THE INTEGRATED MANAGEMENT OF MAJOR IRRIGATION SCHEMES : AN ASSESSMENT

Research Study No. 87 December, 1991

AGRARIAN RESEARCH AND TRAINING INSTITUTE
P.O. Box 1522
114, Wijerama Mawatha
Colombo 7

FOREWORD

This study of the effectiveness of the programme instituted in 1984 for what was termed "the integrated management" of major irrigation schemes, was carried out by a team of researchers that included economists, sociologists and agricultural engineers.

These major irrigation systems, some 313 of them, cover 700,000 acres. Of them, approximately one fourth, covering 15% of the acreage, are in the wet zone. Of the balance 85% almost the entirety lies in the dry zone. As other details set out in Chapter One of this study show, together with the area expected to be irrigated under the Mahaweli Project, a total of over 1.3 million acres would be developed under major irrigation schemes. The population of settlers under these schemes would be of the order of two million people.

This figure excludes people in and around the major irrigation systems who are engaged in highland cultivation as well as those who are engaged in unauthorised cultivation of paddy and other crops under irrigation on the periphery of the officially declared command area. As the study points out, the social and economic infrastructure facilities that support and are supported by these irrigation systems are manned by a significant number of people most of whom would not be members of the settlement communities themselves.

Any attempts at diversifying the use of land under major irrigation systems away from paddy must address the question of whether such crop regimes could support this growing population.

The principal findings of this study relate to the difficulties encountered by the new project management system in interacting with the officials of line agencies on the one hand and with farmers on the other, and of the farmers in organising themselves along the lines envisaged by managers and policy makers.

This brings up the fundamental question of the inter-relationship between the farmers and the State. The problem is broadly of two dimensions although in fact it refers to three-dimensional man in his multi-dimensional relationship with the natural resources with which he works.

The problem, as seen by the State, is one of coordinating the supply of inputs (land, water, seed, capital goods, technical expertise and other services) and the mobilisation of "the target groups", viz., the farmers in such a manner as would facilitate the delivery to them of what are viewed as "services" by the State agencies.

Regardless of the validity of such an approach, this particular problem lies in the area of public management. The issues that have arisen, as was inevitable that they would, in coordinating the inputs of line agencies still await a coherent examination in this country.

The stimulation of farmer organisations brings up theoretical issues relating to the role, largely allocated to themselves, of "change agents" and external "catalysts" that also await more specific scrutiny in relation to a Sri Lankan experience of considerable duration and coverage.

Given our recent history of State sponsored "cooperation", the minimal degree of spontaneity that is required to give vitality to organisations that must ultimately be the product of a voluntary process may be said to have been compromised ab initio by that history to which these farmers too have been and continue to be subject.

The emergence of cooperative bodies such as farmer organisations is further determined by the extent to which the State encourages and protects the freedom of association of its citizens. The increasingly divisive impact of the political processes in the country has had an unmistakably negative impact on the development of cooperative groups such as farmer organisations and of their capacity for the self-management of their affairs.

It is to be hoped that in the light of the new initiatives towards farmer participation in the management of irrigation systems and sub systems an appropriate climate would be created for their emergence as organisations that command the confidence and respect of the farmers themselves.

D G P Seneviratne
DIRECTOR

ACKNOWLEDGEMENTS

We acknowledge with appreciation the assistance and support extended by the officials of the Irrigation Management Division and other line agencies engaged in implementing the INMAS Programme.

The following ARTI staff are acknowledged for their assistance at different stages of the study :

Dr. C.M. Wijayaratne, former Head/Irrigation and Agrarian Relations Division for his involvement in the preparation of the research proposal.

Statistical Officers, Messrs. D.G. Karunaratne, M.A. Gunawardena and N.S.B. Epakande for their assistance in the supervision of field data collection.

The team of investigators for carrying out their responsibility of collecting and recording accurate field data.

The staff of the Statistics and Data Processing Division for their help in processing the field data as well as Mrs. Nirupika Wickramasinghe and Mrs. Soma Wijewardena for typing the final draft of this report.

Our thanks are also due to Mr. A.S. Widanapathirana, Agricultural Economist of the IMPSA Secretariat and Dr. M. Samad, Research and Training Officer of the ARTI for their valuable comments on an earlier draft.

Mrs. Yazmin Bawa for typing the final report.

Finally, Mr. Joe Alwis, former Director of the ARTI, is acknowledged for the support and encouragement extended to this study.

Authors

CONTENTS

Chapter One

INTEGRATED MANAGEMENT OF MAJOR IRRIGATION SCHEMES : A HISTORICAL PERSPECTIVE

1.1 Introduction

This chapter is an attempt at identifying and reviewing the concepts which form the basis of the perspective on Integrated Management of Major Irrigation Schemes (INMAS) and relating them to the social and historical antecedents. The point of departure in this endeavour is the assumption that INMAS can be conceived of, as a social reaction to a given phenomenon which has a historical background. As such, the inquiry is necessarily evolutionary and this means that we are trying to link the past and the present in respect of the management of irrigation settlements in terms of the basic principles that are connected with the concept of INMAS.

The importance of the INMAS Programme will be highlighted by way of placing the major irrigation and settlement systems in the national context and stressing the concept of integrated management towards improving the overall efficiency of the irrigation settlement systems. Against this background, the objectives of the study will be established. In a sense, therefore, the present chapter will also serve as an introduction to the entire report.

The research study does not claim to be an indepth evaluation of the performance of the INMAS Programme. It is rather an assessment of the impact of the INMAS Programme on the system performance[1]. Since it is an action programme, it is important to examine the thinking that has gone into the programme because it is only through such an examination that one will be able to observe the conceptual undersignings of the programme. Since the concepts are building blocks of theory or perspective, the identification of concepts is a step

---

1. The ARTI Research Proposal.

forward in establishing theory. The correct theory yields correct understanding as well as correct strategy. Thus, an examination of the INMAS Programme will ultimately prove its usefulness in the capability understanding of the social reality of irrigation settlement schemes and also its capacity to produce remedial actions.

The foregoing analysis is accordingly aimed at explicating the following issues which are considered to be basic to a social historical perspective on the subject matter.

(a) What are the factors or circumstances which led to the evolution of INMAS ?

(b) What is the specific character of the INMAS package (concept and strategy)[1] ?

(c) In what ways does the INMAS Programme differ from or share similarities with the management perspectives that have been previously employed in the irrigation systems ?

1.2 The Importance of Major Irrigation Systems

Irrigation offers the potential for increasing production (cropping intensity) yield and reducing the risk of crop failure. It can also offer many other benefits. In this section, we will examine the importance of the major irrigation systems in the context of Sri Lanka in the hope that it will shed light on the relevance of the INMAS Programme as well as the present study.

A major irrigation system is defined as one which has a command area of more than 80 ha. What is identified on the command area is the area under irrigation available according to technical specification for cultivation of paddy during Maha and Yala seasons. According to this technical definition, major irrigation systems would fall into the category of supplementary irrigation.

---

1. This is in fact related to the second objective of the research study as well (see section 1.3) which is on the strategy adopted to translate these concepts into practice. However, an analysis on the fundamental character of the INMAS package as such should by definition deal with the strategy as well, so as to establish its uniqueness.

Economically, the major irrigation systems are of great importance in that the development of domestic agriculture in the contemporary period too was conceived in terms of the expansion of large scale irrigation and resettlement projects by the successive governments of independent Sri Lanka. In addition to the restoration of abandoned major tanks, new tanks were constructed, river basin projects were undertaken and old irrigation systems were rehabilitated during the past four decades. According to the figures issued by the Ministry of Lands and Land Development in 1984, there are 313 major irrigation systems in operation, covering an area of 295,000 ha. in different parts of the country. (The breakdown in terms of number and command area of irrigation schemes by district and size is given in Table 1.1).

It should be noted that the extents given above are only the irrigable area and are outside the Mahaweli Development Project which aims at providing better irrigation facilities to about 99,600 ha. which are already under cultivation and new irrigation facilities to about 265,000 ha. Given the incidence of encroachments, the extents under irigation/cultivation is higher. The major irrigation systems have a highland cultivation as well which also include homesteads. According to the Department of Land Commissioner, an extent of 55,000[1] ha. outside the Mahaweli is under major irrigation systems.

In addition to the primary production activities or paddy cultivation (which contributes to 56% of the total national paddy production) and highland cultivation, the major irrigation and settlement systems contain a livestock sector which is, though not significant at present, is of high potential.

In terms of population too, the major irrigation systems are important. Officially, the Mahaweli Development Project has settled about 60,000 farm families[2] and 89,580[3] farm families in other major irrigation and settlement systems, totalling 179,580. Even if the Mahaweli settlers are excluded from the calculation, the actual number

1. Department of Land Commissioner, Statistical Information of the Human Settlement Scheme under the Land Commissioner's Department of Sri Lanka, Colombo, 1981.

2. Ministry of Mahaweli Development (1985). Mahaweli: Projects and Programme, 1986, Colombo.

3. Department of Land Commissioner (1981).

of farm families settled in the major systems could be presumed to be higher due to encroachments and population increase. A rough estimate could be arrived at by dividing the total irrigable extent given above (300,000 ha. approximately) by the average size of holding (1.5 ha.) and multiplying this by the average family size which is 5.6. This calculation gives a figure of 1,120,000. In addition, there are a large number of encroachers, traders, businessmen etc., and a host of government, semi-government and non-government employees providing a variety of services, both in respect of production and consumption, to the direct producers. Therefore, the actual total population living on the major irrigation and settlement systems should be much higher.

Thus, in economic, social demographic and political terms, the major irrigation and settlement systems of Sri Lanka occupy a significant place. In fact, a case has been made by the government to consider the major irrigation and settlement systems as a special sector, not only because of their socio-economic importance, but also because they have their own specific problems calling for specific action and that they do not fall within the accepted definitions of rural and urban classifications [1].

1.3 Objectives of the Research Study

The overall objective of the present study is to assess the effectiveness of the INMAS Programme. Mainly for purposes of providing some feed-back to the policy-makers, especially to the Irrigation Management Division of the Ministry of Lands and Land Development (IMD of MLLD), the study is broadly concerned with a detailed investigation on a range of issues concerning the working of the INMAS Programme.

More specifically it would focus on the following :

i. To review the historical perspective and the concepts behind the INMAS framework.

ii. To review the ways and means by which these concepts were translated into a comprehensive programme of work. (This would also include a review of the process of prioritization of the working objectives.

---

1. Mahinda Silva and Anura Widanapathirana (1984). "Major Irrigation and Settlement Systems in Sri Lanka: Some Policy Issues in Operation and Maintenance". Sri Lanka Journal of Agrarian Studies V (ii).

iii. To assess, in the context of its priority objectives; (a) the process of implementation of INMAS and (b) its impact on irrigation system management during the period under review (1984-87).

iv. To review the mechanisms adopted in the monitoring and evaluation of INMAS and suggest improvements on suitable monitoring points and performance indicators.

The study does not intend to conduct an indepth evaluation of the project performance of INMAS at least for two reasons : (i) unavailability of a comprehensive baseline assessment of relevant variables, and (ii) it is too early to conduct such an evaluation. The report therefore, is not a Benefit-Cost analysis. However, several other means have been adopted to assess the impact of INMAS on system performance, whilst examining the key monitoring points and performance indicators which would be helpful in future monitoring/evaluation purposes of this project.

1.4 Factors which Contributed to the Evolution of INMAS

In this section, attention is focussed on the causal factors, because, as it was observed before, INMAS is viewed as a social reaction to certain specific circumstances. Since the major irrigation systems have been in existence for over 40 years, their problems too are well-known and the INMAS can rightly be considered as remedial action proposed in order to solve at least some of these problems.

In this context, the problem of low productivity should be highlighted first. The major irrigation systems have been established mainly for paddy production. In fact, they have made significant progress insofar as the adoption of high yielding paddy varieties are concerned.

However, an analysis of the paddy production data of 25 major irrigation systems has revealed that the total paddy production is far below the potential yield of high yielding varieties, and that, there is a great disparity in the yields obtained by individual farmers even within the systems (Perera, 1986:5).

Secondly, in physical terms, the prospects for the provision of irrigation water to new lands are limited in view of the fact that, almost all the economically most promising sources of irrigation have been harnessed for development. Thus, the obvious alternative is to increase productivity through improvements in management.

Financially, the escalating cost not only of construction, but also of rehabilitation and maintenance constitute another limiting factor that has to be reckoned with. According to the annual estimates of the revenue and expenditure of the Government of Sri Lanka, the expenditure on irrigation as a proportion of total government expenditure has increased five-fold during the period 1955 to 1985[1].

Further, in terms of agronomy, it has been observed that some of the lands which have been provided irrigation water are not suitable for irrigation, particularly for paddy cultivation, and that the farmers' preference to have water running all the time through the paddy fields is due to their knowledge of this incompatibility (Mendis, 1989). Thus, in addition to the factors mentioned above, these technical matters also add to the importance of giving priority to management aspects.

Another factor to be considered is whether irrigation water is in fact made available to the farmers' fields which are located within the command area at the right time and in the right quantities[2]. It is well-known that in the major irrigation schemes, the lack of water for the tail-enders of the scheme is a problem that has not yet been satisfactorily resolved.

It has been observed that, commencing with the Agricultural Plan issued by the Ministry of Agriculture and Food in 1958, the problems and performance of major irrigation systems have been intensively studied and intensively criticized, that criticisms such as adverse cost-benefits, government pandered welfarism, reckless water management, design inefficiencies of the irrigation lay out etc., are all too well-known to require elaboration[3]. Yet, the awareness of these problems would have produced certain results in the form of concepts, perspectives, action programmes (special projects, pilot projects). In

---

1. Government investments in major irrigation works in particular have increased from Rs.171.9 million in the period between 1950-1954 to Rs.1200.3 in the period between 1980-1982. Abeywickrama, N. (1984). "Irrigation Water Management Policies in Sri Lanka", Progress IV (1).

2. Mahinda Silva and Widanapathirana, A.S. (1984). "Major Irrigation and Settlement Systems in Sri Lanka : Some Policy Issues in Operation and Maintenance, Sri Lanka Journal of Agrarian Studies V (ii), 1984.

3. Ibid.

the past, the interest focussed by the authorities on the prospects for the expansion of irrigation facilities and an indepth understanding of those problems has been marginal. At the time the INMAS Programme was being formulated, it was clear that the prospects for the further expansion of irrigation was limited and the problems relating to such expansion were still in existence. Some of these problems have been identified in a paper produced by the Irrigation Management Division[1] which can be regarded as areas on which the INMAS Programme focussed its attention for corrective action.

Among the factors which contributed to the adoption of the INMAS package, are the experiences gained from various other "pilot projects". According to the Development Secretaries Committee of 1983, the development process of the INMAS concept has been influenced by action-research conducted in the early 80s with a view to identifying methods of water allocation and distribution (Minipe Irrigation Settlement System), diagnosis of field problems through multi-disciplinary teams (Rajanganaya and Kalawewa Irrigation Settlements Systems) and institution building (Gal Oya Irrigation Settlement System).

It must however, be noted that these concepts i.e. popular participation, co-ordination through project management systems and committee systems have been translated into practice in many other areas in the sixties and seventies as well.

1.5 Previous Management Perspectives

Although some of the major irrigation works such as Gal Oya and Rajangana and Systems B & C of Mahaweli were constructed after Independence in 1948, historically the majority of the major irrigation works were done during the period of the ancient Sinhala Kings. The early constructions and their maintenance were made possible through the observance of the principle of Rajakariya which was used for social welfare or meritorious work for that community which functioned in a non-monetised economy. The construction of tanks and irrigation networks conceived in these terms, did involve resettlement, but never was it coupled with migration from the wet zone to the dry zone. It was a case of the expansion of the community into new habitats located within the same broad environ. As such, the reproduction of the system which forms the main function of management of any

---

1. Alwis, J. (undated). "Framework for Farmer Organisation and Farmer Participation in Major Irrigation Systems". Paper presented at BASC Training Course, 1983-1985.

system, was ensured through the observance of the traditional principles of social organisation. There were also punitive measures in operation against those who breached their responsibilities and an irrigation officialdom known as the "kulinas" implemented the law.

The present irrigation systems operate under a different social, economic and political system. The performance of work in these systems is on the basis of wage labour and not on the principle of Rajakariya. Although the basic infrastructure (tanks, paddy lands, highlands including settlements and network of irrigation) was essentially the same, new dimensions have been added to the recent constructions in response to external demands. They included resettlement of people from other communities side by side with the existing communities called "Purana Gam" (original villages) and the accommodation of many other external demands, such as those connected with crop diversification, marketing of produce for the local and export market and hydro-power generation.

An inevitable consequence of this process was the abandoning of the paddy mono-crop emphasis in favour of industrial crops as well as for other field crops. This meant a new challenge for irrigation management. However, even if such considerations were absent, and the paddy mono-crop emphasis was maintained, the perennial problems of the lack of water faced by the tail-enders in practically all the major irrigation systems, the provision of assured supply of irrigation water to the full demand area by itself constituted a formidable challenge even within the subsistence framework. Besides, the fact that Sri Lanka does not have high mountains which are covered with snow that melts in the summer providing a continuous supply of water to the rivers and thereby the tanks, one is compelled to accept the fact that our main sources of irrigation being rainfed rivers, are not in the final analysis dependable. One would be justified therefore, believing that this was a real problem which our predecessors were aware of and perhaps experienced. Thus, even in the past where the circumstances were different, management of water would have been inherent in the peasant way of life. In the present context, an improved management of irrigation systems is an urgently felt need.

In the more recent past, reference to management perspectives is found in the irrigation legislation of 1865 introduced by the British who began renovating small irrigation systems. Their sense of management which found expression in this legislation, was limited to the codification of the customary rules and practices in regard to irrigated paddy cultivation. It sought to legitimize the authority of the bureaucracy and fix responsibility on the one hand, and on the other promote collective farmer decisions in respect of the process of

paddy production. Since the major irrigation systems rehabilitated or constructed are also devoted in the main to paddy cultivation, the observance of this piece of legislation was meaningful. However, whether the codified customary practices could in fact be observed given the different character of the new irrigation settlement systems cannot be positively determined.

The major irrigation settlement systems in the present period on which are our focus of attention here, have had, broadly speaking, two levels of management, one at the system level and the other at the national level. The system level may also be referred to as the provincial level because a major irigation settlement system would physically spread over more than one district and sometimes have its catchment area in a different province altogether.

At the national level, there are many departments coming under two ministries which are responsible for the implementation of the settlement policy of the government. The Ministry of Lands and Lands Development is in charge of the construction of reservoirs, while the Ministry of Mahaweli Development is responsible for river basin projects such as the Walawe and the Mahaweli projects. Other older schemes which have been renovated are controlled by the Land Commissioner's Department which is also under the Ministry of Lands and Land Development. The Ministry of Lands and Land Development and the Ministry of Mahaweli Development are under one Minister. The river basin projects have at the national level special boards of management such as the River Valleys Development Board, the Mahaweli Development Board and the Mahaweli Authority of Sri Lanka created for the purpose of planning and developing them. Inter-agency co-ordination came to be regarded as an area requiring urgent attention, and in 1969 another special board called the Settlement Planning and Development Board comprising of representatives from all government departments concerned with irrigation settlement systems was created in order to co-ordinate irrigation settlement system activities and achieve a uniformity in settlement policy.

The System Level or the Project Level : At this level, the District Land Officer (DLO) is responsible for all project matters and the general administration and is answerable to the Government Agent. Each settlement system is under the administration of a Colonization Officer (CO) who has a number of assistants. The functions of the Colonization Officer included settling people, allocating land, supplying food and implements, overseeing community services and in addition be generally responsible for land development and land administration. Chanelling of services of a large number of officials of other

departments such as Irrigation, Land Development, Land Commissioner's, Agriculture, Agrarian Services, Co-operatives and other such services.

Thus, from the point of view of the centre as well as the peasants, the Colonization Officer was the chief. However, when there is such a wide spectrum of activities concentrated in the hands of the Colonization Officer with no clear definition or demarcation of his responsibilities and functions, he becomes a weak link preventing any expertise on the management of the said responsibilities or duties.

The problem of low productivity in the major irrigation systems received attention of the government, particularly with the advent of the Green Revolution in the 60s. The problem was accordingly conceived in terms of the lack of inputs. As a result, during this period a programme called the Special Projects Programme was implemented which sought to remedy the problem of low productivity by resorting to the cultivation of other field crops in yala and the provision of necessary inputs and support services so that output will be increased. A Project Manager was appointed to co-ordinate these activities. It was the first attempt to handle all agricultural activities on a project basis. The Programme was implemented in 23 major irrigation and settlement systems starting with Elahera in 1967.

