the ACD/ADD approach perceived farmers' satisfaction with their actual O&M activities such as water distribution and allocation (73), actual maintenance (91), and benefits from irrigation (88). On the other hand, farmers in the ICOP approach registered a lower level of satisfaction: 70 with doing actual water allocation and distribution activities, 88 with partici-

pation in actual maintenance, and 73 with the benefits obtained from irrigation. Note that the level of satisfaction in terms of benefits is higher in the ACD/ADD participatory approach (94) than in the ICOP (82).

Level of responsibility in O&M

A high level of farmer member responsibility in doing O&M activities is important for the success of the irrigation organization. The ACD/ADD approach demonstrated a higher responsibility in maintenance (94) and water allocation activities (76). ICOP had 88 for levels of responsibility in maintenance work and 70 in water allocation. The high level of responsibility in O&M activities reflects the success of farmer participation. However, it also indicates the strength of the irrigation organizational base in large national systems.

The higher satisfaction and level of responsibility in O&M in the ACD/ADD approach may be explained by the organizing scheme. The ACD/ADD approach fielded water management technicians (WMTs) to handle the organizing work, while ICOP fielded community organizers (COs).

Participation as a means

The common mistake of substituting "participation" for the tangible benefits expected from development programmes has been a controversial issue among social scientists, policy makers, and donor agencies. The big question is: is farmer irrigation participation a means of attaining effectiveness or success?

There is a need to demonstrate participation as a means to attain success or effectiveness. The measures of irrigation effectiveness such as yield, irrigated area ratio, the fee collection ratio, and O&M expense ratio were determined in the ACD/ADD and ICOP participatory approaches.

The extent of performance effectiveness of the participatory approach in large national schemes shows that the ACD/ADD approach gave a higher annual yield of 7.30 tons per hectare than ICOP with 6.13 tons per hectare. In 1983, the irrigated area ratio was 1.62 or 162%

for the ACD/ADD approach and the ICOP approach. The comparative analysis of fee collection ratio indicated that ICOP and ACD/ADD had the same fee collection ratio of 0.56 or 56%.

The O&M expense ratio was 143% for ICOP and 72% for ACD/ADD. The high O&M expense ratio for ICOP is understandable because ICOP has not completely turned over the irrigation system responsibility to the farmer organization, and the expense still includes the cost of maintaining the COs, ditch tender, and water tender. ICOP is expected to lower its O&M expense upon separation of the water tender from the service and full turnover of O&M to the association.

The preceding results indicate the success of farmer participation in ICOP and ACD/ADD approaches. They also show that the intensive participatory programme of NIA is paying off. However, the results are not conclusive because the performance effectiveness may not be solely attributable to the participatory programme. The superior performance of ACD/ADD in yield, irrigated area ratio, and O&M expense ratio may be attributed to the type of organizing scheme used in the approach where the WMTs undertake active organizing work and at the same time provide system management assistance to farmer-members of the organization.

Top-down and bottom-up approaches

The top-down and bottom-up approaches became an issue in the organization. Castillo (1983) clarified that most literature makes a distinction between the "standard" or the top-down and the "participatory" organizations. Standard or top-down refers to organizations at the village level to carry out packaged programmes whose planning and decision-making processes were done by high level policy makers at the national level. Other authors have defined the participatory approach as farmers' involvement in decision-making at all levels of activities. Furthermore, Castillo (1983) thought that perhaps the difference between top-down and bottom-up approaches is more verbal than real, for much of the impetus for people participation comes from outside the local community and not necessarily from the bottom either. She further said that where projects have been characterized by decentralization, local involvement, and people's participation, the distance

from top down is shorter and the trickle down easier. On the other hand, Lasser (1979) cautions against the notion that because "a programme is decentralized and has a strong extension component, it is therefore participatory." He added that decentralization of authority from central to local levels is not participatory, unless there is also a sharing in planning, decision-making, and evaluation within the local group.

The top-down and bottom-up approaches in the organization have become an issue in recent irrigation organization development. Most organization scholars term them as centralization and decentralization of decision-making in the organization. Decentralization of decision-making in this paper refers to the number of members involved in decision-making on different water-related or O&M activities.

Among the two participatory approaches, ICOP exhibited a higher mean of 78 farmers involved in decision-making while ACD/ADD had a mean of only 54. The greater number of farmer-members involved in decision-making indicates that decision-making is decentralized. However, the matter is not that simple because there are predetermined policies set by NIA at different stages of O&M turnover in national systems. Hence, there is a mix of decisions made by members of the farmer irrigation organization and NIA policies.

In large, national-scheme participatory approaches (ACD/ADD & ICOP), it was observed that officials and members of irrigation organizations participate in making decisions regarding operation and management activities including fee collection. However, limitations are set by the policies of NIA. An example is the three stages set by NIA in the turnover of O&M responsibilities to irrigation associations. Therefore, although the ACD/ADD and ICOP participatory approaches demonstrated a high number of members included in decision-making, the decisions are "programmed" by NIA through set policies that promote the attainment of NIA objectives. This is evident in the reduction of O&M expense and increase in fee collection. Analytically, a high degree of centralization still remains in spite of transformations and involvement of farmer-members.

Conclusions

The findings indicate the need for a farmer irrigation organization with a strong organizational base for the new mode of management transformation in large national irrigation systems. The formation of farmer irrigation organizations with farmer-members actively participating in O&M and fee collection activities fosters relevant forms of participation of members. NIA should emphasize the fostering of participation in their current farmer irrigation development programme.

This study found that farmer participation in irrigation organizations is a means of attaining irrigation effectiveness. The performance effectiveness of the ACD/ADD approach in terms of annual yield is 7.30 tons per hectare, while ICOP registered 6.13 tons per hectare. The irrigated area ratio of the ACD/ADD and ICOP approaches are 162 and 125 per cent, respectively. The fee collection ratio for the two approaches is similar -- 56 per cent. The O&M expense ratio is 143 percent for ICOP and only 72 per cent for ACD/ADD.

These results and interviews with officials of farmer organizations indicate that agricultural productivity is the main criterion of the success or effectiveness of farmers. However, NIA's primary emphasis in the promotion of the participatory approach (formation of farmer organization) is to increase fee collection and reduce O&M expense. NIA should take note of the objective of the farmers and provide assistance in the attainment of higher agricultural productivity. Such moves will generate and ensure continuous high levels of farmers participation.

The greater number of members involved in decision-making in the different participatory approaches indicates that decision-making in the irrigation organization is decentralized. However, the matter is not simple because in the contract agreement, NIA set predetermined policies on the delineation of responsibility and the different stages of O&M turnover. There is a mixture of decisions made by the members of the organization and NIA policies. Therefore, although the different approaches demonstrated a high number of members involved in decision-making, the decisions are "programmed" by NIA through set policies geared toward the attainment of NIA objectives such as reduction of O&M expense and increase in fee collection. Thus, a high

degree of centralization remains.

The analysis suggests there is the danger that the irrigation agency will emphasize the promotion of NIA objectives in the participatory approaches. In the long run, this may be detrimental to the development of agricultural productivity, which is the primary concern of farmer irrigators who are members of the organization. There is a need to examine closely the objectives and implementation of the NIA participatory approaches to guarantee a long-run success. Donor agencies should actively participate in specifying and redirecting participatory approaches to promote objectives that will benefit farmer irrigators, and should not support participatory projects geared toward the promotion solely of the interest of the irrigation agencies.

NOTES

1. This was discussed in detail by David C. Korten and Norman Uphoff in Bureaucratic Reorientation for Participatory Rural Development; Edilberto de Jesus, Bureaucratic Reorientation at the National Irrigation Administration: A Philippine Case Study.

2. The process and strategy for promoting farmer participation through formation of farmer irrigation organizations in the Philippines are well documented and evident in the works of Benjamin U. Bagadion, Farmers' Involvement in Irrigation Development in the Philippines; Frances F. Korten, Developing Irrigator's Organizations: A Learning Process Approach; Carlos D. Isles and Manuel L. Collado, Farmer Participation in Communal Development. Lessons from Laur, the Philippines; Ted Ehera, Irrigators Organization of Rinconda/Buhi-Lao (BIAD III) Project: The Experiment on NIA's New Orientation for National Irrigation Systems; Jeanne F. Illo and M. Elena Chiong - Javier, Organizing Farmers for Irrigation Management: The Buhi-Lalo Experience.

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INDONESIA'S IRRIGATION SECTOR: SOME PRELIMINARY CONCLUSIONS FROM A SOCIO-ECONOMIC PERSPECTIVE

Aart Schrevel

Since the beginning of this century irrigation in Indonesia has received considerable attention. One of the priorities has been rice production, in particular irrigated rice. During the last two decades the time and money that have been spent on increasing the production of this staple crop have been unprecedented. The New Order Government, led by President Suharto, was installed in 1967. Two years later, in 1969, the first of the Five Year Plan Periods was started. One of its long term aims was to become self-sufficient in rice, which was finally achieved in 1985 - after some 20 years of continuous attention to the improvement and expansion of the role of irrigation in food crop production and the supply of other necessary inputs.

The ultimate success of achieving independence from rice imports cannot be attributed to one single factor or input. It is the effect of the availability (to the rice grower) of a combination of improved inputs, of which irrigation water is but one. In order to sustain this self- sufficiency it is necessary to intensify land and water use practices, this however requires at least a minimum understanding of the socio-economic structure of the major rice producing areas and a translation of this understanding into policies and strategies.

The macro situation with regard to rice production and the role of irrigation therein is discussed in the first part of this paper. In addition, the present situation with regard to rules, regulations, trends and policies will be explained. The discussion will be continued by looking at irrigation conditions in the field. It appears that the standard operation procedures that have been introduced and are being introduced in all of the large government-controlled systems are not put into practice, often overseen for various reasons. In

particular the prevailing socio-economic conditions appear to explain to a large extent why field canal systems are not being optimally used.

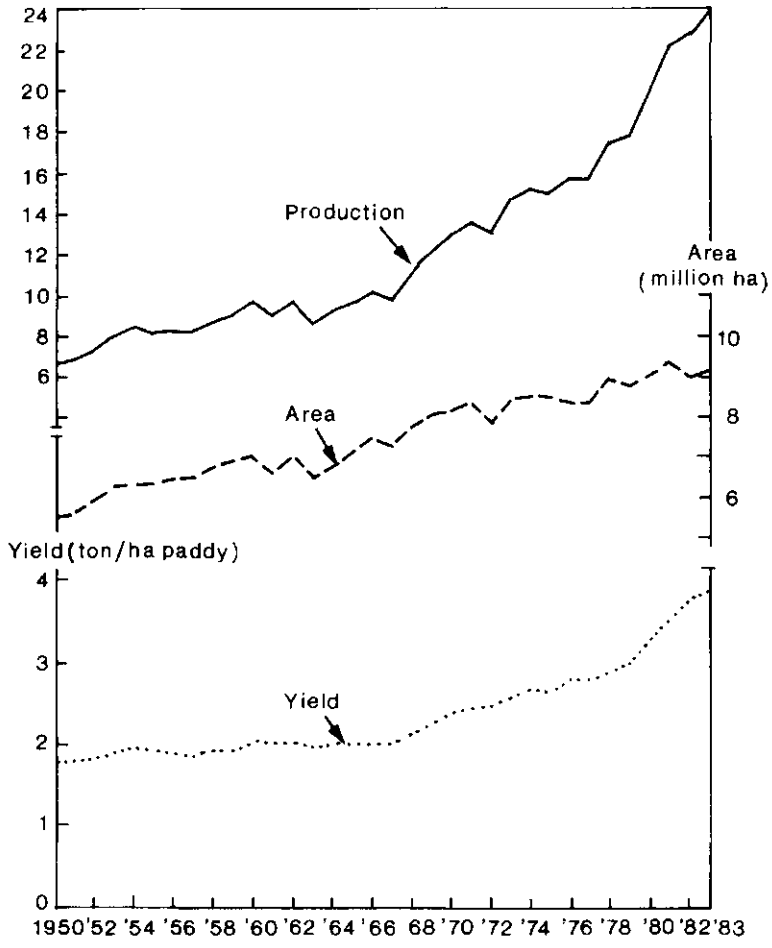
Rice: Indonesia's most important irrigated crop

Rice is clearly the most important crop grown under conditions of irrigation in Indonesia. Improvements in irrigation have always been motivated by a desire to increase the rice production.

In 1985, Indonesia became self-sufficient in rice and therefore independent of rice imports. Achieving self-sufficiency had been a long term aim of the government. Increases in production, both in total output and per head, have been impressive during the last two decades. Total production of milled rice increased from 12 million tons in 1969 to 24 million tons in 1983. Production per head per year during the same period increased from 105 kg to 154 kg (calculation on figures from Tumari, 1987). The average annual increase in production measured 4.9% in the period 1970-82, and was even as high as 7% after 1977 (Tumari, 1987). The higher total production was achieved on already productive land and newly rice-cropped fields. In other words, the total area cropped increased (at a pace of 1.2% during the last decade), as well as the yields. The proportion of irrigated rice growing areas grew even faster, at an annual rate of 1.6%, since 1969 (IIMI, 1987). Farmers now harvest twice as much in weight than they did 20 years ago, in some areas even as much as three times more (Edmundson & Edmundson, 1983).

Figure 1 presents a graph showing the effects on total production by these two factors (cropped area and yield). About a quarter of the growth in output can be attributed to the increase in area harvested. Increases in yields explain the rest and are the result of a number of factors. Improved irrigation is responsible for 16% of the increase, 5% is due to the use of new varieties, 4% by the use of fertilizer,

Figure 1. Increase in yields per ha, extension of areas under rice (wet and dry) and increase in annual production, 1950-1983



Source: Tumari, 1987

and 75% by the combination of these factors (FAO, 1985).[1)]

Most of the rice production (95%) is realized on wet rice fields: over 7-8 million hectares. In total some 9 million ha are used for rice cultivation (FAO, 1984). Yields could be increased by substituting traditional varieties by high yielding varieties in the major producing areas, the distribution of chemical fertilizers and insecticides, improving water supplies, and providing cheap credit to the farmers. Another factor that contributed was the relatively high and

stable floor price of rice and the improvement of irrigation facilities (see: Hüsken & White, 1986; Tumari, 1987; IIMI, 1987; World Bank, 1987).

All these inputs in the rice production process were provided by the government, at heavily subsidized prices (Tumari, 1987; Hüsken & White, 1986). Direct inputs were supplied to the farmers within the framework of a number of agricultural programmes, i.e.: BIMAS/INMAS (literally: Mass Guidance and Mass Intensification), INSUS (Special Intensification), and SUPRA INSUS (Super Special Intensification). The last mentioned is the latest of the agricultural programmes. It started in 1987 and is operated in 7 Regencies (Kabupaten) in West and Central Java, on a pilot scheme base.

The increase in production figures is indeed impressive. Farmers saw their own rice output increase considerably in a relatively short period of time. Many people have asked the question of how the benefits of greater productivity were shared. In particular, to what extent those deprived of land or how the small land owners have gained from the developments. Hardjono, analysing the views of different scholars, does not reach a definite conclusion. The position of the poorer sections of the rural population seems to be improved somewhat, but the improvement of those who were better off increased much more, indicating a decrease in absolute poverty levels, but a widening of the gap between rich and poor (Hardjono, 1987). She concludes the discussion with the final statement (quoted from: Booth & Sundrum 1981), that "... if declining at all" (i.e. the proportion of rural based people living below the absolute poverty line, ".... the rate of decline is extremely slow" (Hardjono, 1987). More important perhaps is the observation that whatever has been achieved, it has been achieved on an "unreformed agrarian structure" (Hüsken & White, 1986). Indeed, a large proportion of the rural population has no access to agricultural land and often also no access to part of the agricultural produce. In the major rice-growing areas their numbers constitute easily half the total population (see below). This has clear implications for irrigation system operation and for future policies with regard to sustaining the increase in agricultural (rice) production. During the last 20 years, different technical factors (inputs) were succesfully manipulated. This is the main reason why the total rice production continued to increase, with the important result that

Indonesia became self-sufficient in rice production. Basically, socio-economic conditions in the production areas remained unaltered.

Self-sufficiency in rice: the challenge

In order to maintain self-sufficiency in rice, the increase in total production will have to be faster than the rate of the population growth. It will have to compensate for both population growth and increases in demand. As incomes increase so does the demand for rice. The population of Indonesia is estimated to grow by 2.1% per year. The increase in rice production will therefore have to be about 2.5-3% per year. However, the last two years have shown a lower increase. The increase in 1986 is reported to have been only 0.9% (Jakarta Post, 20.02.1987). The country's stocks were used to prevent the country from importing. Bulog (Agency for National Logistics Administration) is the government agency responsible for operating on commodity markets, principally the rice market, with a dual purpose of stabilizing prices and accumulating national stocks. Stocks were as high as 1.8 million tons of milled rice in 1986, or about 15% of the total annual production. The increase in 1987 was also lower than projected. The same source, quoting recently issued official figures from the Ministry of Agriculture, put the output at 27.2 million tons, or an increase of 1.5% compared to 1986 (Jakarta Post, 09.07.1988). It is rumoured that this year (1988) the country will have to import rice again (Jakarta Post, 25.05.1988). Indeed the balance is a precarious one. This became especially clear when the result of the prolonged dry season of 1987 was that areas were not worth harvesting. Whether an area could be harvested depended very much on the availability of irrigation water. This illustrates the importance of irrigation in Indonesia where rainfall patterns are erratic, both from year to year as well as during the seasons. The negative effects of the erratic rainfall patterns can be controlled by irrigation. In many areas, irrigation means the difference between one or two harvests per year.

The longer term prospects for self-sufficiency in rice give reason for concern.[2] The population is expected to continue growing before it eventually stabilizes sometime in the next century. At present, the population measures about 170 million. Hull (1981) has concluded

that at present growth rates the population will be as high as 225 million at the turn of the century (quoted in Hardjono, 1987). Obviously, rice production will have to continue to increase, in one way or another.

Meeting the challenge through improved system operation

In theory, production of an agricultural commodity can increase in either of the three following ways, or in a combination of these ways. (1) The area under production can expand. (2) The yield per unit of land per season can increase. (3) Or the intensity with which a piece of land is cultivated can become higher. This is the case when other cropping patterns are introduced, for example, two rice crops and a dry land crop, instead of one rice crop and a dry land crop. Recently all these three methods have been successfully stimulated.

Prospects of opening up more easily developed fertile land, not too far-distant from the markets, have become increasingly scarce. On Java there is practically no more land that can be opened up, but there might still be unused or underused land available on the Outer Islands. Conditions are the most favourable on Java: already 70% of all government schemes are located on the island which contributes 61% of all the rice produced (Central Bureau of Statistics, quoted in Jakarta Post, April 1988). Large areas of tidally influenced swamp land have been opened up, mainly in the Provinces of South Sumatra, Jambi, Riau, South and West Kalimantan, and Irian Jaya. Tidally influenced swamp land appears to be difficult to develop and many of the development parameters are not yet clearly understood. Overall results have not been very convincing and many of the areas probably do not produce surplusses. Another approach to expand the national stock of rice cultivating areas is the programme to provide credits for the construction of new sawahs (Programme Pencetakan Sawah). However, the programme's impact has been disappointing, both in terms of areas covered, as well as in quality of services rendered.

Further intensification of rice cultivation methods, which is the second way to increase total production as discussed here, must be considered possible. Although locally yields of 9 tons are achieved (own observation Tangerang Regency, first crop 1988), average yields

could probably be still higher. Yet, new impulses seem to be required. Production levels of the varieties presently in use seem to have reached a ceiling. Commercially operated seed companies claim to have new stocks of hybrid rice seeds ready, but the seeds are not yet available on the market (Jakarta Post, 04.06.1988). Potentials for higher yields per unit of land may also exist on the Outer Islands. The proportion of the land under high yielding varieties is still comparatively low (less than 50%), (Provinces of East Nusa Tenggara, all of Sumatra except West Sumatra, all of Kalimantan, Irian Jaya, and South East Sulawesi (Tumari, 1987). However, these are the areas that are the least important in terms of contribution to national production figures.

There is one remaining way by which it will be possible to boost the total rice production and that is by increasing the intensity of land use. Much can still be achieved in this field. The provision of seeds, of fertilizers and of the proper insecticides is still not timely in all production areas. Proper insecticides are also not always applied. The services provided by the agricultural extension workers are frequently below standard. In the field of irrigation, considerable improvements are certainly possible. Schemes often function at low efficiency rates, resulting in only parts of the command area actually being served. In a study recently carried out in the Gubug area, Central Java, it was found that another 1,000 ha could be supplied if the main system was more efficiently operated. A range of predominantly non-technical factors (discussed later in this paper) resulted in an overall efficiency of only 42%. Similar conclusions concerning other areas have been reached by others (IIMI, 1987). It is believed that a substantial contribution can be made to the problem of declining growth of total production volumes by improving the agricultural and irrigation services to the farming population in areas that are already producing (often rehabilitated areas).

In the short run, of the three possibilities of increasing the national rice production, intensification of land and water already used for production offers the greatest chance of success. The main objective of the development policy of the government is to increase the performance of systems, with the intention of raising cropping intensities. The two most important donors of financial aid to

Indonesia, the World bank and the Asian Development Bank, have recently stimulated large and long-term projects in the irrigation sector concentrating on increasing the efficiency of the operation of systems. These are discussed in the section on trends in irrigation development.

The irrigation sector since 1969

At present, the figure for the area under government-administrated irrigation schemes is officially 4.8 million hectares. This includes 3.9 million ha of technical and semi-technical irrigation (with water flow distribution and measurement devices) and some 0.9 million hectares under simple irrigation systems (see table 1).[3] With 7-8 million hectares under wet rice and 4.8 million hectares under government systems, about 2.5 million hectares must be under traditional systems. Table 2 shows recent changes in areas under irrigation.

The increase in technically irrigated areas includes traditional and simple irrigation systems that have been converted into technical irrigation systems, as well as newly laid-out systems (IIMI, 1987). The increase was not confined to the Outer Islands, as is sometimes thought, but much of it has been realized on Java. The irrigation system has not only been expanded since 1969, but systems in large areas have been rehabilitated as well. After many years of relatively limited attention to their functioning, many systems were in a bad state of repair when the first large rehabilitation programmes were executed in 1969 (Booth, 1977). In fact, these rehabilitation programmes were designed to bring the existing systems back into the state that they had been in before the Second World War. There are only a few large irrigation systems that have not as yet received attention in recent years. Swamp, tidal land development, and river and flood control work has taken place on 2.0 million ha (figures DGWRD). Tertiary systems were developed on some 1.5 million ha.

Table 1. Areas under irrigation per province, 1987 (x 1,000 ha)

Province	techn. irr.	semi-tech.irr.	simple irr.	total
SUMATRA				
Aceh	4	70	33	107
North Sumatra	63	78	12	154
West Sumatra	28	66	68	161
Riau	2	6	-	8
Jambi	-	9	2	11
South Sumatra	26	8	-	34
Bengulu	13	16	8	37
Lampung	67	13	2	82
(Sub total)	203	266	125	594
JAVA				
DKI Jakarta	-	8	-	8
West Java	656	98	89	843
Central Java	445	95	161	701
East Java	723	128	73	924
DI Yogyakarta	25	27	8	60
(Sub total)	1849	356	331	2536
BALI, NUSA TENGGARA, IRIAN JAYA				
Bali	-	72	4	76
West Nusa Tenggara	40	99	7	146
East Nusa Tenggara	7	7	5	19
East Timor	-	-	4	4
(Sub total)	47	178	20	245
KALIMANTAN				
West Kalimantan	-	8	1	9
Central Kalimantan	-	1	1	2
South Kalimantan	4	3	1	8
East Kalimantan	-	3	3	6
(Sub total)	4	15	6	25
SULAWESI				
North Sulawesi	17	25	4	46
Central Sulawesi	9	16	9	34
South Sulawesi	110	43	28	181
South-East Sulawesi	4	8	-	12
(Sub total)	140	92	41	273
Grand Total	2243	907	523	3673

Source: unpublished figures D.G. of Water Resources Development, 1986

Table 2. Recent changes in areas under irrigation

type of irrigation	increase since 1969 (x 1 mill. ha)	situation 1985 (x 1 mill. ha)
technical and semi-technical	+ 1.5	3.9
simple	- 0.1	0.9
total area under government system		4.8
areas served during the rainy season		3.6
areas served during the dry season		2.3

Source: calculations on unpublished figures DGWRD

The figures above show an impressive increase in areas under irrigation. Yet, caution is required in interpreting the figures. There is always the problem of differences in definitions applied by various sources. In addition, the official figures are the outcome of adding up the areas of thousands of schemes, many of which have never been measured accurately. One frequently comes across considerable deviations in area figures between one government source and another. The general tendency in the data applied by the DGWRD seems to be one of overestimating actual areas. Differences can be as large as 10-25% (own observations).

For a proper understanding of these statistics, it is necessary to explain about the different types of the government irrigation schemes. It appears from figures collected by Francis Korten (1986) that a quarter of all land under irrigation consists of systems smaller than 500 ha. Table 3 provides details. Many of these small to very small schemes are originally traditional systems, that have been incorporated in the government system. As such they provide a clear example of the increasingly dominant role of the government in local resource management (see also D. Korten, 1986).

Part of the increase in areas under government-administrated irrigation can obviously be explained by pointing to the many small systems that have been completed with some structure and, from that moment onwards, were classified as government systems. The present policy is to reverse this trend. In an attempt to economize on budget

Table 3. Area characteristics of government-directed irrigation systems

type of system	total nr. of system	area served (x 1 mill. ha)
total nr. of systems	6700	4.8
systems <500 ha	5000	1.2
systems > 80 ha	2300	0.15 (appr.)

Source: F. Korten (1986), DGWRD

expenditures for operation and maintenance, which are a function of the hectares under irrigation, small systems will be handed over to their users. Handing over of small schemes is first tried out on a pilot scheme base. The pilot project is implemented within the framework of the World Bank financed Irrigation Subsector Project (see next section).

Potentials for further development

Not all of the 4.8 million ha under government-controlled irrigation schemes are double cropped. In the 1986-87 rainy season, some 3.6 million ha of rice fields located within the command areas of government-operated systems were reported to be served (figures DGWRD). It is not unusual for the tail-end 10-30% of systems to be regularly deprived of water (see also IIMI, 1987). The figure of hectares under rice in the subsequent dry season is even lower, and stands at 2.3 million ha. It must be considered possible, if the correct actions are taken, to increase the areas receiving irrigation water for two crops. Wet rice fields produce 90% of the country's total production of rice (figures Central Bureau for Statistics 1988). In fact, the greatest potentials for further increasing total rice production are found in the 10-30% of all systems that are deprived of water or irregularly supplied (compare table 2). This is in agreement with the conclusion drawn at the end of the first section of this chapter.

Tertiary unit development since 1969

When the first results of the rehabilitation projects were analysed in the early seventies, it became apparent that expectations with regard to increases in production were not fulfilled. Water distribution problems at field level continued to occur. Usually only primary canals had been reconstructed under the rehabilitation programmes. Tertiary systems had not been given much attention. It is doubtful if tertiary systems ever existed in all the irrigation areas (Booth, 1977). The unconvincing results were explained by pointing at the existence of the often only rudimentary field canal systems. The subsequent step was to design ways to stimulate the 'water users' to assume their responsibilities and to concern themselves with the (re-) construction, operation and maintenance of the field systems in their area. Different strategies were followed in order to achieve this goal.

The first approach was to set an example to the water users by digging the first 30-50 m. of tertiary canal in their area and by constructing the first division box. When results remained unconvincing and tertiary systems undeveloped, pilot tertiary units (Petak Tersier Percontohan) were set up. These also served the goal of setting an example of what a tertiary unit should look like and how it should be operated. Pilot tertiary units were if possible strategically placed, so that everybody noticed them. Government agencies were to make special efforts to render good services to the units and their users (Soekarso, 1976). Again, results were not convincing. Lack of funds and reluctance on the part of land owners to surrender land, have been mentioned as reasons why successes were limited (Booth, 1977). Hutapea (1979) points out that village officials and farmers were not previously informed. Another important aspect was that proposed organization formats (Water Users' Associations at tertiary unit level) assumed perfect egalitarian land ownership patterns, which was in fact not the case.

When water distribution at tertiary level remained problematic (for an account, read: Suparja, 1979), the government, advised by the World Bank, started with the construction of tertiary systems in all the schemes that had been rehabilitated in the late seventies. Again, a technical solution was worked out for what was already acknowledged

to be a social problem. Tertiary units have been developed on about 1.5 million ha on Java and elsewhere (figures DGWRD).

Several projects developed approaches towards the better integration of the purely technical and organization/managerial aspects of tertiary unit operation.[4] These types of projects are commonly referred to as 'integrated irrigation development projects'. The term 'integrated' is applied, because these projects typically seek to involve the Ministries of Agriculture and Home Affairs, in addition to the Ministry of Public Works.[5] In the course of these and similar projects, already existing concepts of the preferable form of water users' associations were further developed. The efforts culminated in the issuing of Presidential Decree No. 2 1984, in which the concept for water users' associations (P3A) was worked out. More details are discussed in the section on the concept of the P3A, Indonesia's official concept for a Water Users' Association.

The training programmes executed within the framework of the Irrigation Subsector Project (see below) and other projects all concentrate on establishing the P3A type of water users association. Typical of the approach is that the 'water users' are the target group. This group is differentiated only in as far as their role and function in the association is different; e.g. the subsector chief, the gate keeper, the unit water master, the chairman of the water users' association, the members of the association.

Relations between farmers, their economic and social position are not taken into consideration. Yet aspects like these are of major importance in understanding -and influencing- the dynamics of irrigation systems. It is thought that because these factors are often disregarded, success is limited. Rural communities in rice growing areas are just like other communities, they comprise people who have different and often opposing interests. This theme will be further elaborated in the last sections of this chapter. The dynamics of the communities will have to be understood, before we can even begin to intervene in the system of water distribution.

A study recently conducted in an area where the integrated approach was applied, revealed that a large majority of the water users' associations installed only a few years ago, were no longer functioning. Tertiary systems were in disrepair, except for the more important components of the systems (Schrevel & Rosen Jacobson, 1986).

Regulations concerning irrigation

Parallel to the development of the physical irrigation infrastructure, rules and regulations were set up to organize rights and responsibilities towards water. Regulations with regard to water are obviously important in a country as densely populated as Indonesia (170 million inhabitants). The situation in many parts of Java, which houses about 60% of the total population on only 7 % of the total surface of the country, is often one of competition between different types of water users, such as industries, households and agricultural producers. In the light of these figures, it is not surprising that many of the regulations reflect Javanese conditions.

The principles with regard to rights and obligations towards water are laid down in Law No. 11 1974, on Water Issues. This law replaces the 1936 Algemeen Water Reglement. Important points stipulated in the law are that water is to serve economic, social and cultural goals, and it is the government who ultimately decides on the use of water. The responsibility lies with the Ministry of Home Affairs. At field level this Ministry is represented by the Regency Head, District Head and, finally, the Village Head. Another important stipulation is that water resources that were being exploited prior to 1974 are allowed to continue if they do not contradict the law. This enables local traditional customs with regard to water use, regardless of its purpose, to be continued. This also applies to traditional irrigation systems.