The Special Projects Programme brought results in terms of higher yields, agricultural diversification and better co-ordination, although they were limited to the short-run. It has been observed that before five years since the commencement of the programme, signs of exhaustion and decay manifested themselves and the initial momentum could not be sustained : the institutional and organisational changes and improvements made under the programme intended to strengthen the hand of the bureaucracy to deal more effectively with the programme objectives and these were built on a transcient bureaucracy which had no permanent interest in staying with the irrigation settlement systems. The Project Managers were drawn largely from Governments (Agriculture) and the project design did not envisage the need to develop internal capability (farmer organisations). The farmers were not involved in taking management decisions affecting them.

In the context of the green revolution package during this time, we have no information to suggest that the increase in the yield levels of the irrigation settlement systems that were brought under the special programme were confined solely to these systems or whether it was a common phenomenon. We also do not know if all the special projects fared equally well in increasing output. Again we may recall the fact that the majority of the Project Managers came from the Department

of Agriculture, which makes us inclined to believe that their agricultural extension background and professionalism may have contributed in a large measure to the increase of output.

There are two ways to find the veracity of the points raised above. One is to check the performance of projects managed by the Agriculture Department personnel against those managed by others who did not have an agricultural background. Second, is to check the output performance in other schemes which lay outside the project. We have no data to do the needful. Besides, it may also not fall directly within the scope of the present inquiry. Yet, the fact that the question can be raised by itself is a sufficient indication of the limitations of accepting special project programmes as being responsible for increased output.

Nevertheless, that the success was due to the Project Managers having a background in agriculture, carries policy implications. Yet, if it is on record that the special projects started collapsing even before completing 5 years in active production work, on the assumption that the Project Managers were not transferred out in the interim, it may be questioned whether the Project Managers coming with an agricultural background have had any inherent advantage over the others. Such being the case, we may conjecture that the problem of low productivity may have roots elsewhere not necessarily connected to the issue of the Project Manager possessing agricultural know-how and a sense of supply inputs. In fact, other issues such as adequacy, predictability, equity in the supply of irrigation water were not considered important in this strategy and the potential production increase that could be realized through better management of resource base remained largely untalked (Perera, 1986:9).

A new system of management was introduced in 1974, which covered river basin projects such as the Walawe, the Gal Oya and the Mahaweli Projects. The new system was based on the principle of unified management and aimed at integrated development and the promotion of farmer participation through farmer organisations.

Each irrigation project under the River Basin Development Programme was brought under a Resident Project Manager who is assisted by an Assistant General Manager who was formally designated as the Chief Settlement Officer. In 1979, the Resident Project Manager was made fully responsible for all development work pertaining to the project. In the same year a new concept of project management called the "Unit Block Management System" was introduced. The Unit Manager is responsible for a specific area and is

answerable to his superior officer who is at the block level. The Block Manager is answerable to the Resident Project Manager. The number of farm families for whom the Block Manager and the Unit Manager are responsible number 2000 and 200 respectively.

1.6 Fundamental Characteristics of the INMAS Programme

It is necessary to identify the fundamental characteristics of the INMAS Programme in order to highlight its speciality as well as to prompt a comparison with the other perspectives or the programmes adopted. The following statement quoted from a paper presented at an expert consultation on the subject by the Director of Irrigation is particularly useful in identifying the fundamental characteristics of the INMAS Programme on water management.

> "The Programme for Integrated Management of Major Irrigation Settlement Schemes (INMAS) seeks to establish a harmonisation of the various inputs and services necessary for increasing agricultural productivity with special focus on the use of irrigation water which has been identified as the most critical and limiting resource in irrigated agriculture. It would identify the components for which various line agencies would be responsible and seeks to co-ordinate these activities through a system of Project Management. The lack of viable farmer institutions has also been a major constraint in involving farmer participation in management decisions affecting them. Therefore, institutional building and setting up of farmer associations is given high priority under this programme. This would enable them to participate meaningfully in management decisions and activities that affect them and acquire a degree of management capability that will enable the state to withdraw from certain operational activities at a larger stage"[1] .

It is seen that the INMAS Programme basically revolves around the identification of low productivity as the major problem besetting the agricultural settlements (major irrigation systems) and its recognition that the solution to this problem is contingent upon the management of

---

1. Perera, K.D.P. (1986). "Sri Lanka Experience of Integrated Management of Major Irrigation Settlement Schemes (INMAS) Programme on Water Management". Paper presented at the Expert Consultation on Efficient Use of Water with Specific Reference to Paddy in Irrigation Projects, Bangkok, Thailand, 9-13th September, 1986.

resources (various inputs and services including particularly water) which has to be realized through a system of project management where farmer participation is an integral component. It must be conceded then, that this is the perspective of the INMAS Programme. The perspective has identified low productivity as the problem, and the absence of integrated management as the cause of the problem and suggested operationalisation of the concept of integrated management as the solution to the said problem.

The following sections will indicate that unified management underlies the principle of the concept of integrated management. A project management system, with a sub-system of committees at each level with farmer representation/farmer participation, forms the essence of the strategy adopted to ensure proper management of resources, particularly, irrigation water.

1.6.1 Project Management

The INMAS Programme envisaged the management of the agricultural settlements by a system of committees at different levels. At the Field Channel Level, there would be a Field Channel Committee comprising of farmers only. At the Distributary Channel Level, there would be a Distributary Channel Committee comprising of both officials and Field Channel Farmer Representatives. The Project Committee, which is at the project level, consists of all project level officials and Distributary Channel Representatives. The project level officials would represent the Departments of Irrigation, Agriculture, Agrarian Services, Land Commissioner's and the Agricultural Development Authority, State Banks and the Farmer Organizations. While the officers of these organizations would perform their normal duties assigned to them by their respective agencies, any activity required for the project, but coming outside the normal duties would be shared on an agreed basis among the members of the committee.

The immediate concerns of project management will be to increase agricultural production per unit of land and water; provide adequate and equitable distribution of irrigation water; the timely supply of agricultural inputs and sales of produce; to develop farmer institutions to facilitate their participation in management; and the proper maintenance of the irrigation system and farmer education.

In the long-term, it would focus on integrated development of the farm into a commercial holding; crop diversification and

rotation; social and economic development of the farming community; marketing of agricultural produce and by-products; agro-based industries; processing of agricultural produce and handing over to farmer institutions some management and operational functions of irrigation schemes.

The main functions of the Project Committee are as follows:

- Formulation and implementation of a cultivation programme for the season/year
- Holding of timely Kanna meetings
- Ensure proper distribution of irrigation water
- Arrange for timely provision of credit, seed and other inputs
- Monitor programmes and take corrective action where needed
- Recovery of O&M contributions from farmers
- Arrangements for operation and maintenance of all capital assets, and approval of items to be handled under the maintenance programme of the irrigation system
- Promote formation and participation of Farmer Organization in project activities
- Identify training needs of farmers and officers serving in the project and arrange training

The Project Manager, it must be noted, does not have administrative control over the Line Agency staff. He is expected to function on the basis of goodwill and cordial relationship. Nevertheless, the commitment of the Line Agencies has been obtained to extend maximum co-operation, a prepared condition for his functioning, is already present. On the other hand, since the programme is to be for the people, he could draw from man-power resources to fill any gap in authority. As the Director of the Irrigation Management Division of the Ministry of Lands and Land Development had observed, the Project Manager had multiple roles to play: that of an Implementator, Facilitator, Change Agent, Motivator and Catalyst, and each role had a symbolic relationship with several components in the programme[1].

1. Alwis, J. (undated). Integrated Management of Agricultural Settlements (mimeo).

1.6.2 Sub-Committee of District Agricultural Committee

At the district level, the implementation of the INMAS Programme would be monitored by a Sub-Committee of the District Agricultural Committee. The composition of this Sub-Committee and its functions are given below:

Sub-Committee of the DAC would be represented by;

- Government Agent of the District (Chairman)
- Additional Government Agent, Lands
- Range Deputy Director of Irrigation (Secretary)
- Deputy Provincial Director of Agricultural Development Authority
- Asst. Director of Agriculture of the District
- Asst. Commissioner of Agrarian Services of the District
- Asst. Commissioner of Co-operative Development of the District
- Director/Regional Manager, Paddy Marketing Board
- District Manager, Agricultural Insurance Board
- District Managers of State Banks
- Project Managers of projects falling within the district

The District Heads of other agencies may be co-opted into the Sub-Committee as and when required.

The functions of this Sub-Committee would be to:

- Function as the main implementing body for management of the projects coming under the Integrated Managemennt Programme in the district;

- Identify the projects in the district as a production unit of the annual implementation programme of the Ministry of Agricultural Development and Research, and draw up annual programmes and monitor performance of each project on this basis;

- Programme for holding of timely Kanna meetings for Maha and Yala for major schemes in the district, especially in the projects under the programme, and draw up a calendar of such meetings;

- Programme, monitor and review the operation and maintenance programmes in respect of the irrigation network as prepared by the Project Managers;

- Programme, monitor and review the programme of institutional development and building up of Farmer Organizations in these projects;

- Programme, monitor and review the collection of O&M contributions;

- Monitor and review arrangements for prosecution of offenders under the Irrigation Ordinance and Agrarian Services Act;

- Monitor and review administration and organizational aspects of these projects in relation to staffing, services tec.

1.6.3 The Central Co-ordination Committee at the National Level

At the national level, The Central Co-ordinating Committee for irrigation management has been created for the purposes of direction, co-ordination and implementation of the programme. It would monitor progress, take necessary corrective action, review policy and provide guidelines for implementation at both national and local levels while setting priorities and allocating resources. The composition of this committee is as follows:

- The Secretary, Ministry of Lands and Land Development (Chairman)

- The Secretary, Ministry of Agricultural Development and Research

- The Chairman, Agricultural Development Authority

- The Director of Irrigation

- The Director of Agriculture

- The Land Commissioner

- The Commissioner of Agrarian Services

- Representatives of State Banks

- Director, Irrigation Management Division (Secretary)

Representatives of any other agency deemed necessary for implementation of the programme could be co-opted into the Committee as required.

1.6.4 Irrigation Management Division (IMD)

A special Division for administering the INMAS Programme has been set up in the Ministry of Lands and Land Development and is designated as the Irrigation Management Division. The IMD consists of a group of multi-disciplinary staff who would translate the guidelines for implementation, evaluate feedback, assist programme impact and decide on changes or emphasise a necessity to achieve the objectives of the programme. The organizational structure of the IMD is given below:

- Deputy Director, Planning and Progress Control (S.L.A.S.), Planning of New Projects, Implementation of the INMAS Programme, Budget and Progress Control Work connected with IMD projects;

- Deputy Director, Education and Publicity (S.L.A.S) - Institutional Development, Training, O&M Programme and Publicity;

- Deputy Director, Operation and Maintenance (S.L.E.S) - Operation and Maintenance aspects of irrigation systems;

- Deputy Director, Major Rehabilitation (S.L.D.S) - Rehabilitation Programmes (Local and Foreign aided) for Major Irrigation Schemes;

- Deputy Director, Finance (S.L.Ac.S) - Recurrent Expenditure, Payments and Reimbursements (Local and Foreign), O&M Account.

Another feature of the INMAS Programme was the low cost of implementation. The assumption was that, a 25% increase in yield could be achieved by emphasising management improvements. A sustainable increase in paddy yields of 100 bushels per acre was envisaged, and the cost of implementing the programme was calculated to be Rs.20/= per acre per year. Training opportunities were provided for the officials.

In summary, the fundamental characteristics of the INMAS Programme were seen to emanate from the concepts of unified management and farmer participation. Through the project management system in which farmer participation is an integral component, the INMAS Programme expects to harmonise the supply of inputs and services (inter-agency co-ordination and intra-agency co-ordination while paying special attention to water management.

Table 1.1 Number and Command Area of Irrigation Schemes by District and Size ('000 Ha)

District	80 - 600 ha.		600 - 1,000 ha.		1,000 - 1,200 ha.		1,200 - 4,000 ha.		Over 4,000 ha.		Total	
	No.	Area	No.	Area	No.	Area	No.	Area	No.	Area	No.	Area
Kandy	5	1.12	-	-	-	-	1	2.72	-	-	6	3.84
Matale	4	0.52	-	-	1	1.72	-	-	-	-	5	2.24
Ampara	16	2.44	3	2.04	5	7.40	1	2.28	1	49.00	26	63.10
Vavuniya	23	3.52	-	-	1	1.64	-	-	-	-	24	5.16
Mannar	09	2.28	-	-	-	-	1	2.12	1	14.28	11	18.68
Jaffna	6	1.28	2	1.40	2	2.56	1	2.56	1	8.80	12	16.60
Mullaitivu	13	2.84	2	1.68	-	-	2	5.20	-	-	17	9.74
Batticaloe	17	1.96	1	0.64	2	2.80	3	11.00	1	5.12	24	21.52
Polonnaruwa	11	1.80	-	-	1	1.20	2	6.60	3	22.00	17	31.60
Hambantota	22	4.12	3	2.24	3	3.52	2	5.44	-	-	30	15.32
Trincomalee	22	4.32	-	-	1	1.76	-	-	3	17.16	26	23.24
Galle	7	1.24	2	1.44	3	3.80	-	-	-	-	12	6.48
Matara	13	2.60	3	1.64	4	6.48	-	-	-	-	20	10.72
Puttalam	18	3.32	1	0.84	-	-	-	-	-	-	17	4.16
Badulla	10	2.20	5	3.72	1	1.00	1	2.00	-	-	17	8.92
Nuwara Eliya	8	1.64	-	-	-	-	-	-	-	-	8	1.64
Ratnapura	09	1.76	-	-	-	-	1	2.04	1	5.48	11	9.28
Kurunegala	2	0.88	2	1.28	2	3.44	1	2.04	-	-	7	7.64
Moneragala	2	0.80	-	-	-	-	-	-	-	-	2	0.80
Anuradhapura	1	0.40	1	0.80	3	3.00	3	7.60	2	10.16	10	21.96
Colombo	4	0.36	-	-	-	-	-	-	-	-	4	0.36
Gampaha	-	-	-	-	-	-	2	6.08	-	-	2	6.08
Kalutara	1	0.08	2	1.44	-	-	2	4.00	-	-	5	5.52
Total	223	41.48	27	19.16	29	40.32	23	61.68	13	132.0	313	294.64

Chapter Two

METHODOLOGY OF THE STUDY

Broadly, the study methodology includes a review of available literature followed by sample surveys of farmers and officers as well as informal discussions with other persons at various levels associated with the INMAS Programme. This chapter deals with the methodology adopted in the study. It includes a brief account of the sampling frame, the sample areas, the types of data collected and the limitations of the study.

2.1 The Sample

Out of 41 major irrigation systems coming under the INMAS Programme, the following eight systems representing major agro-ecological zones were randomly selected for detailed investigation of farmers and officers :

1. Huruluwewa
2. Kaudulla
3. Mee Oya
4. Minipe
5. Nachchaduwa
6. Nagadeepa
7. Parakrama Samudraya
8. Ridibendi Ela

In addtion, two other systems, namely Ridiyagama and Siyambalangamuwa were selected outside the INMAS Programme to be treated as control units bringing the total upto 10 major irrigation systems. The districts of Ampara, Batticaloa, Vavuniya, Mannar, Trincomalee and Kilinochchi were excluded due to security problems.

Three project sub-committee areas from each system mentioned above were selected in order to represent the locational characteristics of "head", "middle" and "tail" of each scheme. A list of farmers and farmer representatives in these areas was then obtained from the respective Project Managers for selecting a sample of farmers to be interviewed. The selection of farmers was done on the basis of probability proportional to size (PPS). As the farmer

organisations were non-existent in control units, the selection of farm households in these particular cases was done purely on the basis of locational classification mentioned above. However, in order to ensure uniformity, the PPS samples were drawn in respect of both the experimental units (System under INMAS) and the control units (Systems outside INMAS).

A detailed breakdown of the sample selected for the field investigation is given in Table 2.1

The strength of the full sample was 996 farm households, with 753 selected from INMAS Projects, 133 from non-INMAS Projects and 90 farmer representatives interviewed from the INMAS Projects.

2.2 Types of Data

Field investigation in the study locations were conducted over three rounds using three separate questionnaire schedules. The first round of the field investigation consisted of the administration of a questionnaire which was intended to cover a wide range of information on production related variables, such as land use, adoption of modern technology, input supply, resource use patterns and productivity, marketing of produce, and also farmer's perception on O & M fee collection and mobilization.

The second round of the survey intended to elicit information on irrigation and water management related variables. The relevant questionnaire focussed on to the issues of adequacy and reliability of irrigation water, as well as the rehabilitation and maintenance of the irrigation systems. The present status of activities and the changes that have taken place on account of the INMAS Programme, particularly with regard to allocation, scheduling, distribution and monitoring of the supply of irrigation water, and the division of responsibilities in connection with every operation and maintenance task.

The third round of investigation dealt exclusively with the farmer organisational activities and farmer participation under the INMAS Programme. The questionnaire was designed in such a way to describe and analyse the following aspects :

i. The degree of self-reliance among the farmers in managing their own systems;

ii. Total system conciousness among the farmers;

iii. Stucture of farmer groups;

iv. Federation of organisation and its vertical integration;

v. Problem solving processes adopted by the farmers;

vi. Dialogue among the farmers themselves and between farmers and officers;

vii. Division of responsibilities between the farmers and the agencies with respect to system design, construction, operation and maintenance;

viii. Long-run viability and substainability of farmer organisation

In addition to the collection of information through the questionnaires, instructions were given to the field investigators with a view to obtaining relevant information by way of participatory observation during their stay in the field. The investigators recorded their observations in a field note-book given for the purpose. By visiting the farmers, the farmer representatives, the field level officials and also attending various field and project level meetings such as project sub-committee and Kanna meetings, they succeeded in establishing rapport with the community and their observations proved to be valuable in drawing conclusions especially on the present operational status of farmer organisations set up under the INMAS Programme.

2.3 Survey Team

A multi-disciplinary group of researchers along with a Consultant, Statistical Officers and Investigators comprised the survey team. The investigators, all of whom were university graduates with a rural background were recruited for the specific purpose of conducting the field survey. They were given one week in house training on the theoretical aspects of data collection and two weeks practical field training. During the training, heavy emphasis was placed on the technique of collection of information by participatory observation. After the training, two investigators were assigned to each sample scheme, excepting Mee Oya and Siyambalangamuwa schemes where only one investigator each was assigned. Two Statistical Officers were assigned to the study to ensure proper, periodic supervision of field work.

Field work was conducted from October 1987 to January 1988, and during this period the investigators were accommodated in rural farm households. Living in the community facilitated closer interaction with

the respondents of the survey. Although the investigators were expected to complete the three rounds of field surveys by mid January 1988, some of them were unable to meet this deadline. Those who completed their survey earlier were re-assigned to schemes closest to their operational units. Eventually field work was concluded by the end of January 1988.

2.4 Survey of Officials

All the officials (292) of the line agencies such as the Departments of Irrigation, Agrarian Services, Agriculture, Land Commissioner, Agriculture Development Authority and Commercial Banks who were involved in the implementation of the INMAS Programme at the project level were included in the mail survey. This survey was carried out in order to ascertain their perception of the INMAS Programme during the three month period commencing from 1st January, 1988.

Although the questionnaire was mailed out to all the officers belonging to the line agencies directly involved in the INMAS Programme, the number of officers who responded even after sending two reminders - was only 210 (72%). The breakdown of officers who responded and their response rate by Agency and Irrigation System is given in Table 2.2.

The non responses were mainly due to the absence of officers from the project areas. Some were on leave, while the others were on transfer and still others had retired. Some other officers were not in a position to respond as they were new to the project area. The majority of them communicated their inability to respond to the questionnaire. However, it was observed that certain officials in some of the line agencies were deliberately avoiding the social responsibility of having to respond to the mail questionnaire. The reasons for this behaviour was never clear to us. In this connection, we can specifically mention that none of the officials of the Irrigation Department who were attached to the Minipe Irrigation Settlement System, responded even after mailing two reminders to them.

The response rate classified by irrigation systems ranged between 54-85 percent, with the lowest rate being recorded from Minipe. The response rate classified by agency ranged between 38-83 percent, and the lowest rate here came from the commercial banks followed by the Department of Irrigation. All the Managers, except for just one attached to the Agricultural Development Authority responded to the questionnaire. The low response rate of the commercial banks could

perhaps be attributed to their minimal involvement in INMAS activities. Inherent short-comings of a mail questionnaire survey notwithstanding the overall response rate was sufficient to make inferences on the officials' perception of the effectiveness of the INMAS Programme.