In an earlier official document, Presidential Decree No. 1 1969, the Provincial Irrigation Service is designated as the institution to take care of operation and maintenance of irrigation systems. In this case the Provincial Irrigation Service works together closely with the representative of the Ministry of Home Affairs, yet remains more or less independent. The Agricultural Department has a somewhat different status in relation to the representatives of the Ministry of Home Affairs at Province and Regency level. Together, these three Government agencies have been referred to as the Triangle of Supporting Agencies.

The fundamental decision is that the government, through the

Irrigation Service, is responsible for managing the main system, including the tertiary off-takes, and that the water users are to take of water from the field irrigation systems at tertiary level. This was made law in Government Regulation No. 23 1982. In practice, this situation already existed. Regulation No. 23 also mentions the Irrigation Committee (Panitia Irigasi), as a forum to discuss irrigation issues at Province and District level. Irrigation Committees are chaired by representatives of the Ministry of Home Affairs and its members are from the Irrigation Service, the Department of Agriculture and functional agents such as the police and the military. In the same regulation, farmers using one source of water are ordered to organize themselves and to elect a water master from their midst. Details about the organization of water users' associations are worked out in the Presidential Decree No. 2 1984. Government Regulation No 23 1982, Section 36, Paragraph 3, provides the legal base for requiring beneficiaries of irrigation programmes to contribute to the costs (irrigation fee policy).

The official concept for water users' associations: the P3A

Feeling the need to improve system management at field level, the government decided to undertake the development of tertiary canal systems in the late seventies. The systems that were implemented were designed at the drawing tables of irrigation engineers and had a logical setup (in accordance with a set of design criteria). One of the principle features of the tertiary unit is that it is an independent hydrological unit (each unit has its own supply and drainage system) and that it consists of a number of smaller independent hydrological units. These are called quaternary units.

The model for the Water Users' Association as formulated in Presidential Decree No. 2 1984 is based on the model of a tertiary unit as described above. The technically sophisticated tertiary unit that had not as yet been tested under field conditions was used as a base for the model, and not the functioning of water users' associations, or characteristics of the systems they exploit. The result is that new systems and the new organization function according to entirely different principles.

A key figure in the official-type water users' association (called P3A, or Perkumpulan Petani Pemakai Air) is the unit water master. He sets the gates in the division boxes and is responsible for water distribution within the unit. He implements a water distribution schedule drawn up by the farmers and organizes maintenance work. The unit water master coordinates the activities of the heads of quarternary units and is responsible to the chairman. The latter fulfills many of the coordinating and representative functions. The board of the association further consists of a secretary, treasurer, vice chairman, etc. At the quaternary level, heads of quaternary unit are responsible for the distribution of water in their units. They are also expected to organize the farmers so that they agree on water distribution within the unit (approximately 12 ha in size). All functionaries are to be elected, accountable to the members and are to be compensated for their efforts.

The installation of P3As

The P3A mainly receives support from three departments: the Departments of Home Affairs, Agriculture and Irrigation. In recent years, unit water masters (Ulu-ulu P3A, or Ulu-ulu Vak) have been appointed in many areas, either by the water users of tertiary units, or by the village head in cooperation with officials from the Irrigation Service. The unit water master is often supposed to replace the village water master. In many lowland areas in Java, the village water master is or was the village authority charged with the responsibility to manage the villages' water resources.[6] Note that the territory of a village and a tertiary unit do not necessarily coincide. In fact, one of the reasons why the unit water master often fails to function is that he is supposed to direct the farmers from another village or villages. This is often extremely difficult, as villages frequently have a long history of conflict over the use of irrigation water.

P3As should by now be established in practically all the major government-administrated irrigation systems. Members of the board and ordinary members will have been prepared with different degrees of intensity. P3As are sometimes simply installed by decree, without much prior consultation with the farmers and with little effort to explain

to them the need for a water users' association, or, if construction work is taking place, what is being done and how the unit should be operated. Often, courses are organized to explain these matters to farmers and the course is concluded with the official election of the board of the association.

More follow-up activities are organized in case of the so-called 'integrated irrigation development approach'. In the integrated irrigation development approach, water users are approached and the need and functioning of a tertiary unit and a P3A are explained. Farmers are stimulated to set up their own water users' association. As a next step, newly elected leaders are invited to check preliminary designs of the field canal networks in the field. The members of the P3A may or may not be involved in construction work, and the intensity of following differs from case to case. See the introductionary chapter of this book for a discussion on the concept of participation.

Note that the choice of the layout of the tertiary system, with the different types of canals and the fixed operation principles, has been made without the prior consultation with the water users. The same applies to the procedures of the P3A. FAO, in a report discussing participation in operation and maintenance, prefers to label the above-mentioned approach the 'public sector approach', as opposed to the 'participatory approach' (FAO, 1982). Typical of the participatory approach is, that farmers' participation is even more intensive. Farmers assume responsibility for design and implementation of the project and in certain cases agree to pay back the costs of implementation. Group motivators are usually employed. Matters concerning system layout and organization procedures are left to the farmers. The group motivators stimulate the discussion. In Indonesia examples of the participatory approach in the irrigation sector are rare. To our knowledge only the Ford Foundation stimulates farmers' participation of this kind.

Trends in irrigation development

When in the late sixties, after decades of relative neglect, irrigation received the attention it deserved, the emphasis was first on rehabilitation. Projects were executed under the auspices of PROSIDA (Proyek Irigasi IDA, IDA being International Development Association).

The World Bank financed the programme. The World Bank remains to date one of the most important donors, if not the most important. Table 4, presents figures on areas covered and Rupiahs spent from the first Five Year Plan onwards.

Table 4. Areas covered and Rupiah invested in successive Five Year Plan (F.Y.P.) Periods.

F.Y.P.I year 1969-1974	achievements x 1000ha	exp. dev.budget Rp billion	exp. routin RP billion	total exp. foreign aid RP billion	total exp. FYPI Rp bill.
irr. rehababilitation	958.00	50.00	na	na	na
irr. extension	171.00	25.00	na	na	na
river/flood control*	287.00	39.40	na	na	na
swamp/tidal development	200.00				
total	1616.00	114.40	1.40	30.60	146.40
F.Y.P.II year 1976-1979					exp. FYPII
irr. rehabilitation	514.00	144.00	na	na	na
irr. extension	256.00	195.70	na	na	na
river/flood control*	431.00	204.90	na	na	na
swamp/tidal development	219.00				
total	1420.00	544.60	7.00	151.50	703.10
F.Y.P.III year 1980-1984					exp. FYPIII
irr. rehabilitation	321.00	416.40	na	na	
irr. extension	370.00	658.40	na	na	na
river/flood control*	388.00	588.70	na	na	na
swamp/tidal development	439.00				na
total	1518.00	1663.50	21.00	2190.10	
F.Y.P.IV** year 1985-1989					exp. FYPIV
irr. rehabilitation	360.00	335.20	na	na	
irr. extension	600.00	540.90	na	na	na
river/flood control*	500.00	429.10	na	na	na
swamp/tidal development	460.00				na
total	1920.00	1305.20	43.50	1199.40	2548.10

* development budget expenditures for river/flood control and swamp development added together

** provisional figures

Source: DGWRD 1986, after ADB project formulation document

Two important observations are made. Firstly, over a period of some 20 years, the emphasis has gradually shifted from rehabilitation to expansion of areas under irrigation. All the major irrigation works have by now been rehabilitated and efforts now seem to be concentrated on further expansion of the areas under irrigation. However, in this respect the figures are somewhat misleading. During the fourth planning period, it may have been intended to further expand the areas under irrigation, but at present the emphasis is on operation and maintenance and not rehabilitation or expansion. This is clearly stated in the 1987 official statement of policies: 'During this latter part of Pelita IV (fourth Five Year Plan Period) approaching the beginning of Repelita V (fifth Five Year Plan Period) the time has come to give greater emphasis to O&M activities' (GOI, 1987). It is also clear from the activities undertaken within the framework of the Irrigation Subsector Project, as discussed below. This project is the most recent World Bank irrigation project.

The second observation is that the proportion financed by foreign aid (predominantly soft loans) has increased sharply during the last period. During the first three Five Year Plan Periods, it was just over 20% of the total development expenditure but increased to 47% in the fourth Five Year Plan Period and is probably still higher now. This trend can be explained by the fact that government budgets have decreased sharply since the early eighties because of lower world market prices for crude oil, which is Indonesia's main export product. Even though government revenues decreased, it was felt that agricultural development should not loose momentum, hence, the larger foreign loans. An increasing dependency on donor institutions and countries is one of the consequences.[7)]

The Irrigation Subsector Loan

The Irrigation Subsector Loan, the latest of the World Bank loans in the irrigation sector, is important because of its considerable impact on Indonesia's irrigation policy in the years to come.[8)] The project started in 1987 and is expected to last 9 years, divided into three periods. The first period is financed by 40% local budgets and

60% soft loans (total value according to preliminary data is US $ 420 million; World Bank project documentation). The project consists of a number of components, which are to be carried out separately (although coordination between the components will take place). The emphasis is clearly towards consolidation and improvement of existing systems and away from expansion of irrigation into new areas.

The main components of the Irrigation Subsector Loan Project are the following:

- **Ongoing projects.** In this component the World Bank has made money available for irrigation and schemes that have been started but cannot be completed because of budget difficulties in several government schemes. The financing will cover 38 projects throughout the country which will now be able to be completed (there are no figures for the area concerned). The main criteria being economic feasibility and technical standard, the bank clearly aims to consolidate former investments.
- **Special maintenance.** Schemes are being supported that need special maintenance in order to keep functioning. It means that the most urgent technical shortcomings are being repaired. This would make the system capable of sustaining efficient operation and maintenance in future (see below). This component covers 400,000 ha of irrigated land and 100,000 ha of tidal lands.
- **Efficient operation and maintenance.** About 700,000 ha of irrigated land -approximately one fifth of the total area under technical irrigation- and another 90,000 ha of tidal lands will be subjected to the project component called 'efficient operation and maintenance'. Under this heading training courses will be organised for all government officials and farmers concerned. Typical of the approach is that all involved in irrigation are invited to follow a course of several days or longer. They will be instructed as to how a technical irrigation system functions under ideal conditions.
- **Pilot scheme ground-water.** The only irrigation project component whose total area will be expanded further is the one concerned with groundwater exploitation. Pumping up ground-water for the purpose if irrigation is relatively new to Indonesia, hence, the pilot status of this component.

The project is further concerned with the introduction of a number of policy issues. The issue addressed includes the handing over of small schemes -under 500 ha- to their users. As was previously explained, numerous schemes cover extremely small areas and together these easily cover 1 million hectares. Important savings can be made if these no longer need to be financed. The activities undertaken in this component aim at preparing the water user and the authorities for future changes and will include a review of irrigation fees. A pilot scheme for the introduction of irrigation fees will be set up.

The implementation of an irrigation fee will have more far-reaching effects. Up till now water users were not charged for the investments in irrigation. Land owners had to pay a contribution to the development budget of their Province, which was based on the area of land they owned and the quality of the land (IPEDA). The IPEDA contribution is in the process of being replaced by a property tax on land and buildings, based on the actual value of the property concerned (PBB, or Pajak Bumi dan Pembangunan; in English: Tax of Land and Property). The new policy is that water users, or more accurately those who benefit from the investments in irrigation, will have to pay for the costs of operation and maintenance of the schemes for which the Provincial governments will be responsible. Water users will be charged in addition to the PBB tax.

The implementation of this policy will first be tried out in selected Regencies in four Provinces (West, East and Central Java and South Sulawesi). The try-out includes collecting data on present levels of services, levies and taxes paid by farmers, estimating payment capacities and designing collection mechanisms. The concept of an irrigation fee is still in its preliminary stage, but important and already accepted by the central government. It is expected that the accountability of irrigation staff will increase, as the users pay directly for the quality of the service they receive.

The project budgets for operation and maintenance will be increased, first in those areas that have been covered under the special maintenance and efficient operation and maintenance project components. Budgets per hectare will be trebled in those areas that have been prepared. The increase will first be paid from the loan, but the Indonesian government will pay a much larger part of the increase (every three years Rp.10,000 more, until in year nine, Rp.30,000/ha is

available). The funds will be obtained from the revenues of the new property tax and from irrigation fees.

Anticipated results of the Irrigation Subsector Loan

The issues addressed by the Irrigation Subsector Project are interesting, especially in the light of problems that have plagued the irrigation sector for so many years already. By having construction work carried out by the Irrigation Service -and not by a project called into being for the period of construction only- and by increasing funds for operation and maintenance at the same time, an effort is being made to overcome this decades old problem of systems that are badly operated and maintained. Upgrading the performance of all involved in system operation, both at main and at tertiary system level, would also add to better system performance. Although it may be too early to judge as the project has only just started, some scepticism with regard to the ultimate success is warranted. In particular, the intended improvement of performance of large scale irrigation schemes may not occur.

The project aims at upgrading staff performance in extensive areas, through 'slotting in' expatriate experts in offices of the Irrigation Service. However, their impact on system performance will probably be limited. Firstly, because their (the experts') numbers will be small in relation to the number of staff. Essential monitoring of staff performance will consequently rarely take place. Secondly, because models of (main) system operation are used that are probably not suitable in the Indonesian situation. Thirdly, because frequently the technical conditions necessary for the proper functioning of irrigation schemes have not been met (see the section on main system performance).

The project further concentrates on organizing training courses for all those involved in system management, government officials as well as water users. For many of these categories, an increase of technical as well as organizational and social skills, must be considered a necessity. But the intensity with which the training is given, indicated by the frequency of contacts between the trainer and the trainee, is low. The extent to which transfer of knowledge is

actually taking place can be expected to be equally low. More important still, by telling people how things should be done, does not mean that their routine automatically changes. Certainly not under prevailing conditions on Java and in the other irrigation areas that have already a routine in system operation, often based on entirely different principles than those explained during the training courses.

A final important argument why a change for the better is not definite is that farmers attending the courses are not necessarily in the position to change the practices in their villages. Firstly, because the tertiary and main system works may not function properly, making changes ineffective. The innovations all assume that the tertiary systems in the field are fully developed and are in operational condition.

Secondly, it is an illusion to think that the water users tend to share the water equally with the other users. As will be pointed out later in this chapter, the majority of rice producers are not in the position to influence decisions on water distribution. And many of the supposedly interested water users are in reality only part-time users, as many of those actually working in the fields are not really interested in the water flow; whereas those who should be concerned are often disinterested in day-to-day management of the crops on their field.

The participants in the courses will learn how a technical irrigation system (including the tertiary system) is supposed to function, how to set the gates of division boxes and possibly the legal procedures to follow if the water is misused. But upon his return he will still be a villager and return to his place in village society, which means that he may not be in the position, even if he wanted to, to overcome the pressure from certain groups in the village to distribute the water in the old way.

Main system performance in practice

The discussion on water distribution in practice will concern technical irrigation systems only and reflects conditions commonly found in Java.[9] Discussing system operation in practice is done for conveniency by comparing actual conditions with standard procedures. The

standard procedures are the subject of the training courses organized throughout the country. The discussion concerns rehabilitated as well as new systems, and areas that have been exposed to years of 'integrated irrigation development', as well as areas that have received relatively little attention. Although recently upgraded systems are likely to perform better, since the works are in a better shape, the overall management conditions appeared to differ very little. This conclusion also seems to be true for schemes managed by newly trained staff.

Typical irrigation system layout and operation

Typical irrigation systems of the last decade consist of a headwork, a network of primary and secondary canals, a separate network of drainage canals, and tertiary canal systems. At the intake (a weir or dam in the river), the amount of water let into the system can be controlled and measured. Flow manipulation and measuring is possible at several other locations in the system, minimally also where secondary canals branch off from the primary canal. Concrete structures with iron gates are usually built to make this possible. Offtakes have the function to divert defined quantities of water to the blocks of sawahs called tertiary units.

Tertiary units are hydrological units on their own, consisting of a number of quaternary units. The tertiary canals supply water to the quaternary units. Finally, quaternary canals branch off from the tertiary canals and it is from the quaternary canals that the water users are allowed to take water. Division boxes are placed in the tertiary canals, at the location where water is supplied to a quaternary unit. Each tertiary unit has its own drainage system.

The Irrigation Service is responsible for the operation (and maintenance) of the primary, secondary and drainage canals and all the structures in these canals. The water users have to take care of all that is required to distribute water in the tertiary unit and to maintain the field canals. It is important to note that the gate keeper, an official from the Irrigation Service, and not the farmers, sets the gate in the offtakes. Standard procedures prescribe that demands are to be supplied with water according to a predesigned

schedule. This is generally the case, but not done in the sophisticated way described in operation and maintenance manuals. Matching supply and demand is referred to as 'pasten' in Indonesian (see also: Booth, 1977). Rainfall and river discharges should as standard procedure be recorded biweekly and should be related to record of areas cropped, growth stages of crops, etc. Computation is to take place at the office of the subsection chief (Pengamat Pengairan) and the outcome is the irrigation schedule for the following two weeks period. Instructions are then sent down to irrigation inspectors (Juru or Mantri Pengairan) and to their subordinates, the gate keepers (Penjaga Pintu), to set the gates in division structures according to the plan.

The water distribution plan as it is to be designed every two weeks should fit into the plan drawn up by the office of the Regency Head. This plan describes how water should be distributed over the different parts of the Regency (golongan). Requests by water users to deviate from the distribution schedule are to be processed by the irrigation overseer, as he is the only person in a position to oversee irrigation conditions of the entire scheme.

Main system operation in practice

The reality is different. Five assumptions are at the base of the above described standard procedure for main system operation. If any of these are violated, compromise solutions replace official procedure.

The assumptions are:

a) the actual numbers of hectares in each block, the type of crop and its growth stage are known accurately;
b) the actual flow at the intake can be, and is, measured accurately on a certain time basis;
c) it is possible to control and measure the exact quantity of water diverted into each canal;
d) the rate of losses in the distribution system and canals is known;
e) proper gate settings are made as required and the gates are not tampered with between settings (IIMI, 1987).

IIMI found all these assumptions violated in the three areas studied. What was found to be the case in the three systems studied is assumed to be the general situation in most of the larger government-operated irrigation systems.

Irrigation inspectors are responsible for reporting on actual growth stages of crops, but their area estimates are rarely accurate. Firstly, because they seldom use accurate maps, secondly, because their estimates are usually inadequate, and thirdly, because they often do not calculate the actual requirements (Booth, 1977), besides which they have to fill in the data on forms which contain not less than 68 columns (these forms are standard in Central Java). Every two weeks the data have to be collected and processed. The forms may be filled in and transmitted to the office of the subsection chief, but they are commonly inaccurate. In fact, it is not uncommon that forms are returned with a considerable delay. It has been observed that the forms are not used for the purpose for which they were designed, but are kept in files.

Intake flows may be measured, but as was found in one scheme in Central Java, the information never reached the office of the subsection chief in time, because of the distance involved and the lack of transport or other means of transmitting information. A minimum requirement for manipulating water flows in the system are measurement structures that are in good operational order. Most systems have at least several structures that do not fulfill the requirements, because of missing bolts, stuck gates, etc. Another requirement is operational staff with a knowledge of how to set gates and read discharges. The staff is not always well-trained, and, even more important, not systematically supervised. In addition, in many systems illegal offtakes, breaches in embankments and unauthorized gate settings occur, making an accurate system operation impossible.

It would be incorrect to assume that the water in the main system was not being distributed at all. It is distributed, but not as efficiently and accurately as it should be, and not as must be considered possible, given the presence of division structures and water flow measurement devices. If there are no water shortages (low river discharges), the system is operated without much processing of data and calculation of distribution schedules. The figures describing the parameters of supply and demand are collected, but they do not serve

the goal for which they have been designed. They are usually processed and subsequently stored or reported to the higher level offices. The subsection chief, the man responsible for the operation of the main system, will have a fairly accurate idea of the actual situation in his area, but does not interfere much if water supplies are sufficient. Usually, the gate keeper sets the sluices of the division structure for which he is responsible in accordance with the demand which he estimates, and the amount of water behind the structure, taking into account the amount of water entering his area. If water users demand more water, his first reaction will be to see whether he can manipulate a larger inflow into his area. Rarely will the request be brought to the attention of the subsection chief who is responsible for the distribution of water in the entire command area and the only one in a position to judge whether schedules -if existing- can be changed and how this should be done.

If river discharges are low and action is required, the usual reaction of the subsection chief will be to install a rotation schedule. He measures the amount of water available at the intake and decides the sequence in which sub-areas are to be supplied and for how long. This decision is not based on information about areas planted. It is simply a matter of directing water to one part of the command area for a couple of days and to the other part for the next few days at some water division structure. It has been observed, that the same distribution schedule was exercised in situations of essentially different available flows.

In another area, the irrigation inspectors and gate keepers were informed that water quantities were lower than normal: '70% pasten', it was said. All sluices were then set at 70% of the normal quantities. Also in that case, no apparent investigation took place to see which areas needed more water than others, in an effort to use scarce water quantities as efficiently as possible.

Main system water flows: a case study

To substantiate the above statements on general main system operation conditions, the results of a study that was recently carried out in an irrigation scheme in Central Java will be discussed.[10] The system was

recently rehabilitated and in a satisfactory condition. The operating staff, officials from other departments and farmers had all been subjected to various sorts of training courses. Notwithstanding these favourable basic conditions, the overall irrigation efficiency was low and water was distributed unevenly over the command area. Measurements where carried out over a six week period at six locations in the main system, in order to get an impression of flows of water in the area. Only that part of the command area that was actually served with water from the system was observed. Another 1,000 ha, 25% of the command area, was never supplied. The measurements were carried out at the start of the second crop in 1986. Demands for water were particularly high throughout the area, as all plots had to be puddled.

Secondary blocks in the upstream part of the system appeared to receive considerably more water than those in the downstream parts (in liters per second per ha, from upstream to downstream: 1.13; 1.41; 1.28; 0.66; 0.74; 0.58). Farmers in down stream areas suffered from lack of water, but the situation was not so critical that planting was not possible. However, blocks of sawah at the tail ends of all secondary canals, including those in the upstream part of the main system, could not be planted. Irrigation efficiency calculated for each of the blocks indicated high efficiency (about 70%) in the areas deprived of sufficient flows and moderate efficiency 45% in the better supplied areas.[11)]

The answers by 107 water users, when asked about irrigation water supplies, indicated a similar relationship. Sixty four of them complained of water shortages and the complaints came mostly from water users cultivating plots at the tail end of the secondary canals.

Main system operation staff

The overall conclusion must be, that the system designed to equally distribute water over tertiary units is not functioning as desired for a number of reasons.

The method designed to calculate the most efficient way of distributing the available water requires well-trained, well-motivated, mobile staff, a clear and enforceable system of sanctions in case of misuse and well-maintained equipment, to name just a few of the re-

quirements. However, even if these requirements are fulfilled, results will not necessarily be optimal.

Sufficient motorbikes, or trained staff do not necessarily make an organization work. The sum total is more than just adding up individuals. In order to make the system of 'pasten' work, each should know his task and his function in the system. The subsection chief has to know the sequence in which the steps are to be executed and he has to control, stimulate and motivate his staff. The organization of water distribution as it prevails today is better described as a loosely operated complex of people and regulations, apparently without an internal mechanism to stimulate optimal performance.

In fact, operating a technical irrigation system is not particularly difficult. The systems are not so complex, that an experienced subsection chief would not be able to distribute the available water by regularly checking field conditions and considering a few parameters with regard to demand and supply. The parameters being the river discharge, actual rainfall, growth stage of plants, approximate evaporation, availability of drainage water, exceptionally permeable soils, and extraordinary conditions. Related reasons are that staff responsible for actually distributing water and setting gates - irrigation inspectors and gate keepers- are of low rank in the Irrigation Service. Some do not have a permanent position, some are registered as daily labourers. The compensation they receive for their work is limited. This may encourage some of them to seek other methods of augmenting their income and they therefore do not spend enough attention to their irrigation job.

In addition, the field staff responsible for manipulating water flows do not always receive the support they need from their head office or from their supervisors. They almost never have a motorcycle or a bicycle and they may not have travel allowance, yet they are expected to set gates, check systems, help water users solving water distribution problems, and to report regularly at the head office. Problems of staffing and of organizing staff clearly are factors that explain why systems function less than optimally, with areas regularly deprived of sufficient supplies.

Tertiary system performance in practice

It is important to remark, that water users also usually do not insist officially on more water or more regular supplies. Serious problems are usually brought to the attention of the subsection chief, at the monthly meetings organized by the district chief and attended village heads. But the impression is, that if a water user can solve his own problem, for example by taking water directly from a secondary or by setting up a drain, he will not take the trouble to wait for the (uncertain) result of an official request. An example as illustration.

> Farmers at the tail end of a secondary canal of a scheme somewhere in Central Java suffered from lack of water, because upstream farmers had installed illegal intakes in the secondary. They complained to the District Head, who had the problem investigated. The team, of which the subsection chief was a member, concluded that the problem was indeed caused by the illegal intakes and requested the upstream farmers to remove them. When this was not done and the team had left, the downstream farmers removed the intakes. The upstream farmers resisted and the police was called in who supervised the removal of the intakes and threatened a fine of Rp 10,000 if they were replaced. Since then, many intakes have been replaced. Should the upstream farmer be fined, which had never happened so far, the improved harvest far outweighs the financial disadvantage of the fine and if necessary the adjacent farmers, who also benefit, could be asked to help pay it.

This is an example of a case in which the farmers involved the authorities, but as the police nor the authorities have revisited the scene part of the explanation for the failure is the lack of contact and the inconsequent actions of those in control of the water.

The situation as described above is the situation which the farming communities in large government-controlled irrigation schemes experience as normal, though not necessarily optimal. Conditions may differ from scheme to scheme and from section to section within schemes, but probably only in details. The supplies of water to tertiairy units on larger irrigation schemes, are variable, depending on the location of the unit and the season. The way in which water is distributed depends on a number of factors almost all of which are beyond the water users' influence.

Water distribution at field level: general conditions

It is interesting to see how water distribution within tertiary units takes place. Management of water flows and of the field irrigation system itself is the responsibility of all the water users. To this purpose, the government stimulates the formation of water users' associations, called P3As.

During the wet season, rains usually supply enough water to prevent drought stress in crops. Dry spells occur also during the rainy season and active water distribution is often necessary. During the dry season irrigation is absolutely necessary in order to be able to produce a second rice crop (dry field crops may survive on the residue water and whatever rain and irrigation water are available). In many areas sufficient irrigation water makes the difference between having a second rice harvest or not.

In areas where water users' associations have been installed and their boards and members have been trained, one will seldom come across an association that functions as is intended. Seldom are all board members active, records kept or sanctions enforced, but these requirements may not be essential or form a criterium by which water management situations should be judged, nor should they form the focal point of efforts to improve system operation.

The same is true with regard to physical systems in the field. Field canal systems (tertiary units with supply canals, quaternary canals, and with construction boxes) usually have changed shape after a relatively short time; many small field ditches (quaternary canals) disappear, most of the division boxes do not function, two or more units become merged, and drainage canals are tapped. Water may also illegally be taken from main system canal sections, but systems usually have not deteriorated to the extent that irrigation is no longer possible.

Systematic and equal distribution of water over the plots within the unit is no longer possible when the system has been altered as described above. In sections where water is available (usually the units closer to the intake in the river), the farmers feel that there is no problem (although carefully matching supplies of water to the need of the crop may result in higher yields), but the situation for the tail-end farmer will be different.

The unit water master versus the village water master

The man responsible for the management of the field water flows is the unit water master. He has become the man in charge in all schemes where P3As have been established. In many cases, however, prior to the formation of the P3A somebody was already responsible for managing irrigation water, usually the village water master. Even where P3As have been installed, the usual condition is that the village water master still runs the show. There are at least three reasons why it is understandable that the unit water master cannot simply replace the village water master. In East and West Java, for example, the village water master is entitled to part of the office land. He has prestige because he is a village elder. His authority is accepted by the villagers because it is tradition to do so, or because he knows the persons, in and outside of the village, with whom he has to deal. For these reasons, the village water master often prevents the new development coming from outside which threatens his position as a village elder. The unit water master is usually a villager without a special position. He lacks the authority, but also the necessary support (note: according to the regulations village elders are not allowed to take up positions in the P3A board).

Of major importance is also the number of persons involved and the degree of their involvement in water management and crop production. An average tertiary unit easily numbers more than 200 individual water users. Its canal system is designed to be operated by manipulating the gates in the division boxes in a specific order. To do this adequately requires a great deal of skill by the waterm aster - a skill which he usually does not command, even after a training period of one or two sessions- but it also requires that all water users understand the principles of the new system and its operation, which is usually not the case. Immediately when the function of one of the components of the tertiary unit system is violated (for example, if a drain is used for supply functions), other water users take the opportunity to adjust the system to their requirements. This is believed to be the general situation and the result is that the system can no longer be operated anymore. It is understandable that a unit water master, who

is usually a person without much prestige or authority, who does not master the required skills to operate succesfully the tertiary system, who has to control the daily actions of some 200 water users, even at times of high demand and short supplies, never really becomes established. The system deteriorates too quickly to the point that distribution according to schedule is no longer possible, a situation similar to what existed before the modern tertiary system was built. If the village water master himself does not resume his activities, the water users may call upon him at times that his assistance is required.

Another, often misunderstood reason why the unit water master has difficulties in becoming effective is because he is expected to serve water users from two or more different villages. This is the situation if a tertiary unit does not fall within the territory of one village. The unit water master is to be elected from among the water users of the village which has the largest part of the unit within its boundaries. He is expected to distribute water flows within the entire unit, also in the other village(s) and is to coordinate the actions of all the water users of the unit. Villages, however, often have a long history of water disputes, and villagers are used to go to their representatives for help or assistance. The authority of the village water master extended as far as the boundaries of the village, and in all cases that solutions to problems had to be found across the border, he consulted the village authorities of the next village. This is a situation which cannot easily be changed, and it is over-optimistic to expect that this can be changed in the short time available to a project which equals the time period of a limited number of classroom sessions.

Seeking access to water

Yet, water is distributed. It seems that wherever irrigation water is available or has already been available for many years, some pattern of distribution over the area emerges, often organized by the village water master, with some helpers. He also organizes the cleaning of those canal sections required for transporting the water. Labourers may be paid from the accumulated post harvest contributions of water

users. Or the work is carried out by villagers, organized to undertake communal work (gotong royong). The village water master may give preference to supplying certain sawahs first, for example the office land. But this is by no means the rule.