2.5 Survey of Project Managers of Irrigation Management Division (IMD)

In addition to the informal interviews the researchers had with the Project Managers of the sample, a mail questionnaire was administered among all the Project Managers of the IMD to ensure a wider perspective on how they perceive the effectiveness of the INMAS Programme as well as some aspects of the management of the implementation of the programme. Further, the questionnaire provided information useful for designing future monitoring and evaluation methodologies. The questionnaire was mailed out towards the end of March 1988. The Project Managers were expected to respond by the 20th of April 1988. However, only 28 out of 41 Project Managers responded to the questionnaire and the response rate of 68 percent was well below our expectation.

2.6 Data Processing

All the mail questionnaire schedules were processed manually, whilst the bulk of questionnaire schedules of the farm household surveys were processed by computers. Furthermore, the secondary data obtained from various government departments and the information provided by the Project Managers on the progress of the project activities were processed manually.

2.7 Limitations of the Study Procedure

The major limitation encountered in conducting this study was the non-availability of any detailed information on the pre-project condition of the sample systems. The scanty information contained in some of the past writings provided somewhat useful details. Yet, this background information could not be utilized for purposes of comparison of the situation with and without INMAS Programme.

A further constraint was imposed on the analysis by the fact that the actual implementation of INMAS Programme in many of the sample areas had commenced only in 1984 subsequent to the appointment of Project Managers to these schemes. It limited the feasibility of doing a comprehensive evaluation. Under the circumstances, we decided to

sketch the general trends with regard to the performance of the major activities of the INMAS Programme. The absence of time series data on basic assessment indicators for each project was another serious limitation in respect of this study. Although the normal progress reports prepared by the Project Managers for their own purpose of monitoring the progress, their utility for the present study is marginal, as they are largely incomplete and unreliable. As an alternative, the district estimate prepared by the Department of Census and Statistics and the Department of Agriculture were used and the problem was thereby rectified to an acceptable degree.

The responses to the mail questionnaire by both officers of the Line Agencies and the Project Managers were treated with caution. It was noticeable that, in addition to having misinterpreted certain questions (an inherent consequent of a mail survey), the responses given to some other questions appeared to be biased and/or exaggerated. To illustrate, the majority of the Project Managers held that the performance of the INMAS Programme was very successful in all respects whereas this did not correspond to the reality unearthed by the main survey. How fallacious this perception is, can be gauged from the assertion by certain officials that farmers never default in the payment of Operation and Maintenance fee (O & M). It is widely acknowledged however, that the collection of O & M fees in all major irrigation systems has netted in only a paltry amount, and even the principle involved in the government policy has become a contemporary political issue. However, despite these short-comings, the questionnaire yielded certain responses which provided useful information in making inferences on the project performance.

The detailed information on production related variables from farm household survey was obtained only for 1987 Yala season, as the Yala cultivation is generally crucial in a majority of the major irrigation systems. In the irrigation and settlement systems such as Mee Oya, Kaudulla, Huruluwewa and Nagadeepa, for example, the cultivation of paddy in Yala was carried out either on a limited scale or not at all. Consequently, not all the sample farmers were in a position to provide information as detailed, as we would have liked to provide in respect of the 1987 Yala season. In order to counter this problem, the farmers were requested to provide this information in relation to the latest Yala or Maha seasons they cultivated. But, as the reference period was distanced from the actual date of the survey, the accuracy of the information would be questionable in view of possible memory lapses. Where this was the case, such information was treated with caution by the researchers.

As the entire data collection exercise was based on single visit questionnaire surveys, mail questionnaire surveys and some secondary sources such as progress reports, the quantitative findings of this study may have certain limitations, despite the serious cross-checks that were made on data to minimize the sampling and non-sampling error. The findings and the recommendations emanating from the study should therefore, be evaluated in the light of the limitations that were elaborated above.

Table 2.1 **Sample Selected for Field Investigation : IMMAS Projects**

System	Location	No. of Farmers		No. of Farmer Representatives
Ridibendiela	Head = LB.F.C 1-14	35		6
	Middle = RB.F.C 36-42	37]	116	
	Tail = RB.F.C 59-78	44]		
Mee Oya	Head = F.C 1-7	16]		13
	Middle = F.C 11-18	11]	40	
	Tail = F.C 23-33	13]		
Huruluwewa	Head = RB-D_1 (Tract 1)	38]		16
	Middle = LB-D_4 (Tract 4)	14]	68	
	Tail = RB-D_{13} (Tract 13)	16]		
Nagadeepa	Head = Tract 1,2	30]		13
	Middle = Tract 5	41]	98	
	Tail = Tract 9	21]		
PSS	Head = D_3 Canal	41]		13
	Middle = D_1 North Canal	20]	82	
	Tail = D_1 East Canal	21]		
Minipe	Head = D 1 - D 11	36]		4
	Middle = D 43	56]	133	
	Tail = D 57	41]		
Nachchaduwa	Head = HLD Canal 1-6	51]		15
	Middle = LLD Canal 6A-8D	27]	110	
	Tail = HLD Canal 35-39	32]		
Kaudulla	Head = Stage 11 Fcl - 7	26]		10
	Middle = Stage 1 D9	22]	106	
	Tail = Stage 1 BC D1-D2	58]		

Sample Selected for Field Investigation : Non-IMMAS Projects

Ridiyagama	Head = NCB and NRB	39]		
	Middle = SRB, SLB & SCB (Right)	31]	90	
	Tail = SLB 3rd - 10th Mile SCB (Left)	20]		
Siyambalangamuwa	Left Bank	24]	43	
	Right Bank	19]		
Total			886	90

Table 2.2 Officers Responded for the Mail Questionnaire Classified by Agency and Irrigation Scheme

Irrigation Scheme	ID	DAS	DA	LCD	ADA	BANKS	ALL	R R
Ridibendiela	09	03	06	02	n a	02	22	71
Mee Oya	10	09	10	03	02	n a	34	69
Huruluwewa	10	10	14	07	01	02	44	85
Nagadeepa	03	08	05	05	02	n a	23	62
P S S	09	05	03	06	01	n a	24	75
Minipe	n r	03	05	06	01	n a	15	54
Nachchaduwa	04	04	06	02	01	01	18	75
Kaudulla	06	03	08	13	n r	n a	30	77
Total responded :	51	45	57	44	08	05	210	-
No. of Questionnaires mailed :	80	59	78	53	09	13	292	-
Response Rate (R.R)	64	76	73	83	89	38	-	72

Chapter Three

ECONOMIC PERFORMANCE OF INMAS PROJECTS

This chapter deals with the general economic performance of INMAS projects with particular reference to the changes that have occurred in farming practices, input use and productivity as well as the collection of O & M fees and the availability of farm supporting services which may have resulted from the implementation of INMAS Programme.

By improving the irrigation management system, the INMAS Programme basically intended to increase agricultural production in terms of increases in the cropping intensity and an overall increase in the productivity. Conversely, any positive change in the cropping intensity and productivity including any reduction in the crop failure therefore, is assumed to be directly associated with the effectiveness of the INMAS Programme.

3.1 Cropping Intensity

Available official estimates on sample project areas do not indicate any expansion of paddy extent under irrigation during the reference period. However, unofficial estimates indicate marginal increases in areas brought under cultivation in schemes like Minipe, Huruluwewa and PSS. In fact, due to the cultivation of large extents of reservations by encroachers, the actual area under irrigation in all the sample schemes are much higher than what the official estimates indicate. Encroached lands are not provided with irrigation according to the original project plans. As shown in Table 3.1, the additional extent of land irrigated as a percentage of total extent designated for irrigation ranges between 10 percent to 44 percent. The highest incidence was reported from Minipe, and the least increases were from Huruluwewa and Nagadeepa. Having taken note of this situation on the ground, due recognition was given to the gross extent irrigated in the calculation of cropping intensities of the sample schemes.

In the Maha seasons, farmers in almost all schemes plant nearly the full extent of irrigable area with paddy, relying on a combination of rain and irrigation water. However, in the Yala season, the amount of land under paddy largely depends upon irrigation water. Hence, cropping intensity can only be judged with representative data from the Yala season. The paddy cropping intensities calculated for Yala seasons since 1985 which are given in Table 3.2, indicate wide variations : in PSS and Minipe it has remained more or less constant, whereas it has dropped in Ridibendiela and Kaudulla. The Huruluwewa Scheme remained with no Yala paddy crop during the entire reference period, while in the Mee Oya Scheme it was insignificant.

Until 1988 Yala season, the cropping intensities had dropped in the Nachchaduwa Scheme due to the modernization work in progress. The severe drought that prevailed in the 1987 Yala season resulted in the reduction of the cropping intensities in most of the sample schemes.

According to our observations, double-cropping has become possible only in PSS, and the head and the middle areas of the Minipe, Ridibendiela and Kaudulla Schemes. Yala paddy cultivation has become virtually impossible in schemes like Mee Oya, Huruluwewa and Nagadeepa due to inadequacies in the water supply and in the Mee Oya scheme, such cultivation was reported only under Ambakolawewa. The overall average cropping intensity has not appreciably increased as a result of INMAS. The increase in cropping intensity rests with the changes in water saving practices adopted by farmers in drought and flood situations. This is yet to be noticed among sample farmers.

3.2 Crop Failure

The incidence of total crop failures estimated by the Project Managers appeared to be relatively low, ranging from 02 to 15 percent across the sample schemes. Individually, crop failures have been reported to be less frequent in PSS and Nachchaduwa Schemes, whereas it was more frequently reported in schemes like Mee Oya, Huruluwewa and Ridibendiela.

However, the farm household survey revealed a somewhat different picture with regard to the number of farmers who experienced crop failures. In all schemes, a substantial proportion of the farmers appeared to have experienced some kind of crop damage with varying degrees of severity. (See Table 3.4).

Over 40 percent of the farmers in Ridibendiela, Mee Oya, Minipe and Kaudulla reported crop damages every season during the period

under review. Crop damages in other schemes ranged between 21-37 percent. However, the degree of crop damage experienced by the majority of the farmers was not high in most projects, as only less than 5 percent of the farmers reported complete crop failures.

Crop damages have occurred due to lack of irrigation water, drought, insect and pest attacks, and floods or rains in order of the frequency of reporting. The reasons given for crop damages by sample farmers are presented in Table 3.5.

The lack of irrigation water and drought conditions were reported to be the most significant causes of crop damages in all schemes. The crop failures due to pest attacks and floods or rains have been sporadic and relatively low. Insect and pest attacks resulting in crop damages were reported mainly in Nachchaduwa, PSS, Minipe, Kaudulla and Nagadeepa Schemes. Floods or rains were responsible for crop damages in Huruluwewa, Nachchaduwa, Minipe and Nagadeepa schemes which were encountered mainly during 86/87 Maha season. Although the natural factors responsible for crop damages in the sample schemes are totally independent of the INMAS Programme, there has not been any significant reduction in the incidence of crop damages due to such factors as lack of irrigation water, and insect or pest attacks which could have been brought under control by the successful co-ordination of project activities.

However, alternative steps have been taken after 1984 to avert crop damages from lack of irrigation water in several schemes. The implementation of "Bethma" in the Kaudulla, Huruluwewa and Mee Oya schemes attempted to overcome the non-availability of water. The "Bethma" has been reported to be successful in reducing the severity and the incidence of total crop damages experienced in previous years.

The cultivation of cash crops instead of paddy during the Yala season was reported to have been extensively practised in schemes like Nagadeepa, Mee Oya and Huruluwewa over the past several years. The project management has taken special steps to motivate the farmers to take to subsidiary food crops on a commercial scale during the water deficit Yala season. (See Table 3.6).

In the 1986 Yala season, when the weather was favourable, the cultivation of subsidiary food crops was successful in a majority of the sample schemes. The subsidiary food crop cultivation in irrigated lands (lowlands) however, is relatively low in schemes with an assured water supply. For example, over 95 percent of the lands were cultivated with paddy even in Yala, in schemes like PSS, Minipe and

Nachchaduwa where the water supply is relatively stable.

The cultivation of cash crops on a commercial scale on lowland has been reported in schemes which have an inadequate water supply during Yala, which seriously limit the cultivation of paddy. These schemes include Huruluwewa, Nagadeepa, Mee Oya, Kaudulla and Ridibendiela. Although the cultivation of cowpea, green gram and various pulses has been reported in almost all schemes, a certain pattern could still be observed with regard to the cash crops cultivated. Chilli cultivation has been mainly reported in schemes like PSS, Nachchaduwa, Nagadeepa and Minipe, while the cultivation of soya beans was very popular among the farmers in the Huruluwewa scheme. Tobacco cultivation on a commercial scale has only been reported in PSS.

As far as the crop diversification in highland is concerned, there was no clearly observable change in any of the schemes studied. Permanent crops such as coconut, and other tree crops accounted for most of the cultivated acreage in respect of highland. The cultivation of subsidiary food crops and vegetables have mainly been practised on lowlands and highlands or stabilized chenas, particularly during the Maha season. The cultivation of chenas on a commercial basis was reported by a few sample households in schemes like Ridibendiela, Huruluwewa and Nagadeepa.

As a general observation, it may be stated that there is an increasing tendency to grow cash crops both in Yala and Maha seasons, in the sample schemes, despite the lack of official data to indicate this trend. In fact, our field observations and informal interviews with farmers and officials did indicate that the actual extent cultivated with subsidiary food crops was much more than the data indicated in Table 3.6. The cultivation of high input cash crops such as chilli and onion is seen today as a more profitable enterprise than paddy cultivation by most of the sample farmers. The cultivation of subsidiary food crops, tends to increase in Yala under conditions of water deficiency and strict water scheduling under the INMAS Programme.

3.3 Farming Practices

This section attempts to discuss the changes that have occurred in farming practices over the last four years. The analysis is mainly placed on the changes that have resulted in efficiency in input use or greater production as a result of the INMAS Programme. The key variables specifically subject to analysis are method of land

preparation, plant establishment, use of high yielding varieties, application of chemical fertilizer and weed control methods and the intensity of labour use in paddy cultivation.

3.3.1 Method of Land Preparation

Although the dry land preparation is known to conserve water and reduce crop failures caused by the lack of irrigation water, it is the wet land preparation technique which has been universally adopted by farmers in the sample areas. This reveals that the method of land preparation is not related to the water supply situation. Despite the technical feasibility of the methods of dry land preparation and the scope for the popularization of the same as a water saving strategy particularly during the Maha season, the informal interviews the researchers had with the farmers revealed that most of the farmers prefer wet land preparation to dry land preparation for it reduces the cost of weed control. The uncertainty in the timing of Maha rains also discourages farmers from adopting the dry land preparation technique. On the other hand, the popularization of the technique of dry land preparation does not seem to have been given adequate attention by the Project Management. Overall, no changes have been observed in land preparation methods which could be attributed to the INMAS Programme in the sample schemes. In all areas, farmers still continue to adopt the existing wet land preparation technique.

The majority of the farmers in the sample schemes have used tractor power or animal power for land preparation. A limited extent of land has been prepared using mammoties in the Nagadeepa and Minipe schemes. Time-series data on extents of land prepared by respective methods are given in Table 3.7. It is seen that more intensive use of tractor power for land preparation has been reported in Huruluwewa, Nachchaduwa, Ridibendiela, PSS and Mee Oya, whereas animal power has been predominantly used in Minipe and Nagadeepa. There was no discernible change in the use of farm power over the reference period, excepting a slight reduction in the percentage extent prepared by the use of tractor power in PSS and a slight increase in the land extent prepared by tractor power in Nachchaduwa. The survey of farm households however, revealed a slightly different picture with regard to the selection of draught power by farmers in individual schemes. As shown in Table 3.8, the use of buffaloes for land preparation has been reported by the majority of the farmers of PSS, Kaudulla, Minipe and Nagadeepa. There also appears to be specific variations in the location. For instance, farms located at the head areas appear to

be using more buffaloe power for land preparation than those who are located at the tail areas. It is observed that the use of tractor power for land preparation is the inevitable consequence of farmers having to conform to a tight cultivation schedule which is about one month from the time of the first water issues. For farms with water problems and located at the tail-end of irrigation scheme, also the use of the tractor is not a choice but a necessity. The cultivation seasons do not indicate significant variation in the selection of different draught power sources.

Farmers could use more buffalo power for land preparation during Maha as the cultivation schedule is not so tight due to the availability of rain water. However, according to the reasons given by the farmers for the selection of various draught power sources (See Table 3.9), ownership and the availability are the key factors influencing the choice. Those who own either buffaloes or tractors tend to use these sources for land preparation. Those who hire draught power consider various other factors such as availability, quality of work, speed and profitability. Over 40 percent of the farmers who have used buffaloes in PSS, Minipe and Nagadeepa consider that the use of buffalo power is more profitable than using 4-wheel tractors. Those who wanted speedy land preparation used tractors instead of buffaloes. In terms of the quality of work, farmers always perceive the use of buffalo to be superior to the other methods. Some households have chosen 2-wheel tractors due to the non-availability of buffaloes when they are in need. This clearly indicates that the farmers still prefer buffaloes to tractors. In certain schemes like PSS, farmers have opted for buffaloes in an effort to cut down the increasing cost of tractor power.

3.3.2 Method of Planting

Broadcasting of seed has been the common method of plant establishment reported in the sample area. The other methods reported are transplanting and row seeding. Row seeding has been practised in a very limited scale in PSS, Ridibendiela and Mee Oya schemes. However, there appears to be considerable variations in the adoption of other methods across the sample schemes (See Table 3.10).

The highest extent of land under transplanting was reported from Minipe, Ridibendiela and PSS. In those schemes, transplanting has been greatly influenced by the favourable irrigation water availability. It is observed that the total extent of paddy land transplanted in all the sample schemes is generally higher in the

Maha season than it is in the Yala season. It is also higher in the head and middle reaches of the schemes than it is in the tail-end areas. For instance, the proportion of the extent transplanted in Stage I and II of the Minipe scheme is substantially higher than the Stage III and IV due to their locational advantage in terms of water availability. However, the total land extent sown with paddy has also considerably increased during the reference period in many schemes, and the explanation lies in the adoption of short-term varieties. As part of the plan to conserve water, the project management has recommended short-term paddy varieties, particularly for the Yala season which has been adhered to by the majority of farmers. It is observed that the adoption of short-term paddy varieties has adversely affected transplanting practices. This was observed in greater proportion at one time in schemes like PSS and Kaudulla.

3.3.3 Variety Adoption of New High Yielding Varieties

It is evident from the field survey data that there is the widespread adoption of New High Yielding Varieties (NHYV) of seed. None of the sample households did report the adoption of any Old High Yielding (OHY) or Traditional Varieties (TV). The most common varieties adopted were BG 34-8, BG 276-5, BG 379-2, BG 400-1 and BG 94-1. During the project period, there is a noticeable change in the direction of adopting short duration varieties. This appears to be a major outcome of the co-ordination of cultivation activities consequent to the implementation of INMAS. The varieties planted have shifted to the 3-3 1/2 months type, particularly during the Yala season. As shown in Table 3.11, over 60 percent of the farmers in Ridibendiela, Mee Oya, PSS and Nagadeepa have used 3-3 1/2 months varieties during Yala. In Kaudulla, the adoption of 3-3 1/2 months varieties is about 90 percent. However, 4-4 1/2 months varieties are still recommended for the Maha season and the majority of the farmers continue to cultivate these varieties in Maha due to the favourable availability of water.

3.3.4 Fertilizer Application

Changes in the application of fertilizer attributable to the INMAS Programme, is difficult to be established in the absence of proper time series data. The individual progress reports prepared by the Project Managers do not show any definite pattern either (See Table 3.12). Their estimate does not include fertilizer sales by private dealers. Thus, they are not an approximation of the

real quantities of fertilizer purchased and/or applied by the farmers.

In comparision, the analysis of survey data indicated a pattern in the fertilizer application by individual schemes. As shown in Table 3.13, the percentage of farmers who apply fertilizer and the percentage of paddy lands applied with all three types of recommended fertilizer vary across the sample areas. Over 90 percent of the farmers in Mee Oya, Huruluwewa, Nachchaduwa and PSS have used basal mixture (VI), whereas only a low percentage of farmers have applied VI in Nagadeepa, Kaudulla and Minipe.

The lowest percentage was in the Ridibendiela scheme. Of the three recommended types of fertilizer, the percentage of farmers applying Urea is very much higher in all the sample schemes which ranged between 88-100%, while the percentage of farmers applying TDM ranged between 50-93 percent.

The application of chemical fertilizer appears to be closely related to the availability of water. In areas where there is an assured water supply, over 90 percent of the farmers have applied chemical fertilizer. In areas where water is scarce, the application of chemical fertilizer was very much lower due to the risk factor.

The per hectare application of fertilizer which is presented in Table 3.14, clearly indicates that the application of all three types of fertilizer is relatively high in PSS and Kaudulla. There is also a clear variation in the application of fertilizer according to the season in many schemes. The quantity of fertilizer applied during Maha was relatively higher.