From time to time, water shortages may occur. Water users react differently to this situation, depending on factors such as the location of their plots in relation to the source of water and their position in the community. They may contact the village water master with the request to channel more water to their fields. Where water shortages remain as a threat to their crop, they may if possible tap off water from the main canal. Or they may exert their influence on the gate keeper, who is the lowest paid and ranked in the hierarchy of the Irrigation Service, but who is in the position to increase water flows.

In other situations, a solution is found in setting up water levels in a drain, thereby increasing the risk of floods, but decreasing the risks of crop failure. Or upstream farmers are approached with the request for more water. Or they go out at night and close all intakes in an effort to direct water to their plots. Hostility between villagers, not infrequently between villages, may be the result. Often also they contact the farmer cultivating the adjacent plot and ask him to release water from his field. Or, when this is not possible, they go and look for water elsewhere. They usually know the environment well, and know what is possible. This searching for water can assume dramatic forms. Water users have been known to arrange the flow of water over many sawahs to their plot. In many other cases they do not react at all because they believe that it will not help, which they may know from experience when they had tried without success to get water in previous seasons.

Basic socio-economic conditions in Java's major rice producing areas

Results of efforts to set up proper water management groups have been generally disappointing (Supardja, 1979; Hutapea, 1979; FAO, 1985; Suprodjo, 1985). Part of the problem of unsatisfactory results is related to the formulation of the target group. Projects and their staff almost always address the 'farmer', or the 'water user'. Train-

ing courses without exception discuss water users only in relation to the role they play in the organization: common members, head of quaternary unit, water master, board member, etc.

The assumption is that all involved in the process have an interest in the equal distribution of whatever water is available and that they all are in the same position to negotiate its equal distribution. The water users are also expected to be interested in discussing the distribution of water or in taking an active part in its management and that they recognize each others' rights to an equal proportion. These assumptions are basically wrong. Not all have the same social, economical or geographical position in the village and in the water distribution system. The explanatory power of considerations like these in relation to the disappointing results so far is considerable.

Demand and supply of labour

An analysis of the socio-economic base of the major rice-producing areas will help to understand why water users have 'failed to make maximum use of the potentials offered by the the new irrigation systems'. It is acknowledged that conditions within Java differ from region to region and from scheme to scheme. At the one extreme are areas where rice cultivation is still the most important economic activity. At the other extreme are areas where the inhabitants have various sources of income of which rice cultivation is but one, and not necessarily the most important. In both cases the population density is high, which means that the average plot is small.

As to the situation at present, the overall condition in Java's major rice growing areas is that the resources available are not sufficient to supply each household with the means to make a living.[12] For those without access to land, opportunities for productive employment in rural areas are limited. This is true for men as well as for women. Those in search of work usually far outnumber those needed to sustain production. In particular during the slack season, after planting and before harvesting, the demand for labour is low. It is not unusual for rice growing areas to have a labour supply that is two to three times larger than the demand for labour at its peak

(Schrevel and Rosen Jacobson, 1986b).

As other employment opportunities in rural areas are few, the excess labour force has to resort to other means to make both ends meet. Labourers, the majority being young male adults, married or single, usually find their way to one of the urban centres, where they engage in all kind of odd jobs. Some decide to move permanently to the urban centres, in expectation of more regular and stable incomes. Urban centres on Java grow at a pace of 4.3% annually, or twice as fast as the natural increase of their populations (Jakarta Post, 07.06.1988). Others leave their families behind and commute between the village and the town. During land preparation and harvest time they will usually try to return to their village, as at this time wages are relatively secure, even though they are low. Those who go are usually young men, but young women also leave the villages to find work elsewhere. Women however, tend to stay behind in the villages if they are married and have children. Although there must be many young women who continue to work in industry or other sectors, while leaving their children behind with grandparents or other relatives.

Distribution of land in Java's major rice producing areas

The majority of these people come from the ranks of the landless, although large numbers of small landowners and sharecroppers do not generate enough income from the land they cultivate to feed their families. If 0.7 ha of double-cropped land is accepted as a yardstick to indicate the minimum area of land required for an average household to live from the produce of its own land, then a vast majority of the households in rural areas -some 75% and occasionally more- need additional income. If a household depends on sharecropped land, then the minimum size of the land they cultivate must be even larger. These figures have been calculated for the Gubug area in Central Java, using District and other official statistics and survey data. The available land resources in the area are not equally distributed over the households. Up to 40% of the inhabitants do not own land at all, often not even the land on which their house stands. Average land ownership among landowning households is calculated to be 0.4 ha. This figure drops to below 0.2 ha per household if average landownership of all

households is calculated.[13)]

Sharecropping is a common phenomenon in all rural areas. The usual condition is, that if sharecropping is incorporated in the calculation, for example by weighing one ha of sharecropped land as 0.5 ha of owned land, a slightly higher percentage of the rural population cultivates enough land to live from. Sharecropping is especially important in areas where urban-based people have bought land. This condition is more common round urban centres and in villages that are easily accessible from a main road.

Households owning more than 0.7 ha (one 'bau') of doublecropped land form less than 20% of all households. If sharecropped land is also taken into consideration, with 1.0 ha of sharecropped land considered as 0.5 ha, then less than 30% of the households cultivate the minimum amount of land for subsistence. In other words, seven out of every ten households need supplementary sources of income to make both ends meet. The agricultural sector can surely not absorb all of them. Similar data are recorded in other studies (for a discussion of literature, refer to Harjono, 1987).

The data above reflect the broad outlines of the prevailing socio-economic conditions in Java's major rice producing areas. They can be summarized as follows:

- households owning enough land to live from its produce (0.7 ha)	one-fifth of total number of households living in the rural areas
- households cultivating enough to live from its own produce	one-third of total
- work in agricultural sector	for one-third to half of available labour, only at periods of peak demand
- depending on other non-agricultural sources of income	two-third to half of total

A few more points have to be stressed in order to complete the above picture. The situation is not that half of the rural population is engaged in the rice production process, the other half not. The general condition is that almost all households living in the villages have one or two members working in agriculture (rice cultivation) at

one time or another. Their members are also engaged in any of the many different other income-earning activities. The second point is a point of caution. A major weakness of observations as the above is that they provide only limited insight into issues such as relations between households, control over land, or access to land and agricultural produce. Various other factors (credit and labour arrangements) besides control over land and access to agricultural produce can be more unequal and with that the power to influence decisions with regard to the distribution of water.

Basic socio-economic conditions and field irrigation management

It is clear that it is basically incorrect to speak of 'the farmers' or 'the water users', as they are not homogeneous groups sharing the same qualities and expectations. At the same time, the considerations above provide us with another explanation why water users' associations have difficulty in living up to expectations. Many of the water users, in fact the great majority (small owners cultivating their own plot and sharecroppers), are not permanently resident in the villages. Many of them will be more or less continuously away, leaving the growing of their crops to their wives and children, or their neighbours. Often a small compensation is arranged for if a third party is involved. Both the absent owner and the caretaker will not be in the position to contribute much to system management. The owner because he is absent and the caretaker because he is only required to look after the crop, but has no real power to influence the direction of the water flows.

It is difficult to know who most of the water users are. Are they the landowners who own larger holdings (70-75 ha) and who together easily cultivate 50-65% of all land in the villages? Or are they the sharecroppers who cultivate other people's land? Or are they the owners of the numerous small and minute farms who spend most their time working on off-farm activities? Or are they the 50% of the rural households that do not have land of their own and who work as agricultural labourers, or if they are lucky as sharecroppers? Or are they the people from elsewhere who own land in the villages? The answer to these questions is of importance as it can help decide which approach

is preferable in order to establish more efficient water use practices.

From the analysis in this chapter it is clear that the concept of the P3A, which is the model of water users' association based on the principle of all water users having the same positions in the village and the association, is in need of revision. Many of the farmers depending on the regular and secure water flows for the successful cultivation of their crops must be considered to be 'floating members' of the association. Associations or other forms of cooperation should be considered that reflect these basic facts in mind.

Indonesia's irrigation sector: expectations for the future

The achievements of the past couple of decades with regard to the expansion of areas under irrigation and increases in national annual production levels is indeed impressive. The country became independent of rice imports in 1985. This is an important achievement. Both the production per ha and production per head increased considerably. Landowners, large and small, have adopted new varieties and have accepted credits in order to apply fertilizer and insecticides to their crops. Most of the investments which triggered off these increases were heavily subsidized.

It can be deducted, that the beneficiaries of the investments in the government-controlled irrigation and subsidized agricultural sector are to be found especially among the landowners. Households owning larger farming units have benefited most. Small landowners and sharecroppers have also benefited, but less. Those without land may have gained because of an expansion of the labour market.

The achievements were the result of technical innovations. They could be realized and were adopted, even though no efforts were made to reform the agrarian base of the rural areas. No efforts were made to call into being a group of full-time farmers, whose sole activity and interest is rice cultivation. The opposite is true. The number of people involved in rice cultivation as tenants or labourers has increased as a result of the ongoing increase in population. And all involved have generated other sources of income, sometimes of necessity, and often constituting the major source of the household income. Rice

cultivation has further commercialized and villages have become more incorporated in the regional and national economy.

The establishment of sound water management practices in the past and present have not taken these basic conditions into consideration. But they appear to stem from the notion that all involved in rice production have the same interest in and power to influence the distribution of water. This assumption is totally wrong and the persistence in this belief is probably responsible for the disappointing results of water management projects. Another reason is the tendency of these kinds of projects to 'force water users' associations into existence'. Efforts are made to establish groups at the level of the tertiary units, also in areas where existing organizations are based on other principles. Related to this is the observation that many projects today focus an upgrading knowledge and skill of those involved in water management (training), but that the intensity of training courses is too low.

As far as the major rice growing areas in Java are concerned, the question is not which approach towards improving water management is to be followed. It is concluded from the analysis above, that both the 'integrated irrigation development approach' as well as the 'participatory approach' do not fit the Javanese situation. Both approaches are designed to deal with rice farmers who are in a position to spend all their time, energy and attention on the cultivation of their crops. The fact in Java's major producing areas is that farmers are part-time rice cultivators.

Evidently, the annual increase in production will have to be maintained as the demand for rice in absolute terms will continue to increase. Whether again technical innovations like those of the seventies and early eighties (high yielding varieties and fertilizers) can be enjoyed is not clear, and new areas suitable for production are scarce. The government's decision to concentrate on making more intensive use of areas already under cultivation must therefore be considered to be a wise one.

There is still a great deal of room left for improvement of irrigation both of the main as well as the tertiary systems. There seem to be two alternatives. One way is to leave the agrarian base unchanged, in which case rice cultivation will remain one of several sources of income. A minimal condition for improvement of water management prac-

tices at field level is to review and adapt enhanced water management models to existing social field conditions.

The alternative is to intervene in the existing agrarian structure of the major rice producing areas. This requires imaginative solutions and political commitments because the existing regulations as laid down in the Agrarian Law No. 5 1965 do not apply in all cases. The problems are not only political, however. The demographic analysis clearly shows that if a reform is executed and farms with s size of about 0,7 ha are established, a large number of villagers will have to be disappointed. There is no sector in the economy of the country which could absorb the landless people. Working within the framework of the present situation, with all its limitations, therefore seems to be the only alternative.

NOTES

1) Unfortunately the report does not explain how these figures have been calculated.

2) Only rice, the staple food of the Indonesian population, is discussed here. Dry land crop production and crop diversification are issues recently receiving more attention from the side of the Ministry of Agriculture.

3) DGWRD is short for Directorate General of Water Resources Development. It is one of the three Directorate Generals of the Ministry of Public Works. The figures published in this paper noted as 'figures DGWRD' are all unpublished computer-processed statistics.

4) If larger, tertiary systems can be surprisingly complex to be operated, certainly if available water quantities do not allow for continuous water flows to be maintained, in which case rotation schedules have to be implemented. They become even more complex, if allowance has to be made for different topographical conditions within a unit. And virtually impossible to be systematically operated, if influential villagers use their position to influence distribution decisions.

5) Examples of projects of this type are the East Java Irrigation Project and the Dutch assisted Sedeku Project (Central Java), Pompengan Project (South Sulawesi) and Rawa Sragi Project (Lampung).

6) The village water master is referred to as Ulu-ulu (Java), Jogo Tirto (Central Java), Mandur Air (parts of Sulawesi and elsewhere), Raksabumi (parts of West Java), or Mayor (idem), depending on the area. The terms Darma Tirta (Central Java) and Mitra Cai (West Java) seems to be restricted to indicating the group or organization of water users. The village water master, or an equivalent, is also found in areas outside Java.

7) The Asian Development Bank finances a project along the same lines, under the Third ADB Irrigation Sector Loan, with a total value of US $ 140 million.

8) Loans in the irrigation sector are designated for projects and partly also for topping up of routine government budgets (programme aid). Aid projects are almost exclusively executed by consultancy firms, usually expatriate firms in collaboration with local consultancy firms.

9) Much of the literature available is confined to schemes in Java. The author's experience concerns several systems in West and Central Java, South and Southeast Sulawesi and Lampung.

10) The system under discussion is the Gubug Irrigation Scheme, Regency of Purworejo (Schrevel & Jacobson, 1987).

11) The period over which the data to calculate the efficiency was taken is admittedly short.

12) In theory with improved techniques better use could be made of the available resources, which could therefore support more people.

13) Not included in the calculations are the office lands. Office land may constitute 20% of wet village land, thus narrowing the resource base of the village populations even further.

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THE INSTITUTIONAL APPROACH TO IRRIGATED RICE FARMING IN MALAYSIA

Geert Kalshoven

One of the most important elements in the development of the rural environment in Malaysia was the introduction of irrigated rice. This has been achieved by creating a number of large-scale irrigation schemes in West Malaysia, with the objective of increasing rice production and the income of rice farmers. A second step was the setting up of a vast organizational framework for agricultural development to support the rural households within the irrigation schemes. The farmers' desire to take an active part lags far behind the great predominance of government officials in managing the irrigation schemes.

The analysis focuses on the organizational framework of two irrigation schemes: Muda (98,000 ha) and Kemubu (19,000 ha). These schemes form the particular environments where the various technical and organizational forms of government intervention manifest themselves; they also represent the exact locations where rice farmers live and cultivate their irrigated fields.[1]

This chapter is presented in three sections: (1) Agricultural development policies related to rice production, (2) Organizational framework of irrigation and rice production, and (3) Issues of social organization and participation. Throughout this chapter the limited scope for farmers' participation in irrigation is discussed within the context of social organization in general and with special reference to the already existing "farmers' organizations".

Agricultural development policies related to rice production

Rice growing in Malaysia is concentrated on the large coastal plains of the Peninsular. Rice farms are small in size, ranging from 0.25 to some 3 ha, with a mean size of 1.2 ha. Due to the small farm size and low productivity the annual household income within rice areas is much lower than in the urban sectors of the Malaysian economy or in the established land settlement schemes. In 1975 the income of 77% of the rice farming households was below the poverty line of M$ 210 per month (Third Malaysia Plan).

Due to the high incidence of poverty among rice farmers, as well as the fact that they are nearly all of Malay origin, politicians within the United Malays' National Organization (UMNO) are very motivated to greatly emphasize improvements in the rice growers' economic position. The New Economic Policy as formulated by the government contains the overall guidelines for national development policies. Within the overall objectives, government rice policies centre on three primary objectives:

1) to increase the incomes of rice farmers;
2) to promote rice self-sufficiency at national level;
3) to supply rice to consumers at a reasonable price.

In terms of priority the main emphasis is on income support. This objective could be reached by raising the productivity of existing production units and providing services in rice growing areas. The second objective, namely to be self supporting with regard to the staple food of Malayia is based more on reasons of security than of economy. Another objective is manifested in UMNO's efforts to secure its political base in the rice-growing areas by benefitting farmers through a vast network of service organizations.