The level of fertilizer use also can be assessed in relation to the recommendations of the Department of Agriculture in respect of the Dry Zone districts. As shown in Table 3.14, the application of basal mixture has been well below the recommended quantity, while it was well above the recommendations in regard to the application of Urea in all schemes. TDM has been over-used in Huruluwewa, Nachchaduwa, PSS and Kaudulla.

The highest percentage of farmers who have applied basal, TDM and Urea are from the PSS, Nachchaduwa and Huruluwewa schemes. In the remaining schemes, the application of all three types of fertilizer was relatively low. Despite the application of all recommended fertilizer types, a serious imbalance in the quantity applied by many of the sample farmers was noted. The

over utilization of Urea and TDM needs to be discouraged, and the basal mixture (VI) be encouraged. The incorrect use of fertilizer may certainly have influenced the yield levels in the sample areas.

3.3.5 Weed Control

Weed control is very essential in paddy cultivation as the prevalence of weeds affect the yield levels. Weeds can also aggravate the problems of insects, diseases and pests. The degree of weed infestation is dependent upon factors such as rainfall, method of land preparation, method of plant establishment and overall field water availability.

The time series data on the methods of weed control (Table 3.15) adopted by the farmers show a spatial pattern which probably reflects the variation in water availability in individual schemes. The percentage of extent not weeded has substantially declined over the period under review in all the schemes indicating that the farmers have paid increasing attention to weed control. The data also shows that chemical weedicides have been extensively used in all the schemes, except in Minipe. The majority of the farmers in Minipe, and a substantial number in Nagadeepa, PSS and Mee Oya have adopted manual weeding. A large extent of land has been rotary weeded in Ridibendiela scheme where the transplanting has been practised extensively.

The field survey however, revealed a slightly different picture with regard to methods of weeding (See Table 3.16) adopted in sample. Farmers have adopted manual weeding in combination, very often with the spraying of weedicides. Contrary to the time series data, the practice of mechanical weeding (rotary weeding) according to the field survey, is minimal or non-existent in many schemes. The practice of manual weeding is more pronounced in schemes such as Ridibendiela, Minipe and Nagadeepa, whereas over 90 percent of the farmers have resorted to chemical weeding in Nachchaduwa, Huruluwewa and Mee Oya. A combination of both chemical and manual weeding has been reported in Minipe, Nagadeepa, PSS and Kaudulla. According to the informal interviews the researchers have had with the farmers, the adoption of chemical means of weed control is greater during Yala when water is deficient, because such environment is conducive to the spread of weed on the one hand, and flooding of fields as a method of weed control cannot be practised.

3.3.6 Labour Use

The farm household survey identified four types of labour use; viz. family labour, exchange labour, hired labour and contract labour. The practice of using family labour and hired labour is common to all the sample schemes. The use of exchange labour and contract labour was reported from the schemes of Ridibendiela, Nachchaduwa, PSS, Minipe and Kaudulla. Hired labour constitutes the highest proportion in the total labour input. However, in the Minipe and Kaudulla schemes, the use of family labour constitutes the highest proportion. As reported by the majority of farmers, the use of hired labour is essential, as family labour available for farm work during the peak activity period is generally inadequate. The imposition of a strict time schedule for water issues by the project management makes it necessary to hire labour to complete time specific operations such as land preparation and harvesting. The adoption of new high yielding varieties also necessitates farmers to use hired labour in order to maintain the required intensity of agricultural practices. The importance of hired labour in agricultural operations is also attributed to the gradual decline in the traditional system of exchange labour. The use of exchange labour was negligible in Ridibendiela, Nachchaduwa and PSS. None of the sample farmers have used exchange labour in Mee Oya. The overall adoption of exchange labour constitutes only a small proportion of the total labour input.

As shown in Table 3.17, there is a clear variation in the level of labour application across the sample schemes. Minipe and Nagadeepa represents a higher level of labour input per hecture, while relatively low labour inputs were recorded in Huruluwewa, Nachchaduwa and PSS. It is clear from the data, that the level of labour input is closely associated with the extent of farm mechanization in individual schemes. Where land preparation is done manually in combination with animal power, it absorbs the higher degree of labour. As discussed elsewhere, the use of buffaloes was highest in the Minipe and Nagadeepa schemes where the labour input per hectare was also higher. In schemes where tractorization was higher, it was reported that the total labour input per hectare was lower.

No consistent pattern was observed in labour use according to the location of farms. The highest labour use was among the farms located in the tail areas of the schemes of Ridibendiela, Huruluwewa and PSS. In the rest of the schemes, farms located in the head areas were reported to have the highest labour use. In

certain schemes, no clear differences in labour use were observed either head versus middle, or middle versus tail.

The variations in labour inputs per hectare could be generally attributed to the method of land preparation and planting, as almost all farmers use tractors for threshing and manual labour for harvesting and post-harvest operations.

As the sample data provides information on the pattern of labour use for only one cultivation season, it is impossible to explain the changes that have occurred in labour use after the implementation of the INMAS Programme. If there is any evidence of an increased intensity of farming practices, the labour requirement should also increase. Although, time series data on labour use by sample projects is not available, a closer examination of the labour input data compiled by the Department of Agriculture, pertaining to the respective districts in which the sample schemes are located, reveal some useful information on the pattern of labour use over a period of time. The estimates prepared by the Department of Agriculture are generally higher than our sample estimates, as we did not account for aftercare operations. These estimates reveal the highest labour input per hectare in the districts of Kandy and Badulla where the sample schemes of Minipe and Nagadeepa are located. Higher labour input per hectare in the two districts mentioned above are consistent with the survey findings.

However, the district data does not show any consistent pattern in labour use as the estimates vary across the time period. The labour input per hectare is generally higher during the Maha season in Polonnaruwa and Kandy. This could be attributed to the practice of transplanting in Maha. Man-days per hectare have dropped between '82 Yala and '86 Yala in Polonnaruwa, Anuradhapura, Badulla and Kurunegala whereas in Kandy an increase is seen. However, in between seasons, a large fluctuation in labour input per hectare can be observed. If one were to analyse the general trend in labour use in Yala and Maha separately, trends in labour use would appear clearly. In Polonnaruwa, the application of labour during Yala was consistently on the increase until 1984 after which a gradual decline could be observed. It also increased during the Maha seasons until 1984/85, and thereafter a sharp drop is observed. Labour inputs per hectare during Yala has consistently dropped in Anuradhapura until a slight recovery was indicated in '85 and '86 Yala seasons. Labour input per hectare has shown a downward trend in Badulla in both Yala and Maha seasons. A

consistently upward trend in labour use can be seen during Yala and Maha in Kandy with the exception of the '84/'85 Maha seasons. A downward trend in labour input during Maha was also reported in Kurunegala. However, this trend was not clear-cut during Yala in Kurunegala.

There are two possible reasons for the downward trend in labour application in the districts under review. One, is the mechanization of land preparation activities which were labour intensive at one time. The other reason is the gradual decline in transplanting practices due to the greater adoption of short-term paddy varieties. After the implementation of INMAS, the project management has been particularly successful in encouraging the farmers to cultivate short duration varieties. This has adversely affected the transplanting practices, and consequently the intensity of per hectare labour application has fallen.

3.3.7 Adherence to the Cultivation Calendar

Adherence to the cultivation calendar decided upon at the "Kanna" meeting, is a necessary pre-condition for effective water management. The percentage of farmers who adhered to a common cultivation calendar, vary across the sample schemes (See Table 3.19). Over 90 percent of the farmers reported adherence to a common cultivation schedule in Nachchaduwa, Huruluwewa and Nagadeepa. In the rest of the schemes it was relatively low. In all schemes, over 67 percent of the sample farmers have adhered to the decisions taken at the Kanna meeting. The delay in land preparation activities was the main reason for any deviation. The other decisions taken at the Kanna meeting are generally adhered to by the majority of the sample farmers. For example, only a few farmers have adopted long duration varieties in the Yala season disregarding the Kanna meeting decision. Those who cultivate long duration varieties generally run into problems as the water scheduling was geared to the short-term varieties. The reasons given for delaying land preparation are many, yet the most significant reason was the lack of irrigation water in many schemes. The other reasons were the non-availability of labour or farm power when required, lack of working capital and family problems.

A closer examination of the scheduled date and the actual date of the first water issue between the '84/'85 Maha and '88 Yala season clearly indicate that the project management has been able to keep the scheduled date of the first water issue with minor

deviations. The final date of water issue in certain seasons however, had been extended marginally in order to save any standing crop. It was observed during the field survey that strict water scheduling has encouraged the timeliness of land preparation and cultivation of short duration paddy varieties, particularly during the Yala season. Agronomically, this is a very healthy factor in overcoming pest problems frequently encountered in major irrigation schemes. According to the field survey, the staggering of the cultivation season has significantly been reduced in the Huruluwewa, Nachchaduwa, Nagadeepa and Ridibendiela schemes, while in other schemes, improvements have been observed. This could be treated as a significant outcome of the INMAS Programme.

3.4 Paddy Yield

The average yields of the sample schemes, both prior to and after the implementation of the INMAS Programme, forms an important element in the assessment of the impact of the project on paddy production. The district estimates on the average yield prepared by the Department of Agriculture provide the time series data required for the analysis. The progress reports prepared by the Project Managers also provide some data on a project basis for such analysis.

It will be seen that the overall yield data given for each district (Table 3.20) and specific schemes (Table 3.21 and 3.22) do not show a consistently upward trend during the reference period. In fact, yields have varied widely during this period. In the circumstances, no definite conclusion can be arrived at regarding the effect of the INMAS on yield level. The seasonal fluctuations in yield levels appear to have been influenced more by the climatic factors rather than any substantial change in the farm management practices. The highest yield levels were in the range of 170-270 bushels per ha. reported in PSS, Minipe, Nachchaduwa, Kaudulla and Nagadeepa schemes where the variations were relatively less. The lowest yield levels were in the range of 100-170 bushels per ha. reported from Huruluwewa, Ridibendiela and Mee Oya schemes. In the Maha season, in particular, the average yield exceeded 170 bushels per ha. in most schemes. It should also be noted that some individual allotments have reported yields of over 370 bushels per hectare.

According to the relevant district yield estimates prepared by the Department of Agriculture, the highest yield levels have been reported from the districts of Polonnaruwa and Kurunegala, whereas the yield levels were relatively low in Kandy, Anuradhapura and Badulla

districts. Those estimates closely correspond to the estimates prepared by the Project Managers of the PSS and Kaudulla schemes which belong to the Polonnaruwa district. However, some major deviations from district estimates have been recorded in respect of other schemes. As it is difficult to observe any consistent changes in the yield levels in sample schemes during the reference period, it is not possible to assess the impact of the INMAS Programme on yield levels. However, some sample schemes have been able to maintain higher yield levels fairly consistently over the reference period.

3.5 Cost of Paddy Production

The cost of production of paddy for each scheme was calculated from the data recorded in the farm survey. In addition, the cost estimates prepared by the Department of Agriculture were analysed to identify the general trends in the cost of production of paddy in the districts where the sample areas are located.

Table 3.23 explains the variability of production cost by scheme. The computation procedure in cost calculation can be briefly described as follows : Each scheme was considered as one unit of farm in order to obtain an average cost per hectare. Thus, the present analysis is essentially a situational report of production costs. The cost incurred by individual farmers for each cost item was added and divided by the total extent of farms included in the analysis. The major input categories identified in the cost computation were labour, fertilizer, agro-chemical, seed paddy, buffaloes and tractors. The labour inputs were further divided into four categories viz. family, hired, exchange and contract. Cost of weedicides, insecticides and pesticides were grouped under agro-chemicals. Certain input categories were divided into two components such as own resources and hired resources. The own resources were imputed by an average unit cost computed on the basis of actual cost incurred on purchased item by each individual farmer. The family and exchange labour have been valued at the average wage rate computed for hired labour in each scheme.

Analysis of use of inputs shows that labour is the highest cost component in all schemes ranging between 44.9 to 67.6 percent. The labour cost accounted for over 50 percent of the total production cost in PSS, Minipe, Nagadeepa and Kaudulla, and 67.6 percent of the total cost in Nagadeepa. A relatively high value of this input is partly associated with an intensive use of labour. A greater use of labour for land preparation due to extensive use of buffaloes was noted in Minipe and Nagadeepa. In the other two schemes, the higher wage rate is the major contributory factor for higher labour cost. In

Polonnaruwa, wage rates have increased from Rs.22-23 in 1982 to Rs.34-52 in 1986. Tractor charges ranging from 3.26% are reported to be the second highest cost item in many schemes. The lowest tractor cost was in Minipe and Nagadeepa, whereas, the highest was in Huruluwea. The other important cost items were fertilizer, followed by buffaloes, seed paddy and agro-chemicals in many schemes. In Minipe and Nagadeepa, the cost of buffaloes constituted the second highest cost item followed by fertilizer, seed paddy or agro-chemicals, and tractor cost.

The total production cost ranged between Rs.6506/= to Rs.10,506/= across the sample schemes. The highest production cost was reported in the Nagadeepa scheme where the labour cost was high. However, it should be noted that the family labour constitutes the bulk of the labour cost in Nagadeepa. The lowest production cost was recorded in Mee Oya. The variations in production cost appear to be closely associated with the intensity of agricultural activities. The maximum intensity of agricultural activities was reported in PSS, Nachchaduwa, Kaudulla and Nagadeepa schemes. These variations are also reflected by seasons, as the intensity of agricultural activities is generally higher during the Maha season.

Table 3.24 gives the overall summary of financial costs, returns and profitability measured in terms of net income per hectare, returns per man-day and cost returns ratio with respect to each sample schemes.

From the data presented in the table, it is clear that there is a marked variation in profitability levels in individual schemes. The farmers in Nachchaduwa, Kaudulla and PSS recorded the highest net return per hectare, whereas negative returns were recorded in Ridibendiela, Nagadeepa and Minipe schemes. The poor yield level is mainly responsible for the negative returns in Ridibendiela and Minipe, whereas in Nagadeepa, a comparatively higher labour cost accounted for the negative returns. The estimated returns per man-day also considerably vary across the sample schemes. The net return per man-day appear to be very much below the prevailing wage rates in all the sample schemes excepting Nachchaduwa. However, it is interesting to note positive returns in all schemes when the cost of family and exchange labour is excluded from the total production cost. Thus, profitability from paddy cultivation in many sample schemes would turn out to be negative, if the contribution of family and exchange labour in the total labour input was considered. Therefore, the profitability in paddy farming in many schemes can be treated as wages for the contribution of their family labour.

The district level time series estimates on costs and returns relating to paddy cultivation for the period between 1982 and 1986 Yala, provides indications of its profitability as an economic pursuit (See Table 3.25). According to these estimates, the total cost (inclusive of the value of non-cash inputs) of paddy production per hectare in the 1982 Yala season, ranged between Rs.5,914/= to Rs.7,807/=, since then, it has been increasing steadily during the period under review. The respective figures for 1986 Yala ranged from Rs.9,131/= to Rs.11,148/=, thus indicating a general upward trend. The main factor behind this trend is the escalation of the price level of inputs, particularly wage labour.

It is observed that there has been a gradual erosion in the net returns per hectare between 1982 Yala and 1986 Yala. In Polonnaruwa, the net returns per hectare has come down from Rs.5,746/= in 1982 Yala to Rs.3,174/= in 1985 Yala. The other districts also recorded a similar drop. This is attributed to the escalation of prices of most of the production inputs which were not met by a corresponding increase in the farm gate price of rice. The guaranteed price scheme has been largely ineffective, and the average farm gate price has been determined by the market forces which in many respects were unfavourable to the producer. According to the estimates of the Department of Agriculture, the average price of paddy has remained in the range of Rs.60-70 per bushel during the 1982-1986 period.

In Yala 1982, the net returns per investment of one rupee in paddy production was 0.83 cents in the Polonnaruwa district. This had gradually declined to 0.33 cents in 1986 Yala season with marginal variations in between seasons. The same declining trend is observed in the estimates of the districts of Anuradhapura, Badulla and Kandy. The survey revealed low returns per investment of Re.1/=, ranging from -0.15 cents to 0.62 cents in respect of the '87 Yala and '86/'87 Maha seasons. Therefore, paddy cultivation cannot be treated as a profitable investment by any standard

3.6 Collection of O&M Fees

The operation and maintenance fee was first introduced in 1984. This was a specific fee levied on water users in major irrigation schemes. The fee was fixed initially at Rs.100/= per acre with an annual envisaged increase of Rs.20/= per acre per year until 1990, when the full O&M cost of Rs.200/= would have been recovered from the beneficiaries. Until such time , the government was expected to provide the balance of funds needed to meet the O&M costs. In all

irrigated areas outside the Mahaweli, the responsibility for the collection of O&M funds rests with the Ministry of Lands and Land Development. The Government Agents of the respective districts have utilised the services of public officers to serve as collectors. The new project management initiated under the INMAS Programme, expected to co-ordinate the activities of O&M collection within the scheme.

According to the records, the total amount collected as percent of the target for the years of 1984, 1985, 1986 and 1987 stand at Rs.1.85 m (49.2%), Rs.8.4m (17.5%), Rs.4.2m (11.5%) and Rs.1.6m (2.7%) respectively. The total collection for the reference period was Rs.32.8m, whereas the target for all four years was Rs.154m.

The survey revealed that, only 37 percent of the sample farmers have paid O&M fees at least once, since the Programme was initiated in 1984 (See Table 3.26). However, there are variations in the rate of payments across the sample schemes. The highest rate of O&M recovery was reported from the Kaudulla scheme where 98 percent of the farmers have paid O&M fees at least once, since the commencement of the Programme in 1984. Nachchaduwa and Huruluwewa also recorded high rates of payments of O&M fees, whereas it was much lower in the Ridibendiela and Mee Oya schemes. The lowest rate was reported in the control schemes (Ridiyagama and Siyambalangamuwa). Exemptions of O&M payments were allowed in schemes like Mee Oya due to non-cultivation in the subsequent years. In fact, this could be the major reason for the low rate of payments in Mee Oya.

The high rate of payments of O&M fees at the initial stages in all the sample schemes could be attributed to the following :

i. Establishment of new institutional apparatus such as farmer organisations and various committees under the INMAS Programme which raised the expectations of the farmers.

ii. All the key Government Officials at the district level and newly appointed Project Managers at the project level, paid utmost attention to the recovery of O&M fees.

iii. The collectors also took a keen interest on maximum recovery as they were paid commission in proportion to their total collection.

iv. Preparation of a priority list for irrigation rehabilitation and maintenance activities in concurrence with the farmers.

v. Fear of possible legal actions against the defaulters.

It is observed that this enthusiasm declined in subsequent years.

The survey revealed that the farmers' perceptions have also had an influence over the payment or non-payment of the O&M fees. As shown in Table 3.27, 30% of the farmers believe that O&M rates are government taxes levied on them for the use of irrigation water. Over 50 percent of the farmers in Mee Oya and Siyambalangamuwa share this view. In the remaining schemes, except for the control schemes, the majority of the farmers are well aware of the objectives behind the collection of the O&M rate. The lack of awareness in the control schemes could be partly attributed to the lack of the services of Project Managers. However, the survey revealed that even in the INMAS projects, the Project Managers have given low priority to the collection of O&M fees, in their time allocation for various project activities. The efforts of the Project Managers in this connection have been limited to making announcements and publicizing the objectives of the collection of O&M fees at the "Kanna" meetings or at the training classes for farmers. In schemes like Kaudulla, for example, the farmers have been asked to pay O&M rates prior to undertaking the "Bethma" system of cultivation, which may probably have influenced the higher rate of recovery in this scheme. The survey of officers of the Line Agencies revealed various reasons for the non-payment of O&M fees by farmers. Over 35% of the officers believe that defaulting is due to genuine reasons like low yield, low income and non-cultivation on account of lack of water (See Table 3.28). Above all, the shortcomings in the legislation for recoveries have given ample opportunities for the farmers including those who have the capacity to pay O&M rates to evade payment. On many occasions, farmers have paid up, to avoid legal action. However, many cases of default have been dismissed in the recent past by the courts on the grounds that the Magistrates have no authority to hear such complaints, and this has had an adverse effect on the recovery of O&M fees.

Table 3.29 which presents the reasons for non-payment as reported by the farmers shows that the reasons for non-payment varies across the sample schemes. In Ridibendiela scheme, the majority of the farmers stated that they do not pay O&M fees because their fellow farmers do not pay. In several other schemes like Mee Oya, PSS, Kaudulla, Minipe and Nachchaduwa, there has been an organised political campaign to discourage the payment of O&M fees which paralysed the progress in recoveries even in the schemes where the recoveries were high at one time. Other reasons given by the farmers

include crop failures, non-cultivation and low income. However, a higher percentage of farmers in all schemes are of the opinion that, O&M rates are too high for them to pay at every season. In several schemes, farmers expressed their dissatisfaction of the present method of mobilization of funds. Farmers in schemes like Huruluwewa, Mee Oya, PSS, Nagadeepa, Siyambalangamuwa and Ridiyagama for example, are of the view, that operation and maintenance is the duty of the government, and the government should take care of these activities through its own funds.

The reasons for the dis-inclination among farmers towards non-payment in recent years have been largely attributed to the disturbances in the country. The subversive activities have particularly paralysed the organisation of O&M collection. In a number of areas the collectors as well as the contributors have been threatened.

The recoveries could be improved, if the farmers are allowed to make the payment in kind or by manual labour. Farmer organisations should also be strengthened and given more responsibility in the collection and management of O&M funds. As many farmers believe that the O&M fee is unreasonably high, the farmer organisation should be allowed to decide on an appropriate fee collectively for their area of authority. The officers of farmer organisations should be trained in O&M collection and management in order to ensure professionalism. The commissions to which the collectors are entitled should also be made available to the farmer organisations as an incentive. The publicity programmes on O&M collection should also be revitalised to instill a proper understanding of the programme among the beneficiaries. Defaulters and regular contributors should not be treated alike in issuing land titles, resolution of land and irrigation problems. By this differentiation, perhaps recoveries could be improved. The project management should help farmer organisations in progress monitoring in O&M collection in order to take appropriate remedial measures in the event of any set-back.

The legal procedures on O&M recoveries should also be reviewed in their entirety and necessary amendments be made to the Irrigation Ordinance, as it is vital to achieve the objectives of the O&M collections.

3.7 Farm Supporting Services

The main departments in charge of providing farm supporting services to the major irrigation schemes coming under the INMAS Programme, are the Agrarian Services Department and the Agriculture

Department. Other relevant agencies include the Department of Co-operative Development, the Paddy Marketing Board, the two State Banks (the People's Bank and the Bank of Ceylon) and the Agricultural Development Authority.

The Department of Agriculture mainly concentrates on the extension system for paddy and other crops. The Agrarian Services Department, through its Agrarian Services Centres provide basic inputs such as fertilizer, agro-chemicals and seeds. (The Agricultural Development Authority is also responsible for co-ordination of input supplies on an electoral basis).

The main inputs required by the farmers through institutional sources are fertilizer, agro-chemicals, seeds and credit. The timely and adequate supply of these inputs is essential for adhering to the common cultivation schedule that is decided at the "Kanna" meeting. According to the farm household survey, the majority of the farmers believe that fertilizer and agro-chemicals are adequately available in their respective schemes (See Table 3.30). As far as the availability of seed paddy and access to institutional credit are concerned, a sizeable proportion of the farmers are faced with difficulties in getting these inputs in line. Although the majority of the farmers produce their own seed requirements or obtain it informally from fellow farmers who have them in adequate quantities, very often problems arise due to the short supply of a particular type of seed variety recommended for the crop season. With regard to the availability of credit, less than 50 percent of the sample households in Huruluwewa, PSS and Minipe reported credit is adequately available in their respective schemes. The majority of the farmers in other schemes reported that credit is either not available or difficult to obtain in time. Researcher's observations suggest that only a small percentage of farmers have obtained institutional credit in these schemes as the majority of the farmers have defaulted in the repayment of cultivation loans taken earlier. These farmers are reported to have a greater dependancy on non-institutional credit, paying exorbitant rates of interest ranging from 20-25% per month.

Overall, the availability of all production inputs are reported to be generally satisfactory in Kaudulla, Nachchaduwa, Nagadeepa and Huruluwewa, whereas it was relatively poor in the Minipe scheme.

The farm household survey showed that the private traders are the main suppliers of key agricultural inputs in all the schemes, excepting PSS and Nagadeepa (See Table 3.31). The farmers who are eligible for institutional credit generally get their agricultural inputs from

institutional sources. Those who go to the private dealers for the purchase of inputs give weightage to the fact that they can obtain their requirements whenever necessary. Some farmers prefer private dealers to institutional sources due to other reasons such as (a) the possibility of purchasing the input requirements on credit to be settled after the harvest; and (b) the distance from the field to the Agrarian Services Centres and the additional cost of transport involved.

As regards marketing of produce, it is observed that marketing has not received due attention from the project management. The institutional marketing arrangements, and the general pricing policies have not been favourable to the producer. The greatest problems experienced by the farmers are :

(a) Low prices during harvesting time
(b) Lack of suitable purchasing points

The majority of the farmers reported that the sale of paddy to the Paddy Marketing Board has become more difficult in the past three years. Consequently, the majority sell their produce to the private traders. However, some farmers opt for the private traders due to several other reasons. Unlike the State Institutions, the private traders are not very strict on quality control requirements, and they make payment immediately and even make purchases at the farm gate. Over 50 percent of the farmers in Ridibendiela, Nachchaduwa and PSS have indicated that marketing of produce have improved over the past three years, while farmers in other schemes reported that marketing facilities have decreased or remained the same.

Table 3.1 Extent of Paddy Lands Under Irrigation

	P.S.S	Nachcha-duwa	Mee-Oya	Huruluwewa	Ridibendiela	Nagadeepa	Minipe	Kaudulla
	Ha	Ha	Ha	Ha	Ha	Ha	Ha	Ha
Extent irrigated (specified)	7945	2474	2230	3490	2038	1619	4245	4272
Extent irrigated (Gross)	10160	2747	3034	3850	2400	1781	6104	4856
Additional extent irrigated as a % of extent irrigated (specified)	28	11	36	10	18	10	44	14

Source : Progress Reports of Project Managers

Table 3.2 Cropping Intensity of Paddy

S c h e m e	85 Yala	86 Yala	87 Yala	88 Yala
P.S.S.	88	91	93	91
Nachchaduwa	56	40	07	59
Mee Oya	n.a	21	0	43
Huruluwewa	0	0	0	n.a
Ridibandiela	99	85	59	67
Nagadeepa	0	0	24	n.a
Minipe	83	80	74	93
Kaudulla	n.a	92	29	49

n.a Not Available

No Crops = 0

Source : Progress Reports of Project Managers

Table 3.3 **Extent of Crop Failure**
(Percentage from the Total Cultivated Extent)

Scheme	Seasons							
	88	87/88	87	86/87	86	85/86	85	84/85
Nagadeepa	NC	0	03	0	NA	0	NA	02
Ridibendiela	04	0	03	0	05	03	0	NS
Minipe	0	06	15	0	02	0	0	0
Mee-Oya	0	05	NC	14	02	07	NC	NA
Huruluwewa	NC	10	NC	0	NC	04	NC	02
Nachchaduwa	0	02	03	0	0	0	0	NA
Kaudulla	03	10	08	02	NA	NA	NA	NA
P.S.S.	0	0	0	0	0	07	0	0

NA = Not Available

NC = No Cultivation

Source : Progress Report of Project Managers

Table 3.4 **Percentage of Farmers Reported**

Scheme	Crop Damages				
	87	86/87	86	85/86	85
Ridibendiela	50	48	49	47	46
Mee-Oya	NC	50	43	42	NC
Huruluwewa	NC	31	NC	32	NC
Nachchaduwa	NC	31	37	33	33
P.S.S.	34	32	31	28	21
Minipe	52	44	49	40	48
Nagadeepa	NC	30	NC	31	NC
Kaudulla	48	44	43	47	46

Source : Survey of Farm Households

Table 3.5 Reasons for Crop Damages Reported by Farmers (in Percentages)

Reason	Ridiyagama		Mee-Oya		Nuruluwewa		Nachchaduwa		PSS		Minipe		Nagadeepa		Kaudulla	
	87 Y	86/87 M	87 Y	86/87 M	87 Y	86/87 M	87 Y	86/87 M	87 Y	86/87 M	87 Y	86/87 M	87 Y	86/87 M	87 Y	86/87 M
Lack of irrigation	11	17	-	03	-	49	-	43	80	47	69	27	-	48	77	48
Insect/Pest attack	01	-	-	-	-	-	-	24	21	42	11	55	-	57	8	33
Floods/Rains	-	-	-	-	-	24	-	19	-	12	01	25	-	03	-	-
Drought	98	92	-	97	-	33	-	10	-	-	03	-	-	09	16	21
Other	-	-	-	-	-	-	-	-	02	-	-	-	-	-	-	-
N	58	56	-	20	-	21	-	34	28	26	69	59	9	29	51	47

* Percentage sum to more than 100 because of multiple answers.

Source : Survey of Farm Households.

Table 3.6 Cultivation of SFC During Yala Season (Hectares)

Scheme		88 Yala	87 Yala	86 Yala	85 Yala
PSS	- Irrigated	243	332	588	630
	- Non-Irrigated	-	23	49	-
Nachchaduwa	- Irrigated	23	-	-	56
	- Non-Irrigated	-	-	-	10
Mee-Oya	- Irrigated	150	399	N.A	N.A
	- Non-Irrigated	-	178	N.A	N.A
Huruluwewa	- Irrigated	N.A	545	1010	N.A
	- Non-Irrigated	-	-	-	N.A.
Ridiyagama	- Irrigated	134	221	121	115
	- Non-Irrigated	-	-	-	-
Nagadeepa	- Irrigated	N.A	628	1619	N.A
	- Non-Irrigated	-	-	-	-
Minipe	- Irrigated	352	250	1031	580
	- Non-Irrigated	-	-	-	-
Kaudulla		N.A	N.A	N.A	N.A

N.A = Not Available

Source : Progress Reports of Project Managers.

Table 3.7 Use of Farm Power for Land Preparation (Percentage Extent)

Season	PSS			Hurulunewa			Nachchaduwa			Ridibendiela			Nagadeepa			Kadulla			Mee-Oya			Minipe		
	B	M	T	B	M	T	B	M	T	B	M	T	B	M	T	B	M	T	B	M	T	B	M	T
88	39	-	61	-	-	-	20	-	80	-	-	-	-	-	-	60		40	12	-	88	89	-	11
87/88	47	-	53	03	-	97	15	-	85	10	-	90	93	03	04	40	-	60	11	-	89	91	01	08
87	44	-	56	-	-	-	-	-	-	20	-	80	100	-	-	23	-	77	-	-	-	75	01	24
86/87	42	-	58	03	-	97	18	-	82	40	-	60	93	04	03	-	-	-	31	-	69	86	01	13
86	37	-	63	-	-	-	21	-	79	33	-	67	-	-	-	41	-	59	-	-	-	87	01	12
85/86	40	-	60	20	-	80	24	-	76	27	-	73	95	01	04	-	-	-	11	-	89	84	02	14
85	34	-	66	-	-	-	35	-	65	15	-	85	-	-	-	-	-	-	-	-	-	97	01	02
84/85	03	-	97	06	0	94	27	-	73	-	-	-	70	19	11	-	-	-	-	-	-	94	01	05

B = Buffalo ploughed M = Mammoty ploughed T = Tractor ploughed

Source : Progress Reports of Project Managers

Table 3.8 **Selection of Draught Power for Land Preparation (Percentage Farmers)**

Location	Ridibondiela			Mee-Oya			Huruluwewa				Nachchaduwa				PSS				Minipe			Nagadeepa			Kaudulla		
	B	2WT	4WT	B	2WT	4WT	B	2WT	4WT	com	B	2WT	4WT	com	B	2WT	4WT	com	B	2WT	4WT	B	2WT	4WT	B	2WT	4WT
Head	51	49	-	19	81	-	11	47	34	08	08	84	06	02	76	24	-	-	100	-	-	100	-	-	90	10	-
Middle	14	86	-	-	100	-	07	57	29	07	04	93	03	-	25	65	10	-	100	-	-	100	-	-	64	36	-
Tail	17	83	-	-	100	-	-	69	31	-	11	85	04	-	67	29	-	24	98	02	-	100	-	-	66	34	-
All	27	73	-	08	82	-	-	07	54	32	07	08	86	05	01	61	35	02	02	99	01	100	-	-	72	28	-
N		115			40			68				103				82				132			98			110	
Reference season	87 Yala			85 Yala			86/87 Maha				86/87 Maha				87 Yala				87 Yala			87 Yala			87 Yala		

B = Buffalo 2WT = 2-Wheel Tractor 4WT = 4-Wheel Tractor

com = combination of different sources

Source: Survey of Farm Households

Table 3.9 Reasons for the Selection of Various Draught Power Given by Farmers (in Percentages)

Kaudulla	Ridibendiela		Nae-Oya		Huruluwewa			Nachchaduwa			PSS			Minipe		Nagadeepa		
	B	2WT	B	2WT	B	2WT	4WT	B	2WT	4WT	B	2WT	4WT	B	2WT	B		B
2WT																		
1. Buffaloes not available when in need	-	07	-	08	-	05	-	-	04	-	-	14	-	-	-	-	-	-
2. 2WT/4WT not available when in need	-	-	-	-	20	-	-	-	-	-	04	-	-	04	-	04	-	-
3. Readily available	07	54	-	38	40	78	86	25	52	40	16	07	-	73	-	81	42	62
4. Due to ownership	63	29	100	14	100	22	23	50	17	40	42	66	-	61	100	40	68	42
5. More profitable than other methods	10	-	-	03	-	-	-	26	08	-	42	-	-	60	-	41	-	-
6. Superior in quality of work	60	15	-	-	20	03	-	-	11	60	02	-	-	01	-	10	-	-
7. Faster	-	63	-	41	-	-	05	-	08	-	-	17	50	-	-	02	-	-
8. Others	20	11	-	-	-	-	-	-	03	-	04	-	-	16	-	04	-	-
N	31	84	03	37	05	37	22	08	89	05	50	29	02	131	01	98	79	31

B = Buffalo 2WT = 2-Wheel Tractor 4WT = 4-Wheel Tractor

Source : Survey of Farm Households

Table 3.10 Method of Planting (Percentage Extent Planted)

Season	PSS			Hurulu-eeva			Nachchaduwa			Ridibendiela			Nagadeepa			Kaudulla			Nee-Oya			Minipe		
	S	R	T	S	R	T	S	R	T	S	R	T	S	R	T	S	R	T	S	R	T	S	R	T
88	80	01	19	-	-	-	100	-	-	10	-	90	-	-	-	100	-	-	97	-	03	25	-	75
87/88	NA	NA	NA	95	-	05	89	-	11	18	02	80	80	-	20	77	-	22	89	-	11	14	-	84
87	56	01	43	-	-	-	100	-	-	96	-	04	100	-	-	100	-	-	-	-	-	31	-	69
86/87	32	-	68	94	-	16	83	-	17	04	-	96	78	-	22	NA	NA	NA	76	03	21	09	-	91
86	74	01	25	-	-	-	100	-	-	07	02	91	-	-	-	NA	NA	NA	-	-	-	18	-	82
85/86	33	-	67	86	-	14	58	-	52	06	05	79	75	-	25	NA	NA	NA	29	-	71	16	-	84
85	NA	NA	NA	-	-	-	100	-	-	21	08	71	-	-	-	-	NA	-	-	-	-	44	-	56
84/85	25	01	74	99	-	01	79	-	21	-	-	-	100	-	-	-	NA	-	-	NA	-	40	-	60

S = Sowing R = Row seeding T = Transplanting

Source : Progress Reports of Project Managers

Table 3.11

Duration of Paddy Varieties

(Percentage of Extent Planted and Percentage of Farmers Planted)

Duration (in Months)	Ridibendiela		Mee-Oya		Huruluwewa		Nachchaduwa		PSS		Minipe		Nagadeepa		Kaudulla	
	F	E	F	E	F	E	F	E	F	E	F	E	F	E	F	E
3	41	44	58	58	12	10	11	06	64	58	21	20	38	39	85	85
3 1/2	22	17	05	07	10	09	04	02	02	02	30	30	30	27	05	03
4 - 4 1/2	24	23	35	32	78	81	85	92	39	40	49	50	32	34	10	12
Not specified	13	16	02	03	-	-	-	-	-	-	-	-	-	-	-	-
All	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	87 Yala		85 Yala		86/87 Maha		86/87 Maha		87 Yala		87 Yala		87 Yala		87 Yala	

Source : Survey of Farm Households

Table 3.12

Fertilizer Use by Types

	PSS				Nachchaduwa				Ridibandiela				Minipe			
	Area cultivated Ha	V_1	TDM Mt	Urea	Area cultivated Ha	V_1	TDM Mt	Urea	Area cultivated Ha	V_1	TDM Mt	Urea	Area cultivated Ha	V_1	TDM Mt	Urea
84/85	10500	500	540	1000	2747	340	340	340	-	-	-	-	5726	388	445	201
85	8906	894	148	119	1535	40	80	90	2372	310	280	225	4937	285	153	431
85/86	10117	1219	977	1212	2747	399	300	175	2400	448	300	300	5901	446	237	530
86	9226	798	596	650	1111	110	102	65	2032	448	140	300	4819	343	175	398
86/87	10120	1295	726	1320	2747	300	353	200	2400	360	240	240	6073	547	418	634
87	9406	870	791	726	202	08	06	04	1410	225	90	200	4534	362	222	354
87/88	10160	1058	930	1400	2747	340	201	139	398	414	350	360	6101	635	570	570
88	9214	649	350	386	1620	225	110	125	1600	200	200	200	5672	497	380	438

Source : Progress Reports of Project Managers

Table 3.13 Application of Fertilizer (Percentage of Farmers and Percentage of Extent)

Type of Fertilizer	Ridibendiela		Mee-Oya		Hurulumeva		Nochchaduwa		PSS		Minipe		Nagadeepa		Kaudulla	
	E.R.	F.A.	E.R.	F.A.	E.R.	F.A.	E.R.	F.A.	E.R.	F.A.	E.R.	F.A.	E.R.	F.A.	E.R.	F.A.
V_1	60	64	92	98	95	97	96	91	91	90	76	80	67	68	74	78
Urea	94	97	93	100	97	99	97	98	98	99	86	90	88	88	62	88
TDM	62	59	66	70	86	88	91	87	92	93	69	73	58	59	43	73

E.R. = Extent Received

F.A. = Farmers Applied

Source : Survey of Farm Households

Table 3.14

Per Hectare Application of Fertilizer (Kg)

Type of Fertilizer	Ridibendiela	Mee-Oya	Hurulunwara	Nachchaduwa	PSS	Minipe	Nagadeepa	Kaudulla
V_1	140	139	166	151	151	127	131	137
Urea	128	112	162	146	146	122	111	125
TDM	124	115	145	133	138	122	108	137

Recommended quantity per hectare by the Department of Agriculture :

V_1 = 185 kg TDM = 124 kg Urea = 93 kg

Source : Survey of Farm Households

Table 3.15

Method of Weeding by Extent (in Percentages)

Season	PSS				Hurulluwewa				Nachchaduwa				Ridiyagama				Nagadeepa				Kaudulla				Mee-Oya				Minipe			
	H	R	C	N	H	R	C	N	H	R	C	N	H	R	C	N	H	R	C	N	H	R	C	N	H	R	C	N	H	R	C	N
88	35	01	13	-	-	-	-	-	-	100	-	-	-	77	08	15	-	-	-	-	17	-	83	-	98	01	01	-	74	01	25	-
87/88	31	01	50	18	03	-	68	29	07	01	88	04	36	01	56	07	51	01	56	07	51	02	40	07	-	03	-	97	84	02	14	-
87	27	01	36	36	-	-	-	-	-	-	100	-	-	-	NA	-	69	-	31	-	29	-	29	42	-	-	-	-	73	-	13	15
86/87	31	01	46	22	02	-	68	30	18	-	82	-	15	81	04	-	41	01	47	11	-	-	-	-	07	07	86	-	70	-	27	03
86	19	01	39	41	-	-	-	-	-	-	100	-	21	70	07	02	-	-	-	-	-	-	-	NA	-	-	-	-	68	-	27	05
85/86	21	02	33	44	07	-	49	44	18	-	82	-	08	75	06	11	41	01	53	05	-	-	-	NA	26	20	54	-	74	01	25	-
85	-	-	NA	-	-	-	-	-	33	-	-	34	63	06	17	14	-	-	-	-	-	-	-	NA	-	-	-	-	50	-	50	-
84/85	-	-	NA	-	-	-	NA	-	-	-	-	NA	-	-	NA	-	60	01	21	18	-	-	NA	-	-	-	-	-	36	-	16	48

H = Hand weeded
R = Rotary weeded
C = Chemically weeded
N = Not weeded

Source : Progress Report of Project Managers

Table 3.16 Method of Weeding (in Percentages)

Method	Ridibendiela		Mee-Oya		Huruluwewa		Nachchaduwa		PSS		Minipe		Nagadeepa		Kaudulla	
	F	E	F	E	F	E	F	E	F	E	F	E	F	E	F	E
Manual	61	57	33	17	22	08	02	01	20	21	59	58	64	58	23	20
Mechanical	07	06	-	-	-	-	02	02	01	01	-	-	-	-	-	-
Chemical	56	60	90	87	99	98	95	98	65	8	56	52	59	61	68	71
Not done	05	05	03	02	-	-	02	01	21	19	03	03	02	01	11	15