Irrigated rice production

In the early years of policy implementation the main emphasis was on the provision of irrigation infrastructure. The construction of large scale irrigation systems was undertaken in traditional rice growing areas, with Malay households as the major population. With the financial assistance of the World Bank, heavy investments were made parti-

cularly within the Muda and Kemubu areas. The Drainage and Irrigation Department played a major role in the supervision of construction work. By the early 1960's about 215,000 ha were provided with new or improved infrastructure, and by the mid-1970's, this had been done for about 300,000 ha (Taylor, 1981).

Within the established irrigation schemes new rice varieties with an improved yield capacity were introduced. Furthermore, short term credit and rural extension facilities were extended to the farm families in order to stimulate the use of new cultivation practices. The government also improved the marketing of rice, by constructing roads and guaranteeing a minimum price. Minor attempts to diversify the farmers' sources of income included the introduction of livestock improvement, and poultry and vegetable farming on plots near farm houses. The main emphasis, however, was on the increase in rice production, by the introduction of modern technologies; and by 1975 56% of the total rice area was double cropped. With regard to this productivity aim Fredericks considers the Malaysian development programme, in terms of planning and implementation, to be agricultural development more than rural development (Fredericks et al., 1980).

Taylor (1981) judged the success accomplished by comparing the rice harvest in the 1950's, it was hardly 600,000 tons per year and in the early 1970's to about 1.7 million tons. Until 1965 the main season wet rice was the only significant part of rice production. Since then, double-cropping has expanded considerably, and by the late 1970's the off-season crop accounted for about 45% of the national total rice production (Taylor, 1981). According to the same author, the government's target, to become 80-90% self-supporting in rice, was reached towards the end of the Second Malaysia Plan (1975). Since then, the overall emphasis on the expansion of irrigated land has changed to the further rehabilitation of irrigation and drainage facilities and the improvement of farm support services.

Rural organizations and policy implementation

Rural organizations can be described as social units operating within a specific agricultural environment and fulfilling a number of tasks with the view to implementing certain policy objectives. In the case

of Malaysia, these rural organizations were the outcome of a more general process of continuous expansion of the government bureaucracy involved with rural development tasks while implementing the five year plans (Esman, 1972). Besides this development at the national and regional levels, various attempts have been made to create institutions at local level. These local institutions would facilitate farmers' access to the service organizations and would attune agricultural policy to local needs and demands. Here follows a brief description of two major types of rural organizations in Malaysia, the cooperative societies and the farmers' organizations.

Cooperative societies

In 1922 the British colonial government proclaimed the Cooperative Societies Enactment. The basis of colonial cooperative policy was not to involve the State in financial matters in order to replicate the situation as it had been in 19th century Britain and thus ensuring a self-supporting, self-contained and self-governed movement. The State through the Department of Cooperatives would only play a supervisory role (Fredericks et al., 1980).

The basis for the establishment of the movement was primarily of an economic nature; indebtness of the peasant to the money-lender was seen as structural and was a brake on the development of the peasant household. Rural credit cooperatives were viewed as essential instruments to improve structural weaknesses in the rural economy. These organizations were to provide a badly needed competitive network in the unorganized money market and to transform primary producers into independent units (Fredericks, 1975).

Post-war cooperative policy was mainly instigated by the wish to accelerate national economic development. The years between 1955-1963 were of political significance for the cooperative movement as these marked the transitional phase of self-government. Cooperative societies were perceived as viable socio-economic institutions linking grass-roots initiatives to the national processes of rural development. A link-up strategy to coordinate the activities of different cooperatives was gradually employed to compete with the rural middlemen. This government support caused a substantial expansion of the

cooperative movement, particularly in the fisheries and rice sector. Within the rice producing areas the provision of seasonal production credit and fertilizer distribution, rice milling and marketing, were seen as the major tasks of the cooperatives.

Fredericks (1980) describes how after 1963 the government's emphasis on cooperatives as major instruments of rural development was reduced. The major causes were:

1. Inter-personal conflicts in the cabinet resulting in the loss of political leadership needed to foster cooperative development.
2. Lack of management ability and financial resources in the Cooperative Department to perform the complex task of promoting rural development.
3. The hasty growth of rural cooperatives which raised the problem of ideological commitment and of members identification. This caused the members to perceive their organization as a convenient, semi-government supplier of inputs to which little loyalty was owed.

As a reaction to the disillusionment with rural cooperatives as effective organizations based on the concept of self-help, the government began to increase its institutional involvement in rural development by creating various official and para-statal agencies. At the same time, policy makers were forced to look for a different category of rural organizations which could serve as local rallying points for the activities of these various agencies. The local institutions which were thus highlighted were the new farmers' associations and farmers' organizations.

Farmers' associations and organizations

Farmers' associations were introduced as early as 1958; they were expected to undertake agricultural extension activities in a role secondary to the agricultural cooperatives (Sarji, 1977). The concept of these associations was related to the 'area development' strategy outlined by the Minister of National and Rural Development in 1963, to concentrate resources in areas with a good infrastructural base. As such, these associations were based on the concept of farmers' associations as in Taiwan, where they have an important role in the integration of farm services in specific rural areas (De Lasson, 1976).

After the Farmers' Associations Act in 1967 was passed, the associations were transformed from single into multi-purpose organizations, with a plethora of development functions. Apart from the agricultural extension component they were also expected to provide their members with credit, farm inputs, farm machinery, transport and marketing facilities, and even processing services in an integrated way. Besides these technical services new functions included the fostering of rural leadership, the spirit of participation and self-reliance, and community welfare.

From the very start, farmers' associations were intended to develop gradually into independent organizations, managed by the members, but in collaboration with government officials. This is reflected in the formal organizational arrangements, which suggest that board members have the right to participate in decision making. Government officials would mainly fill the executive positions and assist in management operations. In practice, however, the government officials in their executive capacity ran the complete the day-to-day affairs of the associations.

A farmers' association on average covered an operational area of 2,000-4,000 ha supporting 1,000-2,500 farm households. The farmers were grouped together at the local level in 'small agricultural units', consisting of 30-70 members. The actual management of the association and the day-to-day operation of business was performed by a general manager and five or six officials, all seconded from the Department of Agriculture. Following the Taiwanese example, officers were each in charge of one section, covering a specific field of activity, such as credit, input supply, administration, extension or accounting.

By assigning so many tasks to the associations these organizations became largely identical to the agricultural cooperatives. In areas where cooperatives were still active the newly established farmers' associations began to compete with them. At the federal level, there was a rivalry spread between the Department of Agriculture supporting the associations, and the Department of Cooperatives supporting the cooperative societies. The inter-agency problems created confusion among the farmers, misgivings about the larger subsidies to the associations, and insecurity about the future of the cooperatives (Sarji, 1977).

In order to solve these problems it was decided to superimpose a new set of institutions, called farmers' organizations, which had to coordinate and integrate the activities of the associations and agro-based cooperatives. A new parastatal structure at the federal level, the Farmers' Organization Authority, was to manage and streamline the various activities of the former institutions, although each kept its own identity. After an initial phase of loose integration, the Farmers' Organization Authority adopted a policy whereby associations were fully integrated with agro-based cooperatives. The achievement of full integration, however, was not only hindered by the opposition of some well-established cooperatives, but also by the intricate legal and administrative procedures involved (Daane, 1982).

When the associations and cooperatives were placed under the Farmers' Organization Authority in 1973, exceptions were made for those located in the Muda en Kemubu areas. Within these areas new development agencies had been installed, resp. the Muda Agricultural Development Authority (MADA) and the Kemubu Agricultural Development Authority (KADA) and it was decided to place the existing organizations under the auspices of these regional agencies. Instead of attempting to coordinate the various activities by the formation of farmers' organizations at the area level, the agencies took up their task at the regional level. As a result, farmers' organizations function directly under the jurisdiction of the two regional agencies and are not required to report to the Farmers' Organization Authority.

In the Muda area, a special provision has been made for the establishment of an assembly at the regional level, consisting of the chairmen of the board of directors of the farmers' organizations in the area. This assembly has been installed in order to voice the farmers' interests at the authority level. This arrangement must also be seen as a convenient way for officials to consult farmers' representatives at their headquarters. In this way, the assembly has been instrumental in obtaining the cooperation of farmers in the re-alignment of canals and feeder roads under the Muda II project (Fredericks et al., 1980). Interestingly, Scott (1985) noted the farmers' preference to speak of the farmers' organization as 'MADA', referring not to the organization or its elected leadership, but to the government agency that directs its activities.

Organizational framework of irrigation and rice production

In both Muda and Kemubu areas, the management of the irrigation schemes is the responsibility of the engineering divisions of the two regional authorities. This organizational provision differs from that as present in other irrigation schemes in Malaysia, such as the Krian scheme, where operational functions fall under the Department of Drainage and Irrigation. The special organizational status of the Muda and Kemubu agricultural development authorities stems from the period when the creation of semi-autonomous regional corporations was considered essential for achieving an integrated approach to the various development tasks within the major rice producing areas. An interesting side issue of this arrangement is, to what degree the decentralized structure gives a better access to rural services and more room for the participation of water users in the distribution of irrigation water, compared to the conventional centralized arrangement in other Malaysian irrigation schemes.

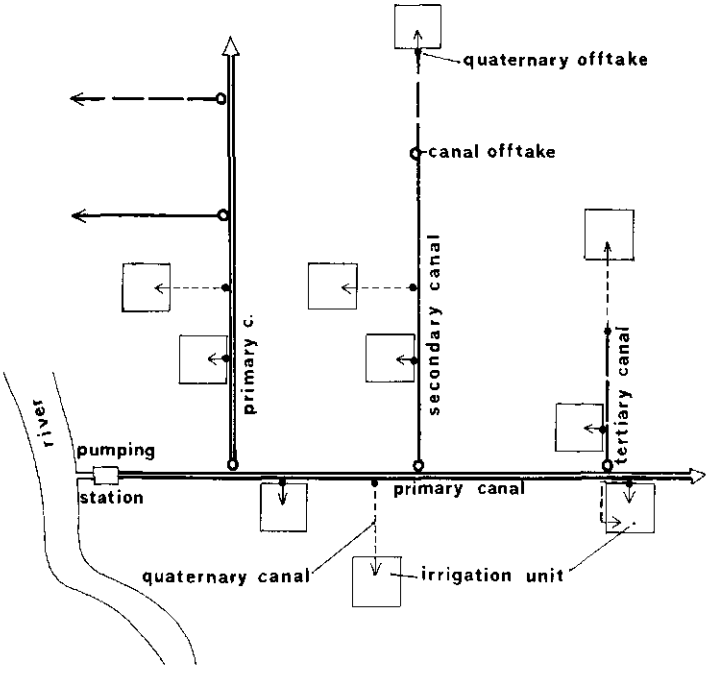
Allocation of irrigation water

As is the case in most large irrigation schemes the allocation and distribution of irrigation water is completely controlled by the scheme authorities in the respective rice producing areas. The engineering divisions have sole responsibility for managing the irrigation schemes' main water system. Water is distributed in accordance with the water-calendar. This concerns the whole system as far as the offtakes proper, i.e. the points where the water reaches the irrigation units (Figure 1). Further distribution of water within those units is left completely to the rice farmers themselves. In Chambers' (1980) classification this would fall under the bureaucratic-communal type of irrigation system, suggesting the existence of one of more communities of users. We shall address ourselves to this question in a later section of this chapter.

The divisions of engineering are responsible for the maintenance of the physical irrigation facilities of the Muda and Kemubu schemes.

A large number of paid labourers are employed to carry out necessary maintenance work, such as the cleaning of the canals and the repair of sluices, dams, etc. Water users themselves never provide labour for maintenance work on a voluntary basis. They are supposed to contribute to the recurrent cost of the irrigation schemes via annual water-rates. Current practices of payment, however, are virtually non-existent and the engineering divisions do not verify possible contributions by water users.

Figure 1. Basic features of the irrigation network in the Kemubu scheme



Source: Van den Steen (1984).

No responsibility is taken by the two scheme authorities for arbitration of conflicts between water users. The scope of their tasks is confined to the allocation of water and maintenance work as far as the irrigation units. Water users are held responsible for the distribution and drainage within the units, and the authorities do not interfere in cases of conflict about water distribution between individual

farmers. The arbitration is therefore left to the farmers themselves and to the local organizations to which the farmers are supposed to belong. On closer scrutiny, these organizations do not exist, and there is also no common platform of interests.

Problems of unorganized water distribution

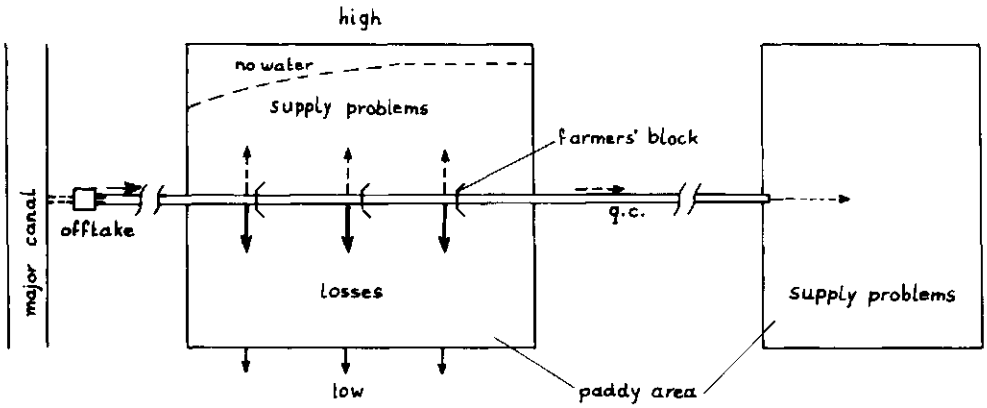
Water distribution practices within the irrigation units are not organized in a pattern. The distribution of water is uneven and further complicated by current practices of the farmers, who are not accustomed to a controlled regime of irrigation supply (Hassani, 1979). The rolling topography of the Kemubu area makes it difficult to achieve a timely and equitable distribution of water. Physical and organizational problems therefore impede adherence to water scheduling, an important factor in double cropping.

At the beginning of the rice cultivation cycle water is delivered to the plots for soil preparation. Farmers at the top-end of the irrigation unit near the offtake close the bunds of their fields when sufficient water has been received, while farmers further down the unit have not yet received enough water (Thavaraj, 1975). When the second water supply has arrived for the transplanting of rice seedlings, top-end farmers do their utmost to retain water on their fields. A high water level is maintained so that weeds cannot grow and spread.

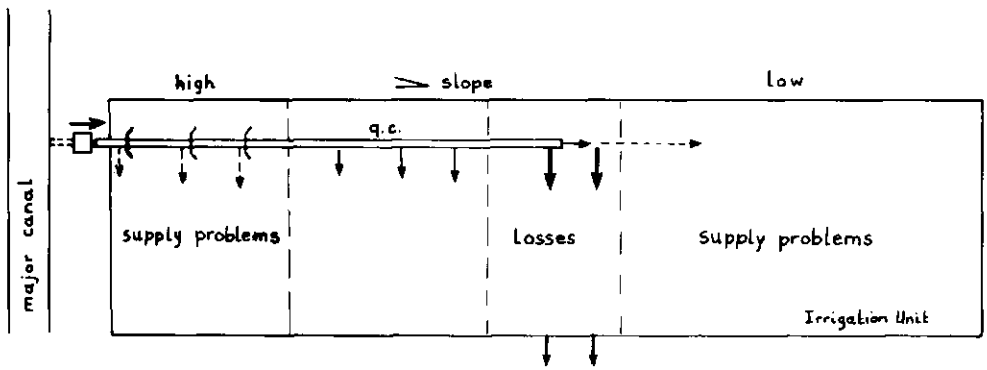
While individual farmers have good reasons for retaining water on their fields, farmers further down the irrigation unit cannot collect an adequate supply of water. Tail-end farmers try then to persuade top-enders to speed up the supply of water so that they can also profit. If this does not yield the required result, tail-enders begin to undertake actions to safeguard the necessary water supply to their fields. In the Muda scheme it was found that affected farmers frequently pierced the bunds of neighbouring fields at night (Afifudin, 1978). In the Kemubu scheme similar actions were observed. Farmers with rice fields near the offtake blocked the quaternary canals to retain as much water as was possible; in turn farmers further down the canals demolished these barricades. The former then took action to reinstall the blocks, and so it became a vicious circle (Daane et al.,

1982).

Figure 2. Problems in water distribution in two rice areas in Kemubu



a. Separate paddy areas served by a long quaternary canal



b. Example of uneven waterdistribution in an Irrigation Unit

Source: Van den Steen (1984).

> During periods of relative water scarcity, farmers with relatively high fields half a mile upstream along the canal or field ditch that supplied the end sections of these units, blocked the water flow in order to increase the water level in the canals so that it could flow on to their fields. Some of them preferred to leave their blocks in the canal indefinitely, even if they had enough water on their fields, whereas some farmers with low fields along the same water way left a permanent gap in the bund to flood their fields. In both cases water was wasted into the drain at the far end of these fields, while fields further down the field ditch did not get enough water or none at all (Kalshoven et al., 1984: 109-110).

The resulting mode of water distribution can be typified by 'total anarchy' at the irrigation unit level. Individual farmers appear to collect as much water as possible on their own fields, without regarding the consequences for other water users. Irrigation water is not considered a public service provided for collective use, but is utilized to meet individual requirements. Farmers put an individual claim on water to the disadvantage of other users, and do not consider modes of irrigation behaviour that would lead to more equal water supply for all categories of water users. Within the irrigation units no institutions exist for arbitration of conflicts in water distribution. These conflicts arise between water users themselves, and not so much between water users and the irrigation staff, as frequently occur in other large irrigation schemes (Bottrall, 1981).

Provision of inputs

With the introduction of double cropping in the Muda and Kemubu areas steps were taken to strengthen the provision of institutional credit and related chemical inputs. Up till then, credit was provided by local shopkeepers and rice millers and to a limited extent by a few credit cooperatives. Now, the farmers' organizations were given the task of providing short term rice production credit and related inputs. They operated under auspices of the Agricultural Bank, a federal institution. The farmers' organizations had, as local agents of the Bank, to screen, disburse and recover the loans. In 1979 the government decided to provide fertilizers at no cost to the rice farmers, whereby the farmers' organizations retained the distribution function.

The loans extended to the farmers were mainly seasonal production loans. They were conceived as forming a package, consisting of the recommended amounts of urea, compound fertilizer and crop protection chemicals. Although these components were meant to form a package, borrowers were actually free to choose only a part of the package. Furthermore, any amount of fertilizer could be obtained up to the maximum of the recommended amount per land unit.

Daane (1982) described the various problems involved with the credit supply function of the farmers' organizations.

> Firstly, only members of the farmers' organization could apply for credit, i.e. a loan from the Agricultural Bank provided via the organization as local credit centre. Non-members were thereby excluded from the benefits of a low interest rate. In fact, the credit scheme only covered a section of the peasants, and shop-keepers continued to be an important source of production credit. Secondly, the application and subsequent processing of a loan involved a number of time consuming administrative formalities, including the filling in of the application form, credit contract, a detailed credit card, coupons (to be exchanged for inputs), a bill for cash items and an overall statement of the loan obtained. These formalities did not only irritate many peasants, but were also time-consuming for the officers concerned, who had to do most of the administrative work (Daane, 1982: 53).

The credit and supply function of the farmers' organizations appeared to be the most time-consuming activity of the field staff. During interviews almost all managers declared that they and their staff had to confine themselves to duties related to the credit scheme and the recovery of loans. The main occupation of staff with other duties, such as project development and rural extension, was to assist their colleagues who were in charge of credit and supply activities. The time-consuming administration of the credit scheme also greatly affected the opportunity for field staff to supervise the utilization of the loans and guidance to borrowers (Ho Nai Kin, 1976).

A final problem of the credit scheme was loan recovery. In the early years of the scheme, the rate of repayment was about 95%, a commendable record. Since 1976, however, there has been a sharp decline in repayments with a 76% rate for selected farmers' organizations in Muda. Measures to recover outstanding loans were confirmed to field staff during farm visits, frequently reminding and advising borrowers to repay their loans but no legal action was taken against debtors. Field staff assumed that loan recovery was the responsibility of the

Agricultural Bank, whereas the bank regarded this as a duty of the farmers' organization. There was strong evidence that both parties referred to the role of the other, leaving the case as it was (Fredericks et al., 1980).

Rural extension

Rural extension work started its operations in the Muda area on a basis of pilot projects. These projects were undertaken by the Department of Agriculture in the period 1967-68, before double-cropping was introduced. In each of the 14 project locations approximately one hundred farmers with plots adjacent to one another were persuaded to grow the recommended new rice varieties (IR 8 and later IR 5).

The development of improved rice varieties, originally a task of the Department of Agriculture, was transferred in 1969 to the Malaysian Agricultural Research and Development Institute, which also conducts research on other crops. Rice research is done at the experimental station at Bumbong Lima, at about 50 km from the Muda area. In Kemubu, a research station is located near Kota Bharu, where agricultural research is undertaken on all crops except rubber and oil palm.

The Agricultural Division of MADA operated seed farms at Telok Chengai, where seed was multiplied, which was obtained from the experimental station. The seed was then supplied in small portions to farmers who had good contacts with government agencies. In turn, these farmers multiplied the seed and shared it with neighbours and relatives, usually on an exchange basis. The seed farms - provided approximately 5% of the total seed requirements in the area - therefore the bulk of a new rice seed was exchanged by farmers themselves (Daane, 1982).

In both Muda and Kemubu areas technical information on rice cultivation practices was given by extension personnel from the farmers' organizations. As already mentioned, the credit and administrative functions of the organizations required so much attention that there was little time to advise on agronomic matters. The activities of extension officers were limited to the organization of occasional excursions by bus to more "advanced" areas, and paying farm visits, when there were serious insect problems in the rice crop.

Reasons for the limited involvement in promoting new rice cultivation methods were amongst others that information was given on the general purpose and scope of the farmers' organization, and not so much on technical aspects of modern rice cultivation. Extension workers in both areas did not appear highly motivated to undertake advisory work, partly because they considered their college education not sufficiently practical for the farmers' purpose. They relied very much on a 'blanket approach' that was unsuitable, considering the wide variety of local agricultural conditions. The standard package of recommendations was not changed for several years, either because of inadequate research at the experimental station, or because of a poorly developed communication network between researchers and extension workers.

The overall effect was that extension workers concentrated on administrative tasks and were not very field-oriented. Routine work consisted of licensing, inspections and collection of rice crop-cutting test data for statistical purposes. By and large, the extension worker tended to depict himself more as a 'multi-purpose' worker than as a person with a distinctly advisory position (Fredericks et al., 1980).

Agricultural staff at the regional office of MADA recognized these problems and were working on locally adapted recommendations. They also tried to improve communication levels between agricultural researchers, subject matter specialists and extension workers at the field level (Ho Nai Kin, 1977). Furthermore, MADA enlarged in order to increase the number of extension workers attached to the farmers' organizations and provided them with better support from more subject matter specialists (MADA, 1980).

In the Kemubu area extension work since 1980 was based on the training and visit system, as propagated by the World Bank (Benor and Harrison, 1977). This system, locally known as 2L (Latihan dan Lawatan), combines a bi-weekly training session of extension workers and bi-weekly visits of those workers to groups of farmers. Originally, groups of some 50 farmers were formed during a village meeting at which the 2L concept was explained. These groups were formed on a co-residential basis, and not on the basis of field neighbourship.

For individual farmers, the frequency of extension contacts appeared positively correlated with the operated acreage. This

> means, that the larger farmers had most contacts with the extension service. Household income and non-agricultural jobs showed no correlation with these contacts. Despite the fact that one third of the operators were women, the extension activities were clearly aimed at men, few women operators attended any of these activities (Rodenburg: 107).

As to the implementation of the training and visit system, training sessions were held according to plan. The second part, however, proved to be problematic, as it was impossible to organize group meetings with the farmers. Extension personnel gave the following reasons: (1) farmers older and more experienced than extension workers did not show much interest in attending the courses; (2) considerable differences in political outlook refrained farmers from joining group activities in extension;and (3) many farmers did not have enough time because of their off-farm activities. Extension personnel did not meet individual farmers, as they generally avoided meetings at villages.

In practice farmers used an adapted package of cultivation techniques, incorporating the useful elements and leaving out the unrealistic ones as contained in the extension message. Although some variations in particular techniques were found, they remained within the limits of a relatively uniform level. The more specialized techniques that were recommended required greater control of the environment than was feasible on the rice fields. Other techniques could only be undertaken in very close cooperation with adjoining farmers. This proved unrealistic as extension activities were not so advanced as to be able to achieve this kind of cooperation.

Rice marketing

The government's interest in increasing the rice yield manifested itself as early as 1949, when a guaranteed minimum price for rice was established. In the early sixties drying and storage facilities were provided in the Muda region. Since the creation of the National Padi and Rice Authority in 1971 these facilities have been further extended by providing milling facilities. The marketing authority also operates a licensing scheme, which must be regarded as an official control mechanism to curb the milling and marketing activities of private dealers and middlemen. Furthermore, the authority manages the strate-

gically important national stockpile of rice, and also controls rice imports and exports.

The farmers in the Muda and Kemubu areas sold their surplus rice immediately after the harvest. As the rice authority subsidized the rice (M$10 per pikul), farmers were highly motivated to sell their rice to the buying and processing centres. In selling, however, they appeared to rely on the services of middlemen, who provided cheap transport to the official rice mills in the region. Middlemen also helped farmers to obtain subsidies and payments.

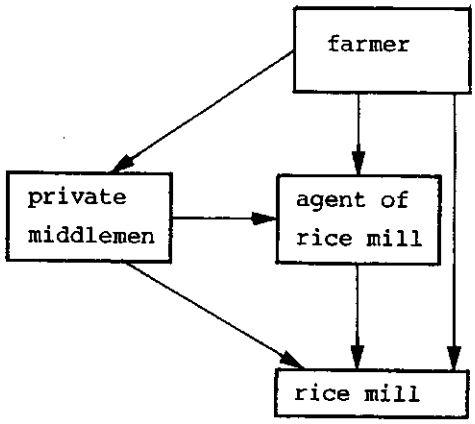
> In the Muda area farmers sell their surplus paddy immediately after harvest, because they need the cash and lack drying and storage facilities. Despite the existence of official paddy buying centres, in both areas the bulk of the marketed surplus of paddy is still sold to local shopkeepers who often act as agents for private mills. The latter try to attract paddy by offering prices above those paid by the marketing board.
> There are various reasons why peasants still continue to sell their paddy through these traditional channels. Firstly, the shopkeepers provide reliable and convenient transport services, whereas the marketing board owns only a few big lorries which often cannot reach the farms. Secondly, despite the existence of the credit scheme and some minor sources of institutional credit, a large number of the peasants are still regularly in debt to the shopkeepers (particularly consumer credit). Therefore, they are obliged to sell paddy via them. However, no indications of the mal-practices were found as mentioned in government reports with regard to marketing in the 1960s (Daane, 1982: 55).[2]

In Kemubu, the farmers included all categories of rice producers including owner-operators, tenants and owner-tenants, while all middlemen were private entrepreneurs. Mills processing rice for the market were owned either by cooperatives or by the marketing board. Some farmers' organizations operated as buying agents for the board. In the Kemubu scheme, the rice market was serviced by four large rice mills, two operated by the marketing board, and two operated by cooperatives, and by some 15 small cooperative rice mills.

There are four types of marketing channels in the movement of rice (Figure 3). The market situation varied considerably between the two seasons. During the main season, Kelantan was struck by a severe drought resulting in low yields. As there was a ready market for dry, main season rice, this resulted in a smooth buying season. During the off-season, good growing conditions for rice resulted in high yields. As the off-season crop was not really wanted by the cooperative rice

mills, because of the risks of quality deterioration of wet rice, the supply was mainly concentrated in government mills, creating delays for the vans delivering rice (Van Tilburg, 1984: 142-143).

Figure 3. Different types of marketing channels in the rice marketing system in the Kemubu scheme



Source: Van Tilburg (1984)

An institutional approach to agricultural development

After reviewing the various components of the organizational framework of irrigated agriculture it can be concluded that in West Malaysia a heavy emphasis is laid on the institutional approach to agricultural development. Within irrigation schemes a vast array of service organizations exists, ranging from branch offices of federal agencies and regional development authorities to farmers' organizations. These services cover such vital elements as the provision of irrigation water, input supply, rural extension and marketing. Everywhere in the rice landscape material constructions can be observed that show the government's interest in supporting the production potential of rice farms.

The farmers are held responsible for the distribution of water

within irrigation units. Water distribution in the Kemubu scheme, is largely an anarchical process, leading to wastage of water in the upstream sections of units and difficulties in obtaining water in the high fields. While farmers recognize the need for a more organized way of water distribution, they are unable to form a common platform. In fact, farmers expect the scheme authority to assume responsibility for water distribution within the irrigation units.

Compared to other countries in Southeast Asia the provision of services and support for Malaysian rice farmers seems well developed. Closer inspection of this heavy organizational framework, however, reveals certain weaknesses. Several problems have occurred with the implementation of the various development policies, such as the limited management capacity of field staff. Communication between field personnel and farmers is weakly developed due to the office orientation of the former.

Most of the development activities have originated from the government bureaucracy, while the active interest and participation of farmers has lagged behind. An example is the farmers' organization, which may be typified as an officially imposed service point for agricultural inputs and not as a development centre where farmers have an important voice in policy formulation. This organizational unit is managed by government personnel, and farmers are not inclined to play a more active role in organizational responsibilities. From the practical point of view, there is no sense in taking on these new roles, as the offices are already staffed by trained personnel. Also, farmers are much more interested in undertaking off-farm activities, that leave little room for activities of a more general scope. The next section deals in greater detail with the factors that impede the farmers' participation.

Issues of social organization and participation

The participation and cooperation of farmers in irrigated agriculture are considered as vital components of effective forms of rural development. In Malaysia this aspect may be adequately covered by farmers' organizations, as these form institutional entities at the irrigated area level. These organizations could represent forms of association

between farmers as well as rallying points for government action. They also have been subjected to a number of field studies (Afifuddin, 1978; Daane, 1982; Fredericks et al., 1980). In the preceding sections some attention has already been given to the structure of farmers' organizations; it now seems relevant to discuss further the various factors leading to the formation of these institutions, and to their possible role in fostering forms of participation by the farmers.

Formation and affiliation

In the early stages of formation of farmers' organizations officers from the regional development authorities were asked to name suitable farmers who could play an influential role in the creation of these organizations. These farmers already had close connections with government agencies and assisted other farmers in their dealings with the agencies. They belonged to the category of modern village leaders, characterized as better educated, industrious and eloquent. Frequently they were active local political party leaders, and sat on committees, both within and outside the villages (Afifuddin, 1978).