* Percentage sum to more than 100% because of multiple answers

Source : Survey Farm Households

Table 3.17

Mandays Per Hectare by Districts

	82	82/83	83	83/84	84	84/85	85	85/86	86
Polonnaruwa	106.1	130.0	112.4	148.5	123.1	184.7	119.4	87.3	99.3
Anuradhapura	182.2	117.4	144.5	117.9	103.1	94.8	108.3	137.2	168.5
Badulla	200.6	206.2	214.3	190.1	212.3	183.9	173.0	172.3	143.0
Kandy	140.9	162.0	158.4	196.8	178.4	186.3	183.2	202.7	227.1
Kurunegala	204.7	182.6	103.7	161.3	103.4	147.5	143.8	139.7	187.6

Source : Department of Agriculture

Table 3.18 Mandays Per Hectare By Scheme and Location

	Ridibeddiela	Mee-Oya	Huruluwewa	Nachchaduwa	PSS	Minipe	Nagadeepa	Kaudulla
Head	94.3	111.5	64.9	82.1	92.2	131.9	184.6	139.7
Middle	113.1	80.6	68.1	79.2	74.7	120.5	184.1	98.3
Tail	114.5	71.7	75.9	68.4	98.4	104.3	133.0	84.1
All	108.1	90.0	68.6	78.3	88.5	125.3	172.2	97.8

Source : Survey of Farm Households

Table 3.19 Adherence to the Cultivation Season

Scheme	Percentage farmers adhered to the cultivation calendar	Percentage farmers delayed cultivation
Ridibendiela	88	12
Mee-Oya	65	35
Huruluwewa	98	02
Nachchaduwa	97	03
PSS	66	34
Minipe	45	55
Nagadeepa	92	08
Kaudulla	67	33
All Schemes	67	23

Source : Farm Household Survey

Table 3.20

Paddy Yield by Districts (Bushels Per Acre)

District	83 Yala	83/84 Maha	84 Yala	84/85 Maha	85 Yala	85/86 Maha	86 Yala
Polonnaruwa	80	78	72	87	77	95	70
Anuradhapura	71	65	63	73	64	70	61
Badulla	67	68	64	70	66	94	69
Kandy	64	78	54	66	68	80	70
Kurunegala	64	79	65	83	84	84	67

Source : Department of Census and Statistics

Table 3.21 Paddy Yield by Sample Projects (Bushels Per Acre)

District	Scheme	84/85 Maha	85 Yala	85/86 Maha	86 Yala	86/87 Maha	87 Yala	87/88 Maha	88 Yala
Polonnaruwa	PSS	-	85	91	80	95	85	100	-
Anuradhapura	Huruluwewa	45	-	-	-	90	-	50	-
	Nachchaduwa	-	60	100	90	110	-	70	65
Kurunegala	Ridibendiela	-	-	-	70	50	48	-	70
Badulla	Nagadeepa	50	-	90	-	80	-	78	-
Polonnaruwa	Kaudulla	-	-	-	80	85	-	75	80
Kurunegala	Mee-Oya	-	-	-	-	-	-	65	70
Kandy	Minipe	-	60	85	81	78	72	70	75

Source : Progress Report of Project Managers

Table 3.22

Paddy Yield (Bushels Per Acre)

	1987 Yala			86/87 Maha			1986 Yala			85/86 Maha			1985 Yala		
	H	M	T	H	M	T	H	M	T	H	M	T	H	M	T
Ridibendiela	39	42	37	56	56	45	55	60	42	96	105	97	95	110	102
Mee-Oya	-	-	-	15	33	26	-	-	-	74	71	81	-	-	-
Huruluwewa	-	-	-	56	49	59	-	-	-	59	50	60	-	-	-
Nachchaduwa	-	-	-	73	80	81	58	71	-	67	81	78	59	75	82
PSS	52	69	42	68	79	66	55	64	51	67	76	69	54	72	54
Minipe	49	30	25	60	67	68	49	44	41	62	69	70	49	40	44
Nagadeepa	-	-	-	68	54	50	-	-	-	68	59	50	-	-	-
Kaudulla	31	52	22	74	70	69	61	53	50.	70	70	64	59	50	43

Source : Survey of Farm Households

Table 3.23 Cost of Production Per Hectare Classified by Inputs

Input	Ridibendiela		Maha-Oya		Huruluwewa		Nachchaduwa		PSS		Minipe		Nagadeepa		Kaudulla	
	Cost/Ha in Rs.	%	Cost/Ha in Rs.	%	Cost/Ha in Rs.	%	Cost/Ha in Rs.	%	Cost/Ha in Rs.	%	Cost/Ha in Rs.	%	Cost/Ha in Rs.	%	Cost/Ha in Rs.	%
Labour																
Family	1530.18	20.08	1335.24	20.52	1099.15	16.00	827.94	9.97	1158.84	13.04	1952.52	24.85	4204.65	40.02	3217.08	37.79
Exchange	25.63	0.33	0.00	0.00	168.14	2.44	24.85	0.29	89.57	1.00	1511.75	19.00	1477.04	14.05	283.32	3.32
Hired	2097.42	27.53	1761.96	27.08	1984.64	28.90	2693.18	32.49	1683.57	18.95	747.42	9.39	1415.20	13.47	950.86	11.17
Contract	147.21	1.93	0.00	0.00	0.00	0.00	183.06	2.20	1552.16	17.47	193.64	2.43	0.00	0.00	38.71	0.45
Sub-Total :	3800.44	49.89	3097.20	47.60	3251.92	47.36	3729.03	44.36	4484.14	50.49	4429.34	55.69	7096.89	67.55	4489.98	52.75
Other Inputs																
Fertilizer	870.76	11.43	1012.90	15.56	987.68	14.38	1246.27	15.01	1300.82	14.64	939.13	11.80	892.56	8.49	955.51	11.22
Agro-chemicals	371.28	4.87	301.75	4.63	322.13	4.69	790.28	9.52	673.50	7.58	188.62	2.37	532.24	5.06	525.66	6.17
Buffalo - Owned	324.11	4.25	62.42	0.95	43.98	0.64	26.38	0.31	167.88	1.89	625.31	7.86	591.20	5.62	433.57	5.09
Buffalo - Hired	125.34	1.64	144.82	2.22	12.73	0.18	30.96	0.37	143.86	1.61	829.44	10.43	561.20	5.34	484.71	5.69
Tractor - Owned	521.99	6.84	138.38	2.12	335.61	4.88	431.90	5.20	674.54	7.59	78.24	0.98	0.00	0.00	341.14	4.00
Tractor - Hired	1022.40	13.41	1140.87	17.53	1386.53	20.19	1443.52	17.39	927.65	10.44	361.00	4.53	316.40	3.00	751.58	8.83
Seed Paddy Own	410.62	5.39	108.20	1.66	106.47	1.55	316.49	3.81	346.04	3.89	52.16	0.65	366.80	3.49	95.14	1.11
Seed Paddy Hired	170.09	2.23	499.38	7.67	419.18	6.10	282.75	3.40	162.44	1.82	449.21	5.64	148.24	1.41	433.71	5.09
Sub-Total	3816.59	50.10	3408.91	52.39	3614.30	52.63	4568.56	55.05	4396.75	49.50	3523.11	44.30	3408.64	32.44	4021.03	47.24
Grand Total	7617.03	100.00	6506.11	100.00	6866.22	100.00	8297.59	100.00	8880.89	100.00	7952.44	100.00	10505.53	100.00	8511.01	100.00
Family and Exchange Labour Rs.	36.72		36.43		44.16		43.04		42.45		34.91		41.63		45.54	

Table 3.24 Costs, Returns and Profits from Paddy Per Hectare by Schemes

	Ridibendiela	Mee-Oya	Hurulunewa	Nachchaduwa	PSS	Minipe	Nagadeepa	Kaudulla
Yield/ha (Bu)	94.67	112.0	137.88	192.25	175.37	96.15	141.6	175.37
Cost of production/ha (Rs)	7617.03	6506.11	6866.22	8297.59	8880.89	7952.14	10505.53	8511.01
Gross Income/ha (Rs)	6626.90	7840.00	9651.60	13457.50	12275.90	6730.50	9912.00	12275.90
Cost/Return Ratio %	114	83	71	61	72	118	106	69
Net Income 1/ha	-990.13	1333.89	2785.38	5159.91	3395.01	-1221.94	-593.53	3764.89
Net Income 2/ha	565.68	2669.13	4052.67	6012.70	4643.42	2266.33	5088.16	7265.29
Labour Input/ha (Mandays)	108.12	90.02	68.56	78.33	88.47	125.29	172.18	97.82
Net Income Per Manday (Rs)	-9.15	14.82	40.62	65.87	38.37	-9.75	-3.45	38.49
Net Return Per investment of 1 Rupee	-0.13	0.21	0.41	0.62	0.38	-0.15	-0.05	0.44
Season	87 Yala	85 Yala	86/87 Maha	86/87 Maha	87 Yala	87 Yala	86/87 Maha	86/87 Maha

Gross Income = Yield/ha. x G.P.S. Price (70/= per bushel)
Cost Return Ratio = (Cost of Production/Gross Income) x 100
Net Income 1 = Gross Income - Total Cost (Incl. Family and Exch. Labour)
Net Income 2 = Gross Income - Total Cost (Excl. Family and Exch. Labour)
Returns/Manday = Net Income 1/Total Mandays Per Ha.

Table 3.25

Costs, Returns and Profits from Paddy Per Hectare by Districts

		82 Yala	82/83 Maha	83 Yala	83/84 Maha	84 Yala	84/85 Maha	85 Yala	85/86 Maha	86 Yala
	Per hectare									
	Total cost Rs.	6936.40	8422.68	7905.75	9932.71	8810.54	10942.89	8678.86	11336.09	9497.20
Polonnaruwa	Gross Return Rs.	12682.83	12464.95	12464.73	12106.09	11507.85	12979.41	12368.52	16302.94	12670.98
	Net Return 1 Rs.	5746.43	4042.27	4558.98	2173.38	2687.31	2036.52	3959.66	4966.85	3173.78
	Net Return per Manday	54.18	31.10	40.56	14.63	21.83	11.83	33.16	56.89	31.95
	Wage Rate	23-33	30-45	26-35	28-35	32-49	32-40	35-80	34-50	34-52
	Total Cost	7560.94	7351.39	8088.31	8167.97	8186.94	8101.75	8854.48	10015.06	11147.78
Anuradhapura	Gross Return	8428.38	10075.80	12210.52	9978.48	9479.54	12221.73	11250.13	12336.29	12309.76
	Net Return	867.44	2724.41	4122.21	1810.51	1292.60	4119.98	2395.65	2321.23	1157.98
	Net Return Per Manday	4.76	23.31	28.52	15.35	12.54	43.45	22.13	16.92	6.87
	Wage Rate	21-27	26-50	24-50	30-57	32-37	27-48	34-40	25-44	24-51
	Total Cost	6759.65	7754.12	7657.57	9304.79	9926.07	9685.93	9762.13	11443.56	9753.29
Badulla	Gross Return	10214.25	10590.37	11201.73	9936.51	10383.26	11303.39	10235.26	15459.04	11472.68
	Net Return	3454.59	2836.25	3143.57	631.72	457.19	1617.46	473.13	4015.48	1719.38
	Net Return Per Manday	17.22	13.75	14.66	3.32	2.15	8.79	2.73	23.31	12.02
	Wage Rate	14-28	16-27	17-36	16-39	27-35	30-37	33-40	37-46	38-45
	Total Cost Rs.	7807.03	6899.50	5700.07	7741.45	5828.24	7040.02	7836.64	6888.04	9131.27
Kurunegala	Gross Return Rs.	13381.13	14719.81	10725.13	12178.06	10227.45	13238.50	16122.21	13449.47	11253.91
	Net Return Rs.	5574.09	7820.32	5025.06	4436.61	4499.22	6198.49	8285.56	6561.43	2122.64
	Net Return Per Manday	27.23	42.83	48.46	27.50	42.53	42.00	57.62	46.98	11.31
	Wage Rate	15-27	17-30	23-31	18-33	20-45	17-38	21-41	20-33	26-49
	Total Cost Rs.	5914.34	7139.26	7207.41	8931.54	8624.05	8580.60	8587.79	9965.76	9991.64
Kandy	Gross Return Rs.	11564.76	7969.92	10112.37	11859.65	8587.75	9671.93	10648.27	12159.09	12216.07
	Net Return Rs.	5650.42	830.66	2904.96	2928.11	36.31	1032.04	2060.47	2193.34	2224.43
	Net Return Per Manday	40.10	5.13	18.34	14.88	0.20	5.54	11.24	10.82	7.79
	Wage Rate	19-3-	21-30	14-37	25-36	22-37	24-39	21-37	31-36	31-36

Table 3.26 Farmers Classified by Payment of O&M Fees (Percentage Reporting)

Category	Ridiben-diela	Mee-Oya	Hurulu-wewa	Nachcha-duwa	PSS	Minipe	Nagadeepa	Kaudulla	Siyam-belan-gasuwa	Ridiya-gama	All
	%	%	%	%	%	%	%	%	%	%	%
Those who paid at least once	39	35	87	91	63	62	63	98	56	13	37
Never paid	61	65	13	09	32	38	37	02	44	87	63
N	116	40	68	98	82	133	110	106	43	90	886

Source : Survey of Farm Households

Table 3.27

Farmer Perception on Reasons for the Collection of O&M Fees
(Percentage Reporting)

	Ridibendiela	Mee-Oya	Hurulu-wewa	Nachcha-duwa	PSS	Minipe	Nagadeepa	Kaudulla	Siyambe-langamu-wa	Ridiya-gama	All
1. Government tax levied on them for the use of irrigation water	07	60	31	12	30	35	26	10	56	44	30
2. Raising funds for the O&M activities of the scheme	88	35	53	84	70	61	74	84	28	53	63
3. Others	05	05	06	04	-	04	-	06	16	03	07
N	116	40	68	98	82	133	110	106	43	90	886

Source : Survey of Farm Households

Table 3.28

Reasons for the Non-Payment of O&M Fees by Farmers as Given by the Officers of Line Agencies

Reason	Percent of Officers
Shortcomings in the legislations on O&M recoveries	42
Low yield/low income	38
Non-cultivation	35
Unreasonable fee (too high)	08
Operation of land by others	16
Dissatisfaction with the method of mobilization of funds	31
Lack of confidence of officers	02
Ignorance of the objectives of collection	16
Political reasons	22

* Total does not add upto 100 due to multiple answers

Table 3.29

Reasons for Non-Payment of O&M Fees Given by Farmers to those who have never paid O&M Fees (Percentage Reporting)

	Ridibendiela	Mee-Oya	Hurulu-wewa	Nachchaduwa	PSS	Minipe	Nagadeepa	Kaudulla	Siyambalangamuwa	Ridiyagama
1. Non-cultivation	-	08	11	-	35	04	06	50	11	-
2. Crop failure	07	44	11	10	38	57	19	-	11	02
3. Low income	17	04	33	20	27	08	92	-	53	41
4. Others do not pay	52	15	33	10	12	14	06	-	42	29
5. Influences from certain organizations	-	50	-	30	23	22	-	50	-	-
6. Unreasonable fee (too high)	44	08	33	50	31	29	75	-	05	44
7. O&M is a duty of the Government	-	25	18	-	15	-	14	-	16	15
8. Dissatisfied with the present method of mobilization	-	90	44	-	60	52	-	21	-	-
N	71	26	09	10	26	51	36	02	19	78

Source : Survey of Farm Households

Table 3.30 **Status of Inputs Availability**

	Ridibandiela			Mae-Oya			Hurulunena			Nachchaduwa		
	Adequately available	Not available	Difficult to obtain in time	Adequately available	Not available	Difficult to obtain in time	Adequately available	Not available	Difficult to obtain in time	Adequately available	Not available	Difficult to obtain in time
Fertilizer	73.3	2.6	24.1	86.2	1.2	12.6	94.2	2.1	3.7	94.8	1.7	3.5
Pesticides and other agro	85.7	1.7	12.6	88.7	0.9	10.4	91.7	1.2	7.1	91.4	0.7	7.9
Seed paddy	53.8	2.8	43.4	67.3	2.4	30.3	54.8	3.7	41.5	68.7	2.2	29.1
Credit	61.9	0.9	37.2	54.6	4.2	41.2	41.4	6.7	51.9	70.8	0.9	28.3

	PSS			Minipe			Nagadeepa			Kaudulla		
	Adequately available	Not available	Difficult to obtain in time	Adequately available	Not available	Difficult to obtain in tme	Adequately available	Not available	Difficult to obtain in time	Adequately available	Not available	Difficult to obtain in time
Fertilizer	91.3	2.1	6.6	67.8	3.1	29.1	88.7	0.7	10.6	97.3	0.6	2.1
Pesticides and other agro	94.6	1.2	4.2	65.4	2.8	31.8	94.3	0.8	4.9	98.4	0.7	0.9
Seed paddy	47.7	2.9	49.4	42.1	8.6	49.3	78.2	4.3	17.5	78.9	0.9	20.2
Credit	49.2	6.6	44.2	34.5	9.1	56.4	56.4	7.6	36.0	65.4	3.2	31.4

Source : Survey of Farm Households

Table 3.31 Sources of Complementary Inputs Reported by Sample Farmers (Percentage)

		Ridiben-diela	Mee-Oya	Hurulu-wewa	Nachcha-duwa	PSS	Minipe	Nagadeepa	Kaudulla
Fertilizer	ASC	1.7	7.1	20.9	2.9	2.3	4.1	19.8	5.6
	Private Traders	60.0	90.4	76.1	94.2	24.4	66.9	33.7	94.3
	Co-operatives	38.3	2.5	3.0	2.9	73.3	29.0	46.5	-
Weedicide	ASC	1.4	2.9	16.1	-	1.9	10.8	33.3	-
Fungicides	Private Traders	98.6	94.3	82.3	99.0	46.3	81.1	34.8	94.7
	Co-operatives	-	2.8	1.6	1.0	51.8	8.1	31.9	5.3
Pesticides	ASC	-	2.6	20.5	-	2.4	8.3	20.0	-
	Private Traders	100.0	94.7	79.5	97.8	43.9	72.9	34.7	100.0
	Co-operatives	-	2.7	-	2.2	53.7	18.8	45.3	-

Source : Survey of Farm Households

Chapter Four

ASSESSMENT OF EQUITY, ADEQUACY AND DISTRIBUTION OF IRRIGATION WATER IN PROJECTS UNDER INMAS

4.1 Introduction

The foregoing analysis is made from the point of view of assessing the impact of the INMAS Programme on equity, adequacy and reliability, distribution of irrigation water at field level on the one hand, and on the irrigation system rehabilitation and maintenance on the other.

4.2 Source of Data

Data on the adequacy and distribution of water at the level of the farmer's fields were obtained by way of a sample survey of the farmers. In this survey, the pre INMAS situation was assessed on the basis of farmer's recollections because there were no relevant baseline data available.

Data such as water issues, area capacity curves, volume of water in the reservoir, shramadana work and details of rehabilitation and maintenance work were obtained from the records maintained by the Irrigation Department and the Irrigation Management Division. Consistency of hydrological data was ensured by taking one month as the unit of time in analysing the irrigation data where daily records were available. They were converted to monthly records.

4.3 Water Distribution

An irrigation system includes a source of water and a water delivery system. The latter normally has several sub-systems viz. main, branch, distributary and field channels.

It was generally observed that the area cultivated in any given

season depended on the amount of water available in the reservoir at the beginning of the season, the anticipated rainfall plus diversion. Table 4.1 gives data on reservoir capacity and the irrigated area of several selected schemes over the study period.

The graphs of water issues vs. time for PSS, Kaudulla, Nachchaduwa, Ridibendiela and Ridiyagama are presented in figures (4.1(a) to 4.1(e). (These are monthly water issues. As such any fluctuations in water issues within a month are not reflected in these graphs).

Table 4.2 shows the maximum and average monthly water consumption in acre feet per acre. The lowest maximum monthly consumption is recorded at Nachchaduwa, while the highest was at Ridiyagama. Probable reasons for the extreme fluctuations in water consumptions are discussed below.

Ridiyagama, an anicut scheme fed by the perennial Walawe river, naturally recorded the highest maximum and average consumption of water. Farmers in this scheme have an adequate supply of water throughout the year. In fact, the least number of complaints regarding water shortages were reported from this particular scheme, suggesting that this is a typical case.

The observed relatively high levels of water consumption of the PSS and Kaudulla schemes were a result of augmentation by Mahaweli waters. The data suggest that where there is an augmented supply, the water consumption per acre increases. Conversely, the area irrigated per unit of water drops as a result of augmentation.