When identified the officers took great care to establish informal, personal relationships with the contact persons, who then were provided with information for canvassing potential members of the organizations. Although general information was spread to a wide public, especially after the Friday mosque meetings, actual membership applications were distributed to selected persons. This caused a large section of the potential membership to believe that access to the organizations was at the discretion of the contact leaders. These persons preferred to wait before becoming members, until they were personally invited. In the villages studied between a half and two thirds of the total membership was formed by farmers who had been personally invited to join. In this way, the group could be trusted to cooperate in the newly created organizations (Daane, 1982).

Later, however, farmers felt less restrained and applied for without being invited, as opinions about access to public goods changed due to increasing contact between villagers and the outside world, and because of improved means of communication.

Material interests were the predominating reasons why farmers

joined the organization (see Table 1). In the Muda area, the main reason for membership was to be able to gain access to cheap production credit provided by the farmers' organizations.

Table 1. Reasons for becoming member of farmers' organization in Muda (% of members)

references to private interests:		
- cheap credit only	80	
- cheap credit and/or extension advice and/or share in FO profit	5	
- other	2	
references to common interests	11	
no particular reason	2	
total	100	(n=60)

Source: J.R.V. Daane (1982: 119)

This reason applied especially to farmers who operated the larger farms, and who benefitted from a large amount of inputs. Very small farmers were generally opposed to the use of credit, as they feared this would motivate them to spend more than necessary and mean a return to the earlier situation in which they were in debt to shopkeepers and moneylenders. However, small farmers were inclined to make use of shop credit because of its flexibility and the lower risk involved. These small farmers liked to secure their access to credit, for times when they were unable to repay their full loan on time. Only the shopkeeper could give this assurance, as institutional credit was suspended when a loan could not be repaid promptly.

As can also be deducted from Table 1 only a small minority of farmers referred to the common interest as a reason to become a member of the organization. Most farmers believed that the success and survival of the organization was mainly dependent on government support; they considered their own possible contribution as strictly limited. The predominance of material reasons over common interests as a motivation to join the organization is an indication in itself of how farmers visualized the relative importance of such an institution. A typical answer of a leader to the question as to why he had joined the farmer's organization was 'To help the government eradicate poverty among the rural population' (Daane, 1982, p.133).

Participation

As is well known by rural practioners and researchers the concept of participation is of an ambiguous nature, and fraught with difficulties. In his attempt to operationalize the concept in his field work Daane (1982) concentrated on actual contributions to and active mental involvement in the decision-making process of the farmers' organization. As substantive indicators of participation he used:

- attendance at meetings
- the active participation in these meeting
- vizualization of the major problems of the organization and the possible solutions to these problems
- the number of future activities of the organization one could propose, and
- the occupation of an office within the organization.

As to the first indicator, the attendance at meetings, about 50% of all members attended meetings. It was not unusual that the required quorum (50%) could not be reached; when attendance was very low the meeting was called off. With regard to the active participation the survey showed that about 10% of the ordinary members took an active part in the discussions. The majority of the attendants were passive. In the Muda area, 42% of the members were able to make mention of at least one problem, solution or proposal. The majority had never thought about these issues or were unable to discuss them. As can be expected the leaders and board members scored higher in giving possible solutions.

The most frequently mentioned problem concerned the increase in the number of unrepaid loans. Other problems were poor staff performance, the lack of communication between staff and members, and insufficient support to the organization by the members themselves. Most of the solutions to the problem of non-repayment were about the action needed to be taken against bad debtors, but remained vague as to what particular form the action should have. Solutions to the other topics were 'the improvement of training and motivation of staff', 'more visits of staff to the village to discuss the problems of the farmers' and 'more advice and information about the farmers' organization and the task of the members'.

> Most proposals for future activities in the members' interest concerned improvements in the existing activities, e.g. better quality fertilizer, lower prices for inputs, lower interest rates, extension courses, more machinery for hire and, most frequently, a faster disbursement and timely delivery of inputs. Proposals concerning new activities were scarce. They concerned paddy marketing and processing, the sale of consumer goods through sundry shops at village level and operation of a burial fund (Daane, 1982: 147).

As to the last indicator of participation, the willingness to fulfil a post within the organization, it was found that active leaders, acceptable to the general membership, were scarce. In spite of the by-laws, determining that members could not hold the same office for more than two terms of two years, several leaders had held their office as long as the organization existed. This tendency should be attributed to the absence of other potential leaders who were willing to undertake a job within their organization.

One of the substantial issues leaders had to decide upon was the policy of the organization itself. The representative bodies whose decisions, in principle, did have an impact on the policies of the organization were the assembly and board of directors. These bodies had to sanction the budget, the service plan, and all operational measures. Although representatives did exercise this formal authority, their actual influence on the activities undertaken was relatively small compared to the influence of the regular staff. These were the persons who reported to the regional authorities, where their superiors were located. It was this category of office-holders, and not the board or assembly, who determined transfer of staff, their promotion and conditions of service.

On closer scrutiny, both assembly and board members did not lay down a coherent policy for the farmers' organization with clear priorities. Most of the policy-making was left to the staff and their superiors; their plans were accepted unanimously after very little discussion.

> This does not mean, however, that representatives did not see shortcomings in the implementation of activities and that they had no other wishes, e.g. concerning new projects and activities not yet undertaken by the farmers' organization. Individual board and assembly members proposed these new activities and promoted the implementation of the proposals by asking questions about progress in each meeting. However, since board and assembly members recognized their ultimate dependence on the authorities and regarded themselves as inexperienced in business and organizational admini-

> stration at this level of complexity, they let the staff and their superiors judge the feasibility of proposed projects and implement them. There were no training programmes to help board and assembly members in the execution of their tasks (Daane, 1982: 66).

If a politically influential representative considered that his proposal did not receive sufficient attention, and requests were made in vain to the staff, such person tried to increase pressure on the staff by lodging a complaint directly with the staff's superiors in the authority. In exceptionally pressing cases, the representative operated via the local state assembly member, who by his position at the board of the regional authority had direct access to the highest state official (the Menteri Besar). In these cases the slow administrative process between farmers' organizations and the regional authority could be by-passed via the pull of political connections (Kalshoven et al., 1984).

Patterns of social organization

A striking feature of rural Malay society is that there are virtually no corporate entities forming an intermediate level of organization between the farmer's household and the State. To the rural Malay, the village is first of all the location where he/she lives and not so much a social unit to which he/she belongs. There are no local organizations, exercising a certain authority over a particular area, or a group of people. The village as such does not show a corporate structure; corporate groupings above the household do not exist. Above all, patterns of social organization are based on dyadic relationships between individuals and households.

Geographically, villages consist of linear settlements of individual farmhouses along canals. Frequently, farmers do not refer to their area as a village (kampung), but only mention the number and section of the canal or drain they live along.

The village as a geographical entity represents the smallest territorial unit in the administrative structure. This structure is based on territorial sub-divisions - called ketua kampung areas - which are linked to sub-districts (mukim), districts (dearah), the state (Negeri) and finally to the federated nation (Negara). All administrative tasks are executed at district level, leaving the

village chief as merely a link and interpreter of government policy to the local people. The village chief is in most cases not a direct mediator as this role is performed by the sub-district officer (penghulu). This little formal authority is also reflected in the Village Security and Development Committees, that exist only in name and appear at present almost inactive. In fact, Malaysian villages are not only linked to the federation via the administrative system, but also via the political parties.

If infrastructural improvements in the village are needed, individuals voice these proposals to local politicians or to officers in a government agency, thereby by-passing the committees. Even the major repair of such common provisions as feeder roads and bridges is not organized on a village-wide basis, as is the case in many countries in Southeast Asia (known as gotong royong); Malay villagers consider major maintenance work a government task.

> Cooperation for collective rather than individual purposes is difficult and only occurs on an ad hoc basis when certain problems arise, e.g. the minor repair to a collective infrastructural facility. In such cases no action is undertaken until one of the villagers who use the facility takes the initiative, usually the following day, to call on the other users to contribute labour inputs to do the repair. The participants are not invited personally, but the message is passed round by word of mouth at the mosque or at a small prayer house (surau). The composition of the group of participants is dependent upon the problem to be solved (Daane, 1982: 79).

Malay villages as loosely structured societies

The characteristics of the rice growing villages as indicated above may now be summarized as follows:

1. the absence of a village identity and self-governing local organizations;
2. the absence of formal institutions result in a weak level of social control and a lack of ability to settle internal disputes;
3. the reliance of individuals on personal networks, with no lasting relationships, and a lack of enduring social groups above the household level (Kuchiba et al., 1979).

On the base of such characteristics some authors have described Southeast Asian village societies in terms of 'loosely structured

societies'. Embree (1950) coined this term following his observations in Thailand. According to him, considerable variation of individual behaviour was sanctioned, and traditional groupings were weakly developed. Although other observers have criticized this term as being inadequate in typifying social behaviour among villagers, most agreed on the predominance of personal networks, the provisional nature of commitments to group action and the weakly developed social sanctions within villages.

Daane (1982) documented the consequences of these loosely structured or 'less institutionalized' societies for cooperative efforts at the village level. He made the distinction between a form of cooperation of the 'reciprocity' type, i.e. aiming at the achievement of individual ends, and the form of cooperation aimed at the achievement of collective goals. This last form requires a degree of discipline in order to be successful or to reach a continuous commitment to a common cause. 'The multiple loyalties of the individuals in these societies, make group interests difficult to reconcile with individual interests and preclude this type of discipline and commitment' (Daane, 1982: 83).

Scope for participation in irrigation and its limitations

The foregoing analysis of the weak levels of social organization at the village level has important consequences for the scope of participation in irrigation. As indicated in the introductory chapter there are three main factors which have a great impact on the formation and functioning of cooperative associations in irrigation units:

1) the technological complexity of the irrigation system,
2) the relative water shortage or excess of water, and
3) the social cohesion among water users (Bottrall, 1981).

The degree of technological complexity of the two Malaysian irrigation schemes under study can be regarded as fairly high. This can be attributed to the absence of effective infrastructural facilities such as tertiary irrigation canals and drainage canals. Within the irrigation units, consisting of many fields, and with the many topographical variations, it becomes very difficult for water users to attune their cultivation activities to the water calender of the scheme authori-

ties. The defects in the infrastructural network of the irrigation schemes make an effective and equitable distribution of water within the various units virtually impossible (Thavaraj, 1975). In more general terms, Bottrall (1981) states that the management of a system can only be as good as the physical condition of the system allows it to be. This physical condition of the schemes under study does not contribute to the formation of cooperative efforts by the water users concerned.

The second factor conducive to the creation of water associations is the relative water shortage or excess of water. The irrigation system of both schemes has been originally designed for a continuous supply to all irrigation units. For distribution purposes and for regulating the supply of water according to the size of the units concerned, the offtakes were provided with a gate. In order to obtain a continuous supply, farmers removed practically all the gates, thereby nullifying their regulation function. Within the units farmers appeared to collect as much water as possible on their fields, without considering the consequences to other water users. This resulted in a relative water scarcity for this group, a situation, not conducive to the formation of associations (Hoogstraten, 1985).

As to the third factor, the degree of social cohesion among water users, it has already been stated that this seemed very weakly developed among Malay rice farmers. Field neighbours were different people from residential neighbours, a fact which did not contribute to group activities. Also, social institutions resulting in a common stand in irrigation activities, did not appear to exist within irrigation units.

The score on these three items suggest that conditions within the units are not very favourable to the formation of water groups of associations. Bottrall (1981) states that when there is a water distribution system that is technically very complex, with a relative water shortage and a low degree of social cohesion, a cooperative association should be kept as small as possible, whilst the supervision of the irrigation authority should be strict. The size of the association should be determined by the number of water users with a sense of commitment to a common goal, and a feeling of group identity among the farmers. The irrigation units within the schemes, consisting of 20 to 60 persons, are in many cases too large to create effective

cooperative associations (Hoogstraten, 1985).

Not surprisingly, disadvantaged farmers within the units suggested that the scheme authority should take a more active role in water management as the only solution to the existing irrigation problems. Some went so far that they wanted the authority to take over full responsibility and the actual water distribution in the units. This could be achieved through a stricter control by the linesmen, or by nominating a common irrigator who should be the only allowed to intervene in irrigation matters. Both cases would imply that the irrigation authority should exercise a more definite role in the water management at the irrigation unit level.

This kind of role, however, was undesirable to the irrigation staff at the authority. It should imply that they would come under pressure of dissatisfied farmers, whose complaints, under existing circumstances, could never be settled at a satisfactory level. It also would mean that the authority would have to mediate in solving conflicts and be blamed by those who felt they had had a deficient water supply. On top of that, certain dissatisfied farmers would be able to mobilize political support for their cases. Under such circumstances the irrigation authority would find it very difficult to maintain an uncompromising attitude in its task of managing the distribution process (Kalshoven et al., 1984). Taking all this into consideration it is only logical to restrict its operational domain as far as the irrigation unit level, and leave the distribution of water to the water users themselves.

Conclusions and implications

The above observations indicate a strongly individualistic nature of Malay rural society. Many villagers have come from different geographical areas; the linear settlement pattern of houses along canals is not conducive to the formation of social cohesion. The absence of a village identity and of formal as well as informal structures at the village level make it difficult for forms of social cohesion to arise. The characteristics of a 'loosely structured society' have important consequences for cooperation among farmers.

Although it has been recognized that farmers' organizations could

play a vital role in fostering cooperative attitudes among members, this type of organization fails to attract the active interest of farmers. A strong point of these organizations is that they form a network of agricultural services within the irrigation schemes, providing essential inputs such as fertilizer. The very formation and staffing, however, show the strong government involvement and control of these institutions. On their hand, farmers appear rather reluctant to make their own decisions during board meetings; their acceptance of responsibilities within the organization is of a very limited nature. The view presented by Afifuddin (1978) that farmers are mobilized at all levels and are moving towards a stage of complete 'participatory involvement' in the growth of the regional economy cannot be substantiated. A more realistic view would be that these institutions manifest the government's interest and intervention in irrigated rice production, and that they form useful links to the rural development bureaucracy.

With regard to the issue of farmers' participation in irrigation management it can be stated that this issue has only been raised in recent years, notably by government officials. A major innovation in the planning of the Muda II project was the attempt to relate farmers practical field experience to the technical design criteria (Othman, 1985). The exact outcome of the experimental pilot block in terms of participation of farmers has still to be evaluated. In effect, it has been agreed that all planning, design and construction of tertiary facilities are to be executed by the Drainage and Irrigation Department, in consultation with the Muda Agricultural Development Authority. Correspondingly, the main emphasis is still on the technical approach to the irrigation and drainage problems within the scheme.

In the Kemubu scheme very little has been undertaken in terms of farmers' involvement in the management of irrigation water. At the scheme authority the concept of 'irrigation units' is used only to indicate the physical area irrigated from each offtake. The farmers are unaware that these units are an organizational entity for water distribution. There are no indications of groups forming with common interests and a collective task in water management. Farmers are mainly interested in getting their share of water and therefore continue their individual activities. Asked for their opinion on this matter, disadvantaged water users pleaded for a more active role of

the scheme authority as a proper solution to their immediate irrigation problems.

NOTES

1. The analysis of the varous organizational aspects of the Muda and Kemubu irrigation schemes is based on two major field studies conducted in West Malaysia in the years 1978-1980 and 1982. The following researchers participated in these studies: Jon Daane, Leo Fredericks, Geert Kalshoven, Frits van den Steen van Ommeren and Aad van Tilburg. The present writer was mainly responsible for analyzing the organizational framework of irrigated rice farming in the two irrigation schemes.

2. Although preference is given to the more general term of rice, in some quoted case material the term paddy has been used, when referring to the crop.

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