Water issues in all schemes seem to follow the same pattern. In Kaudulla, the monthly water issues have reached a peak during the month of May in all four years. Such distinct peaks are not observed in the other four schemes.

There is no evidence of a substantial change in water issues at the reservoir level in the schemes studied, attributable to the INMAS Programme. However, there is a possibility of changes taking place at the macro-level which aspect is not covered under this study.

4.3.1 Water Distribution at Field Level

Under normal circumstances, the Irrigation Department delivers irrigation water through field channels to the farmer's fields. Irrigation Department's policy does not allow farmers to tap water

directly from the main, branch or distributary canals. But, under certain typographical, hydrological or social conditions, certain farmers may be compelled to take water directly from these canals to their fields.

Sixty one percent of the farmers at Mee-Oya and 47% at PSS received water directly from the distributary canals (Table 4.3). In all other schemes the majority of the farmers received irrigation water from the field channels. Incidentally, 65% of the farmers in both these schemes had no problems with regard to distribution of water within their fields (Table 4.4). This can be attributed to most farmers having access to irrigation water from the distributary canals in these two schemes.

4.3.2 Uniformity of Water Distribution

Water distribution within the fields is even except, in respect of the Siyambalangamuwa and Minipe schemes (Table 4.4). In these two schemes, 73% and 57% of the farmers respectively believe that there is no even distribution of water within the field.

Two reasons can be identified as the causes for uneven distribution of water within the field. They are (a) uneven levelling of land and (b) high seepage due to the texture of the soil. The latter seems to be the reason in the case of Siyambalangamuwa and Minipe schemes where 65% and 59% of the farmers surveyed had sandy or moderately sandy soils.

4.3.3 Adequacy/Inadequacy of Water Supply to the Fields

Adequacy of irrigation water refers to the sufficient volume of water available to cultivate a full paddy growing season without allowing stress in respect of paddy plants during critical periods.

Among the schemes surveyed, 24 and 25 percent of the farmers in Nagadeepa and Minipe respectively had not received an adequate supply of water prior to the INMAS Programme. However, after the introduction of the programme, 68% of the farmers in Nagadeepa scheme believed that they received an adequate supply of water for cultivation. In the case of the Minipe scheme, there was a marginal improvement with 36% of the farmers responding positively to adequacy of water for cultivation. In the Kaudulla scheme, 47% of the farmers reported that they received an adequate supply of water as against 49% prior to the INMAS Programme.

Tables 4.5 and 4.5a show the reasons for inadequacy in water supply "before" and "after" INMAS Programme. It is evident that in the Minipe scheme, the majority of the farmers (47%) attributed inadequate water supply to insufficient water rotations. There seems to be a slight improvement in this situation after the INMAS Programme.

The improper location of the field seems to have been the main reason for the inadequate water supply to such fields. Those fields located at the tail-end of the system, or a canal, or above the canal bed, receive inadequate water. In this respect, rehabilitation has not brought about improvements in many schemes including Huruluwewa which was in the process of rehabilitation under the Major Irrigation Rehabilitation Programme. However, Nachchaduwa rehabilitated under the Major Irrigation Rehabilitation Programme recorded some improvements.

It has been observed that the farmers did not consider wastage of water as the cause for an inadequate supply of irrigation water. Fifty percent of the farmers in Kaudulla quoted inadequate rotational issues as the main cause for inadequate supply of irrigation water. It appears that there had been no improvement in this aspect as a result of the INMAS Programme.

4.3.4 Rotational Water Issues

A time series data of rotational water issues for seven schemes are presented in Table 4.6. In general, the duration of water rotations during the Maha seasons were longer than in the Yala seasons. This could be attributed to two reasons (a) cultivation of long duration (4-4 1/2 months) paddy varieties and (b) staggering of cultivation during the Maha season. It is evident that continuous irrigation of 25-40 days had been issued for land preparation throughout the reference period. However, in the Minipe irrigation scheme, water had been issued continuously for 120 days from the time of land preparation during the Maha seasons throughout the reference period. As such, the pattern of water rotations at the reservoir level in all schemes, except for Minipe had remained more or less the same during the period under consideration.

Tables 5 and 5a indicate that generally there had not been an improvement in the inadequacy of water as a result of rotational water issues under INMAS except for Minipe. However, Table 4.7 indicates that there had been an improvement in water rotations

per se at FC level in Huruluwewa, Ridibendiela, Mee Oya, Nagadeepa and Minipe irrigation schemes. After the introduction of the INMAS Programme, 85, 92, 92, 85 and 79 percent of the farmers respectively have agreed that water rotations have improved as against 82, 77, 90, 73 and 38 percent respectively prior to the INMAS Programme. Farmers attribute the improvements to the respective personnel in different schemes. At Huruluwewa, Mee Oya and Minipe the farmer representatives had been responsible for the success, whereas at Ridibendiela and Nagadeepa, the success was a result of the efforts by the Irrigation Engineer and Technical Assistants respectively (Table 4.8).

It is evident that water rotations at field channel level had been the responsibility of the farmers and the Vel Vidane prior to the INMAS Programme with the exception of Ridibendiela, Nagadeepa, PSS and Minipe irrigation schemes (Table 4.8). In the 4 schemes mentioned above, either the T.A. or the Irrigation Engineer had been responsible for water rotations at FC level. With the introduction of the INMAS Programme, more farmer representatives had taken the responsibility of water rotations at FC level. In the Minipe irrigation scheme, 42% of the farmers said that the farmer representatives were responsible for the water rotations at FC level as against 24% prior to the INMAS Programme. During the pre-INMAS period, the farmers in the Minipe scheme attributed the responsibility of initiating water rotations at FC level to the T.A. in charge. Since the commencement of the INMAS Programme, this situation has changed and more farmer representatives were responsible for water rotations. In PSS, this situation was reversed. Prior to the INMAS Programme, the farmers attributed the responsibilites of initiating water rotation to the T.A. Since the commencement of the INMAS, the farmers feel that the responsibilities have "changed hands" within the Irrigation Department. Twenty one percent of the farmers in PSS said that the I.E. was responsible for water rotations as against 15% before the INMAS Programme. Farmers of PSS who attributed the responsibilities to T.A. prior to INMAS have changed from 40% "before" to 34% "after" the INMAS Programme.

4.3.5 Water Distribution at D.C. and F.C. Level

As shown in Table 4.9, two out of eight schemes namely, Nachchaduwa and Nagadeepa have recorded improvements in water distribution in that the incidence of the inadequate flow of water

in the FCs has been substantially reduced. These improvements are largely due to rehabilitation and strong farmer organisations in the two schemes. In many other schemes the water flow in the FCs has either remained the same or recorded a reduction in the incidence of excess water only, or inadequacy of water only.

Water distribution from FCs to the farm plots was best handled by the farmers themselves, except in the case of Nachchaduwa, where it had been the responsibility of the Vel Vidane. The Vel Vidane was actively involved in water distribution prior to the INMAS Programme, and 74% of the farmers of this scheme attributed the efficiency of water distribution to the role of Vel Vidane. Under the INMAS Programme, the role of Vel Vidane was given over to the farmer representatives. Yet, the farmers of Nachchaduwa generally selected the former Vel Vidane as their representative.

On the other hand, water delivery from distributary to the field channel had been the responsibility of the Irrigation Department personnel in most of the schemes surveyed. In this task, the "Jala Palakas" and the work supervisors of the Irrigation Department have fulfilled their duties successfully. However, the survey of Nachchaduwa and Huruluwewa schemes revealed that the farmer representatives had performed this duty better than the Irrigation personnel.

According to this survey, 83% of the farmers of Nachchaduwa and 48% of the farmers of Huruluwewa had attributed the success to the FRs of the schemes. Incidentally, the farmer responses were the same to the above activity even "before" the INMAS Programme commenced, suggesting that the duties of the Vel Vidane prior to INMAS, had been taken over by the farmer representatives under the farmer organisation structure.

Several reasons emerged from the survey as being responsible for uneven distribution of water within a field channel. In the schemes surveyed, the major reasons were :

(a) negligence of the farmer representatives
(b) lack of co-operation among farmers
(c) location of the canals

In the Mee Oya scheme, lack of farmer co-operation had been the main cause for uneven distribution of irrigation water. Prior to the INMAS Programme, 95 percent of the farmers in this scheme

attributed the lack of farmer co-operation as being the main reason for uneven distribution of water. Since the commencement of the INMAS Programme, this percentage has been reduced to 46. In Nachchaduwa and Huruluwewa, silting in channels has resulted in insufficient water flow, which in turn has resulted in the uneven distribution of water. However, this situation has been rectified after the rehabilitation work carried out under the INMAS Programme in these schemes. After rehabilitation, only 11% of the sample farmers in Nachchaduwa believed that silting caused inadequate distribution of water in canals as against 61% prior to the INMAS Programme. In the Huruluwewa scheme the corresponding figures were 23% and 13%.

4.3.6 Scheduling of Irrigation Water

The irrigation water scheduled is prepared at the pre-Kanna meeting at the Project Committee level which is then presented to the Kanna meeting of the farmers where the first and the last date of irrigation water issues are decided on. This is a management innovation introduced under the INMAS Programme which has worked well. It has minimized the conflicts that usually occur at the Kanna meetings. Finally, the Irrigation Department implements these decisions at reservoir level (Table 4.10).

In general, water issues during the Maha season are over a longer period than that of the Yala season. This is mainly due to the practice of cultivating long duration varieties of paddy and staggering the cultivation. Irrigation scheduling also depends on the reservoir capacity (available water and expected rainfall and diversion) and the estimated extent to be brought under cultivation. It was observed that, although the last date for water issues had been decided at the Kanna meetings, in practice this was not always adhered to. This was clearly evident in the Maha seasons of 1985/86 and '87/'88 (Table 4.11). During the Maha season of '85/'86, the first issue of water in the Nachchaduwa scheme had been delivered after 7 days and 14 days in HLD and LLD respectively, while the final issue had been prolonged by as many as 38 and 46 days, respectively for HLD and LLD. Such extensions may perhaps be due to insufficient rainfall during the season. For the 1987/'88 Maha season, the first and final issues of water in the Mee Oya scheme was in fact delayed by 41 days and 33 days respectively from the original schedule. This deviation is also due to the drought that prevailed in the area during the preceding Yala season (Table 4.10). However, in most schemes farmers have requested extra issues during the season for various reasons. Since

the commencement of the INMAS Programme, many such requests have been granted (Table 10). Usually the reasons for such requests varied from late sowing, delays in water issues during land preparation, non-availability of seed paddy at sowing time, illegal cultivation of encroached land etc.

The farmer's perceptions on water scheduling in most schemes indicated that water was delivered on schedule, prior to the INMAS Programme except in Nagadeepa and Minipe schemes, where only 27 and 21 percent of the farmers respectively said that the water delivery was according to the schedule (Table 4.12). However, the situation in these particular schemes also improved after the INMAS Programme to the extent that 73 and 47 percent of farmers respectively said that water was delivered on schedule (Table 4.12a). Two extra water issues were provided during 1986/'87 Maha season in the Nagadeepa scheme and one extra issue in Minipe to compensate for the delay in land preparation. The situation in Nachchaduwa scheme was somewhat different. Despite the issue of extra irrigation water for chillie cultivation in the 1985 Yala season and for late sowing in the '85/'86 Maha season, 32% of the farmers were dissatisfied with the water delivery schedule as against 12% prior to the INMAS Programme. This could be due to the interruption of water deliveries as a result of rehabilitation in the 1986/'87 Maha season. In other schemes, the farmer responses showed an improvement in water scheduling after the implementation of the INMAS Programme (Table 4.12 and 4.12a).

4.4 Rehabilitation

4.4.1 General

It is rather difficult to draw a clear line of demarcation between rehabilitation and maintenance. Generally, what amounts to rehabilitation is either delayed or neglected maintenance.

As such, the Irrigation Department used the terms rehabilitation and maintenance to indicate the source of funding rather than the type or quantity of work. An extreme example was found at Ridiyagama. In this scheme, the North Central Branch Canal is in a very poor state. About 3 miles of this canal needs lining, a job normally defined as rehabilitation. However, the IE at Ridiyagama uses part of the maintenance funds every year to construct a rubble masonry wall to protect this canal. As such, for all record purposes, this work is considered as maintenance work even though

it is in fact a type of rehabilitation. In the rest of this section the words rehabilitation and maintenance are used to indicate the source of funding to the IE in keeping with the definition of the ID.

The process of rehabilitation appears to have been streamlined as a result of the INMAS Programme and farmer awareness on the rehabilitation programme, and participation in design meetings have improved as a result of the INMAS Programme.

4.4.2 Types of Rehabilitation

Canal construction and desilting were the two main items of work carried out under the rehabilitation work at main distributary and field channel level in most of the systems. In Nachchaduwa and Huruluwewa schemes, canal construction work was carried out at all three levels i.e. main, distributary and field channel levels. However, in the Ridibendiela scheme, desilting was done at all three levels. Repairs to gates at canal diversions, repairs to measuring structures and fixing of pipe-outlets (Poles) at FC level had not been indicated as major rehabilitation work by the farmers (Table 4.13). Installing of farm inlets in Nachchaduwa was considered part of F.C. construction rather than rehabilitation.

In general, farmers seem to be unsatisfied with the quality of rehabilitation (See Table 4.14). The only exceptions were Nachchaduwa and Siyambalangamuwa where 70% of the farmers indicated that they were satisfied with the rehabilitation work. Those who were not satisfied with the type of rehabilitation were generally the tail-enders.

Whether the farmers were satisfied with the rehabilitation work depends on the extent to which the farmers have got what they expected out of the rehabilitation programme. The majority of farmers expected "more" water after rehabilitation, rather than higher efficiency in the supply of water. Farmers who found that they did not get "more" water after rehabilitation, were not satisfied with the rehabilitation work. In such cases, the responses of farmers to this question need to be assessed with this situation in mind. However, there were specific complaints where the water flow had been reduced in respect of tail-enders as a result of rehabilitation.

Farmers in almost all schemes attributed the success as well as the failure of rehabilitation to the Irrigation Department in terms

of the presence or absence of efficiency and sense of responsibility of the irrigation officials. Most of the farmers indicated that their ideas were sought at the design stage of only the F.C. level and the work carried out was to their satisfaction. At main canal or distributary canal level, farmer's ideas were not sought with the exception of Nachchaduwa, where about 33% of the farmers at D.C. level said that their ideas were also incorporated in the designs.

In most of the schemes, farm labour had not been adequately utilised in rehabilitation work. However, farmers in PSS (40%), Kaudulla (40%) and Huruluwewa (47%) schemes respectively observed that farm labour had been adequately utilised in rehabilitation work (Table 4.15).

4.5 Maintenance

4.5.1 Preparation

There had been a substantial change in the preparation for maintenance as a result of the INMAS Programme. Prior to this programme, the IE in consultation with his staff decided on the maintenance work to be carried out in the coming year. But, since the introduction of INMAS, the following procedure has been adopted.

The Project Manager prepares a list of maintenance works that need to be undertaken utilising the maintenance budget which includes both farmer and government contribution. On the basis of this, the IE prepares an estimate for all the works which generally exceeds the available funds. Then the IE in consultation with the farmer representatives and the Project Manager prepares a list of priority items that needs to be undertaken immediately.

In all the irrigation schemes surveyed, regular maintenance is undertaken during the off-season. The Irrigation Department maintains the main and distributary canals, while the farmers maintain the field canals. Invariably, the farmers complain that the Irrigation Department does not perform their duties in maintaining the main and distributary canals. On the other hand, the Irrigation Department has the same complaint to make with regard to the maintenance of field canals by the farmers.

A list of 'major' maintenance work carried out in schemes surveyed during the study period is presented in Table 4.16.

Emergency maintenance is carried out immediately. The Irrigation Engineer decides whether a particular maintenance work is required to be treated as "emergency" or not. Normally, the farmers inform the overseer on site about emergency maintenance to be carried out, who in turn informs the T.A. in charge of the scheme. The TA informs the IE of such maintenance work.

There were certain instances where the farmers requested the politicians to get the maintenance work done by the ID. The politicians then informed the IE to attend to the maintenance work. The practice of going through the politicians for maintenance work has significantly reduced since the implementation of the INMAS Programme. The current practice is for the farmer to approach the T.A. or IE through their representatives for maintenance work.

4.5.2 Shramadana and Field Channel Maintenance

In almost all schemes, farmers were involved in shramadana work in canal cleaning, although the incidence cannot be measured due to the non-availability of proper records. In some schemes, the IE maintains records which relate to large-scale shramadana work only (These are given in Table 4.17). In the Nagadeepa scheme, for example, the majority of the farmers cleared the field canals only annually, prior to the INMAS Programme.

The process of field channel maintenance under the INMAS Programme includes the clearing of their portion of the field channel by farmers through shramadana or individually and getting the ID to do the structural repairs. The Project Managers play an important role in getting the farmers to maintain the field channels, but this seems to have caused no direct impact on the maintenance of the main and distributary canals.

In fact, the procedure and the level of emergency maintenance of the main and the distributary canals had not changed significantly as a result of the INMAS Programme. Project Managers do not get involved in the operation and maintenance of the irrigation systems beyond the field channel level either.

However, maintenance at the level of the field canal has improved significantly as a result of the INMAS Programme. In the Nagadeepa scheme, for example, prior to the INMAS Programme, 35% of the farmers used to clean their channels annually. At present, 95% of the farmers of this scheme clean their field

channel seasonally (Table 4.18 and 4.18a). In all schemes surveyed, almost 100% of the farmers have cleaned the field canals to the required standard.

4.5.3 Agency Perception on Maintenance and Water Use Efficiency

In assessing the effectiveness of the INMAS Programme on water use efficiency, a special survey carried out to obtain the perception of the Line Agencies on maintenance and water use efficiency proved to be useful.

In all the systems surveyed, the maintenance work which are above the field canal and the structural repairs were carried out by the Irrigation Department (ID). What is meant by "maintenance" insofar as the ID is concerned is the process of attending to emergency and regular maintenance carried out by the ID. Eighty six percent of the Line Agency officials in all systems surveyed maintained that, the information regarding urgent repairs and maintenance should be brought to the relevant authorities in time. In Nagadeepa, 100% of the officers in Line Agencies agreed that the urgent repairs should be brought to the notice of the relevant authorities in time while this figure was 66% in Ridibendiela scheme. According to the officials, (seventy six percent of the ID officials and 95% of the DAS officials) the practice of farmers bringing information regarding urgent maintenance and repair work to the notice of the relevant authorities is a result of the INMAS Programme. However, with regard to the impact of the INMAS Programme on the actual maintenance of the canal network according to the same officials has been rather modest. Only 44% of the ID officials and 66% of the DAS officials expressed the opinion that there had been such a positive impact.

The majority of the officials, Land Commissioner's Department (75%), Department of Agrarian Services (60%) and the Department of Agriculture (59%) observed an increase in the water-use efficiency attributable to the INMAS Programme. However, only 46% of the Irrigation officials shared this view.

A system-wise agency perception on water-use efficiency (Table 4.19) shows that Line Agency officials in Nagadeepa, Ridibendiela, Mee Oya and Nachchaduwa attribute increased water-use efficiency to the INMAS Programme.

Conclusion

The impact of the INMAS Programme on irrigation water distribution, to adequacy and equity was assessed in terms of an analysis based on the available secondary data and a field survey on farmer perceptions carried out four years after the inception of the INMAS Programme. Certain improvements were observed in water distribution, its adequacy and equity at the field level.

In all, but Nagadeepa and Minipe schemes, irrigation water was adequately distributed even before the implementation of the INMAS Programme. However, the situation in these schemes also began to improve since the commencement of the programme. One of the major reasons for the inadequate supply of irrigation water resulted from the inadequacy of rotational issues. In fact, the majority of the farmers observed that the inadequacies in the supply of irrigation water was not due to the wastage of water at field level.

Prior to the INMAS Programme, the initiating of water rotations had been the responsibility of the Vel Vidane. Under the INMAS Programme, the farmer representatives took over the duties of the Vel Vidane, although in the scheme (PSS) this did not take place. Here, the initiating of water rotations is still the duty of the Irrigation Department officials. Generally, the delivery of irrigation water from field channel to the farms have been best handled by the farmers themselves, except in Nachchaduwa where the farmer representatives have been playing an active role. In this specific instance, it was observed that most of the former Vel Vidanes were selected as farmer representatives under the new system.

Water distribution from distributary to field channel had been the duty of the Irrigation Department personnel. The task was ultimately carried out by the Jala Palaka and work supervisors at distributary canal level who performed this task well. However, according to the farmers, in Nachchaduwa and Huruluwewa, this task was performed better by the farmer representatives. Presently, under the INMAS Programme, the water schedule is prepared at the Pre-Kanna meeting. This practice has resulted in reducing the conflicts on water scheduling at the Kanna meetings. Though the first and the last dates of water issues are decided at the Kanna meetings, farmers invariably would request for extra issues of water due to various reasons, and in many instances these requests have been granted. Particularly, large deviations from the first and the last dates of water issues were observed at Nachchaduwa and Mee Oya schemes.

The rehabilitation process appears to have been streamlined as a result of the INMAS Programme. The views of the farmers have been sought at the design stage and the quality of the rehabilitation work done, especially at F.C. level has been to the satisfaction of the farmers. Desilting has resulted in better water distribution in schemes such as Huruluwewa, Nachchaduwa and Ridibendiela.

Planning for regular maintenance has also been systematised, and is carried out jointly by the Irrigation Engineers and Project Manager in consultation with the farmer representatives. Priorities are decided upon jointly without constraining the available budget for maintenance. Cleaning of F.Cs are usually carried out through shramadana work before the cultivation season begins. Prior to the INMAS Programme, however, the farmers of the Nagadeepa scheme, used to clear the field canals annually. Since the implementation of the INMAS Programme, they clean these canals seasonally.

Most of the Line Agency officials involved in the INMAS Programme attribute the improvements in many field activities such as canal network maintenance, water-use efficiency etc. to the INMAS Programme. However, the Irrigation Department officials are rather sceptical about this claim.

Table 4.1

Reservoir Capacity and Estimated Extent Cultivated Under the Selected Schemes (1984/85 Maha - 1986/87 Maha)

Scheme	84/85 Maha		85 Yala		85/86 Maha		86 Yala		86/87 Maha	
	Reservoir capacity (Ac. ft)	Extent cultivated (Ac)	Reservoir capacity (Ac. ft)	Extent cultivated (Ac)	Reservoir capacity (Ac. ft)	Extent cultivated (Ac)	Reservoir capacity (Ac. ft)	Extent cultivated (Ac)	Reservoir capacity (Ac. ft)	Extent cultivated (Ac)
P.S.S.	90,700	25,000	83,000	18,532	19,398	19,632	98,096	23,590	31,601	25,345
Kaudulla	-	-	-	-	-	-	-	-	15,000	11,994
Nachchaduwa	37,680	6,785	31,633	6,785	6,940	6,785	26,000	6,785	14,700	6,785
Huruluwewa	-	-	-	-	7,200	10,102	32,625	10,102	17,265	10,102
Ridibendiela	-	-	7,480	6,114	6,200	6,000	7,480	6,000	2,680	6,000
Mee-Oya	-	14,735	-	-	9,260	8,002	-	721	5,448	3,438
Minipe	-	-	-	14,733	-	15,078	-	1,391	-	14,820
Nagadeepa	-	-	-	-	10,400	4,200	25,600	4,200	5,175	4,200

Source : Irrigation Management Division, Colombo.

Table 4.2 Maximum and Average Monthly Water Consumption During the Period 1983-86

Name of Scheme	Maximum Monthly Consumption ft.	Average Monthly Consumption ft.
PSS	1.26	0.62
Kaudulla	1.31	0.36
Nachchaduwa	1.04	0.42
Ridibendiela	1.13	0.48
Ridiyagama	1.74	0.82

Source : Irrigation Department Daily Water Issue Records.

Table 4.3 Number and Percentage of Farmers Irrigating from Different Canals

Scheme	Main Canal		Branch Canal		Distributary Canal		Field Canal	
	No.	%	No.	%	No.	%	No.	%
PSS	0	0	0	0	45	47	49	52
Kaudulla	3	2	0	0	27	22	88	74
Nachchaduwa	0	0	0	0	27	22	88	76
Huruluwewa	1	1	0	0	10	12	72	86
Ridibendiela	4	3	0	0	14	10	113	86
Mee-Oya	3	5	1	1	32	61	16	30
Nagadeepa	1	0	0	0	22	19	90	79
Minipe	14	10	0	0	22	16	100	73
Siyambalangamuwa	9	20	0	0	24	55	10	23
Ridiyagama	17	17	8	8	37	37	38	38

Source : Survey Data.

Table 4.4 **Farmer Responses on Water Distribution in the Field**

Scheme	Uniform		Not Uniform	
	No.	%	No.	%
P.S.S	61	65	32	34
Kaudulla	67	56	52	43
Nachchaduwa	79	73	29	26
Huruluwewa	44	54	37	45
Ridibendiela	85	70	36	29
Mee-Oya	34	65	18	34
Nagadeepa	57	51	54	48
Minipe	57	42	76	57
Siyambalangamuwa	11	26	30	73
Ridiyagama	71	75	23	24

Source :Survey Data.

Table 4.5 **Reasons for Inadequate Water Supply (Before INMAS)**

Project	Reason 1		Reason 2		Reason 3		Reason 4		Reason 5	
	No.	%	No.	%	No.	%	No.	%	No.	%
PSS	9	18	14	28	5	10	15	30	6	12
Kaudulla	8	8	24	25	12	12	48	50	3	3
Nachchaduwe	5	23	4	19	5	23	6	28	1	4
Huruluwewa	20	37	10	18	8	15	10	18	5	9
Ridibendiela	9	22	14	35	6	15	9	22	2	5
Mee-Oya	10	62	4	25	0	0	2	12	0	0
Nagadeepa	14	9	43	30	30	20	50	34	6	4
Minipe	7	3	42	23	38	21	86	47	17	3
Siyambalangamuwa	10	16	20	32	18	29	11	17	3	4
Ridiyagama	12	18	19	28	15	22	17	25	3	4

Codes : Reason 1 - Canal bed is below the field
Reason 2 - Field located at the tail-end
Reason 3 - Other farmers take more water
Reason 4 - Inadequate rotational water issues
Reason 5 - Wastage of water

Source : Survey Data.

Table 4.5a Reasons for Inadequate Water Supply (After INMAS)

Project	Reason 1		Reason 2		Reason 3		Reason 4		Reason 5	
	No.	%	No.	%	No.	%	No.	%	No.	%
PSS	9	17	15	28	6	11	17	32	5	9
Kaudulla	9	9	24	25	12	12	48	50	3	30
Nachchaduwa	1	16	2	33	1	16	2	33	0	0
Huruluwewa	21	38	10	18	8	14	10	18	5	90
Ridibendiela	12	19	19	31	17	29	11	19	2	3
Mee-Oya	10	71	2	14	0	0	2	14	0	0
Nagadeepa	12	12	32	32	21	21	32	32	3	3
Minipe	13	6	56	26	49	23	86	40	8	3
Siyambalangamuwa	-	-	-	-	-	-	-	-	-	-
Ridiyagama	-	-	-	-	-	-	-	-	-	-

Codes : Reason 1 - Canal bed is below the field
Reason 2 - Field located at the tail-end
Reason 3 - Other farmers take more water
Reason 4 - Inadequate rotational issues
Reason 5 - Wastage of water

Source : Survey Data.

Table 4.6 Rotational Water Issues (1984/85 Maha - 1986/87 Maha)

	84/85 Maha		85 Yala		85/86 Maha		86 Yala		86/87 Maha	
	Continuous days	Rotational days	Continuous days	Rotational days	Continuous days	Rotational days	Continuous days	Rotational days	Continuous days	Rotational days
P.S.S.	42	110-152	40	83	35	110-152	40	93	30	120
Nachchaduwa	-	-	25	95	25	95	25	113	30	120
Huruluwewa	-	-	-	-	30	129	25	84	25	125
Ridibendiela	-	-	30	75	45	77	31	27	40	105
Mee-Oya	-	-	-	-	30	105	25	90	25	90
Minipe	120	Nil	30	100	120	Nil	30	100	120	Nil
Nagadeepa	-	-	-	-	45	115	30	110	45	75

Source : Irrigation Management Division, Colombo.

Table 4.7 Farmer Responses on Water Rotation

Scheme	Before				After			
	Yes		No		Yes		No	
	No.	%	No.	%	No.	%	No.	%
PSS	37	39	57	60	37	39	57	60
Kaudulla	84	68	38	31	83	69	39	31
Nachchaduwa	104	88	13	11	82	70	35	30*
Huruluwewa	71	82	15	17	73	85	13	15
Ridibendiela	102	77	30	22	121	92	11	8
Mee-Oya	49	90	5	9	50	92	4	8
Nagadeepa	83	73	30	26	96	85	17	15
Minipe	54	38	86	61	111	79	29	21
Siyambalangamuwa	41	93	3	7	-	-	-	-
Ridiyagama	64	62	38	37	-	-	-	-

Source : Survey Data.

Table 4.8 Persons Responsible for the Initiation of Water Rotations "Before" and "After" IMMAS

Scheme	Before IMMAS										After IMMAS									
	Farmers		V.V.		W.S.		T.A.		I.E.		Farmers		F.R.		W.S.		T.A.		I.E.	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
PSS	0	0	10	31	4	12	13	40	5	15	0	0	9	28	5	15	11	34	7	21
Kaudulla	5	6	65	78	7	8	0	0	6	7	4	4	65	79	7	8	0	0	6	7
Nachchaduwa	6	6	82	82	0	0	5	5	7	7	2	2	66	86	1	1	1	1	6	7
Huruluwewa	6	54	4	36	0	0	0	0	1	9	6	50	5	41	0	0	0	0	1	8
Ridibendiela	2	2	65	65	0	0	1	1	31	31	2	1	45	39	0	0	1	1	67	58
Mee-Oya	38	80	6	12	0	0	0	0	3	6	38	74	11	21	0	0	0	0	2	3
Nagadeepa	37	41	30	33	1	1	19	21	2	2	30	47	10	15	0	0	20	31	3	4
Minipe	3	8	9	24	2	5	20	54	3	8	16	18	36	42	2	2	21	24	10	11
Siyambalangamuwa	5	15	26	81	0	0	1	3	0	0	-	-	-	-	-	-	-	-	-	-
Ridiyagama	2	3	16	27	4	6	13	22	24	40	-	-	-	-	-	-	-	-	-	-

Source : Survey Data.

Table 4.9 Status of Water Flow in Field Channels

	Before INMAS								After INMAS							
	Excess		Sufficient		Less		No Flow		Excess		Sufficient		Less		No Flow	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
PSS	10	11	64	71	16	17	0	0	1	1	65	72	24	26	0	0
Kaudulla	5	4	52	49	40	37	0	8	5	4	50	47	41	38	10	9
Nechchaduwa	9	7	81	71	22	19	1	0	2	2	73	90	6	7	0	0
Huruluwewa	14	16	47	56	22	26	0	0	13	15	45	55	24	28	0	0
Ridibendiela	5	3	96	74	28	21	0	0	4	3	86	66	39	30	0	0
Mee-Oya	1	2	39	82	7	14	0	0	1	2	40	86	5	10	0	0
Nagadeepa	9	7	28	24	74	65	2	1	2	1	77	68	27	24	6	5
Minipe	15	11	34	25	85	63	0	0	2	1	49	36	82	61	0	0
Siyambalangamuwa	10	23	11	25	22	51	0	0	-	-	-	-	-	-	-	-
Ridibendiela	10	10	60	61	28	28	0	0	-	-	-	-		-	-	-

Source : Survey Data

Table 4.10

Irrigation Water Scheduling Decisions - 1984/85 Maha - 1986/87 Maha

Scheme	84/85 Maha			85 Yala			85/86 Maha			86 Yala			86/87 Maha		
	Date of issue	No. of days	No. of extra issues & duration	Date of issue	No. of days	No. of extra issues & duration	Date of issue	No. of days	No. of extra issues & duration	Date of issue	No. of days	No. of extra issues & duration	Date of issue	No. of days	No. of extra issues & duration
P.S.S.	15.10.84 to 15.02.85	152	Not required	20.04.85 to 20.08.85	132	One (17 days)	25.10.85 to 31.03.86	152	Not required	20.04.86 to 30.08.86	133	One (10 days)	10.10.86 to 10.03.87	150	Not required
Kaudulla	-	-	-	-	-	-	-	-	-	-	-	-	01.10.86 to 28.02.86	150	Not required
Nachchaduwa	01.10.84 to 28.02.85	157	Not required	15.04.85 to 15.08.85	120	One (10 days)	01.11.85 to 01.03.86	120	Not required	01.05.86 to 15.09.86	138	Not required	01.11.86 to 31.04.87	150	Not required
Huruluwewa	-	-	-	-	-	-	01.10.85 to 01.03.86	160		15.05.86 to 15.08.86	90	-	20.10.86 to 19.03.87	150	-
Ridibendiela	-	-	-	25.03.85 to 17.07.85	112	One (6 days)	10.10.85 to 25.02.86	135	Two (12 days)	10.04.86 to 25.07.86	105	Two (12 days)	01.10.86 to 25.02.87	145	Not required
Mee-Oya	-	-	-	-	-	-	25.10.86 to 10.03.86	70	One	20.04.86 to 15.08.86	65	-	13.10.86 to 07.11.86	25	-
Minipe	25.10.84 to 31.03.84	135	Not required	30.04.85 to 31.08.85	133	Not required	15.10.85 to 15.03.86	151	Not required	20.04.86 to 31.08.86	163	-	20.10.86 to 20.03.87	162	Not required
Negadeepa	15.11.84 to 31.03.84	135	Not required	-	-	-	29.10.85 to 05.04.86	155	Not required	01.05.86 to 15.09.86	135	-	15.11.86 to 15.03.87	120	One (10 days)

Table 4.11 Deviations from the Irrigation Water Schedule - 1984/85 Maha - 1988 Yala

	First Issue of Water								Final Issue of Water							
	88	87/88	87	86/87	86	85/86	85	84/85	88	87/88	87	86/87	86	85/86	85	84/85
	Yala	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala	Maha
P.S.S.	+3	NA	+5	+15	0	0	0	0	+5	+ 4	+13	+ 5	0	0	+16	- 5
Nachchaduwa	-5	NA	0	+ 8	0	NA	NA	NA	+3	NA	0	+ 4	0	NA	NA	NA
HLD	NA	+ 4	NA	NA	NA	+ 7	0	0	NA	- 9	NA	NA	NA	+38	+30	+ 2
LLD	NA	+16	NA	NA	NA	+14	0	0	NA	+15	NA	NA	NA	+46	+ 1	+10
Mee-Oya	0	+41	NC	0	NA	+ 7	NA	NA	0	+33	NC	0	NA	+10	NA	NA
Huruluwewa	NA	0	0	0	+5	+ 4	NC	0	NA	+33	+ 9	0	+22	0	NC	+10
Ridibendiela	00	+ 5	+25	+13	0	0	0	NC	0	+ 5	- 5	-15	0	0	0	NC
Nagadeepa	NC	0	0	+15	NA	+ 5	NC	0	NC	+23	0	+25	NA	+10	NC	+11
Kaudulla	+7	-13	HLD +10 +20 LLD	0	NA	NC	NC	NC	+7	- 3	0	- 5 + 5	0	NA	NC	NC
Minipe	0	NA	0	0	0	0	0	0	0	NA	+11	+15	0	0	+15	0

Source : Irrigation Management Division, Colombo.

"+" Number of days delayed from the schedule
"-" Number of days advanced from the schedule
0 - On Schedule
NA - Not Available
NC - Not Cultivated

Table 4.12 Farmer Responses on Water Delivery as Per Schedule (Before INMAS)

Project	Delivery as per scheduled (No. of Farmers)		Delivery not as per scheduled (No. of Farmers)	
	Yes	%	Yes	%
PSS	57	60	37	39
Kaudulla	81	65	42	34
Nachchaduwa	102	87	15	12
Ridibendiela	96	72	36	27
Huruluwewa	65	75	21	24
Mee-Oya	22	40	32	59
Nagadeepa	31	27	82	72
Minipe	30	21	110	78
Siyambalangamuwa	25	56	19	43
Ridiyagama	54	52	48	47

Source : Survey Data.

Table 4.12a Farmer Responses on Water Delivery as Per Schedule (After INMAS)

Project	Yes	%	No	%	% change "before" and "after" INMAS
PSS	58	61	36	38	+1
Kaudulla	83	67	40	32	+2
Nachchaduwa	79	67	38	32	-20
Huruluwewa	65	75	21	24	0
Ridibendiela	107	81	25	18	+9
Mee-Oya	40	74	14	25	+34
Nagadeepa	83	73	30	26	+56
Minipe	66	47	74	52	+26
Siyambalangamuwa	0	0	44	100	-
Ridiyagama	1	0	101	99	-

Source : Survey Data.

Table 4.13 Farmer Responses on Types of Rehabilitation Performed

Scheme	Main Canal						Distributary Canal						Field Channel					
	Cons	De-	Regat	Struct	Pip-	All	Cons	De-	Regat	Struct	Pip	All	Cons	De-	Regat	Struct	Pip	All
PSS	18 (66)	0 (0)	3 (11)	0 (0)	0 (0)	6 (22)	3(50)	0(0)	3(50)	0(0)	0(0)	0(0)	1(33)	0(0)	2(66)	0(0)	0(0)	0(0)
Kaudulla	20 (57)	0 (0)	1 (2)	2 (5)	0 (0)	12 (34)	4(33)	1(8)	3(25)	2(16)	0(0)	2(16)	5(35)	1(7)	0(0)	2(14)	6(42)	0(0)
Nachchaduwa	38 (42)	13 (14)	4 (4)	1 (1)	1 (1)	33 (36)	31(38)	12(15)	1(1)	3(3)	2(2)	31(38)	14 (20)	3 (4)	6 (8)	4 (5)	11 (16)	29 (43)
Huruluwewa	47 (71)	18 (27)	0 (0)	1 (1)	0 (0)	0 (0)	22(40)	28(51)	1(1)	2(2)	1(1)	0 (0)	13 (24)	28 (61)	1 (61)	5 (9)	7 (7)	0 (0)
Ridibendi-ela	21 (22)	60 (63)	2 (2)	12 (12)	0 (0)	0 (0)	21(22)	65(69)	0(0)	6(6)	1(1)	0 (0)	21 (23)	45 (49)	2 (2)	4 (4)	18 (19)	1 (1)
Mee-Oya	10 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	9(90)	1(10)	0(0)	0(0)	0(0)	0 (0)	9 (90)	0 (0)	0 (0)	0 (10)	1 (10)	0 (0)
Nagadeepa	0 (0)	6 (42)	6 (42)	2 (16)	0 (0)	0 (0)	11(32)	5(14)	6(17)	9(26)	3(8)	0 (0)	5 (15)	0 (0)	0 (0)	12 (37)	15 (46)	0 (0)
Minipe	0 (0)	0 (0)	0 (0)	0 (0)	2 (33)	4 (66)	4(44)	1(11)	1(11)	1(11)	0(0)	2(22)	3 (60)	1 (20)	1 (20)	0 (0)	0 (0)	0 (0)
Siyambalan-gamuwa	5 (27)	3 (16)	6 (33)	2 (11)	0 0	2 (11)	0(0)	1(9)	9(81)	0(0)	0(0)	1(9)	0 (0)	0 (0)	3 (75)	0 (0)	1 (25)	0 (0)
Ridiyagama	12 (29)	11 (26)	1 (2)	15 (36)	1 (2)	1 (2)	10 (28)	6 (17)	0 (0)	13 (37)	6 (17)	0 (0)	2 (33)	0 (0)	1 (16)	1 (16)	2 (32)	0 (0)

* Figures in brackets indicate percentages of total respondents

Cons - Canal Construction
De-sil - De silting
Regat - Repairs to gates at water diversions
Struct- Repairs to structures
Pip-out - Repairs & Installing Pipe-outlets (Poles)

Source : Irrigation Management Division, Colombo.

Table 4.14 Farmer Responses on Success of System Rehabilitation

Scheme	Positive Responses		Negative Responses	
	No.	%	No.	%
PSS	3	8	86	92
Kaudulla	24	19	98	81
Nachchaduwa	82	70	35	30
Huruluwewa	16	18	70	82
Ridibendiela	53	40	79	60
Mee-Oya	2	4	52	96
Nagadeepa	33	29	80	71
Minipe	7	5	133	95
Siyambalangamuwa	31	70	13	30
Ridiyagama	46	45	56	55

Source : Survey Data.

Table 4.15 Response of Farmers on the Use of Farm Labour in Rehabilitation

Scheme	No. of Persons Responded Positively		No. of Persons Responded Negatively	
	No.	%	No.	%
PSS	38	40	56	59
Kaudulla	50	40	56	59
Nachchaduwa	37	31	80	68
Huruluwewa	41	47	46	52
Ridibendiela	31	23	101	76
Mee-Oya	9	16	45	83
Nagadeepa	32	28	81	71
Minipe	35	25	105	75
Siyambalangamuwa	-	-	-	-
Ridiyagama	-	-	-	-

Source : Survey Data

Table 4.16 Schedule of Maintenance Work Carried out by the Irrigation Department (1984/85 Maha to 1986/87 Maha)

	84/85 Maha	85 Yala	85/86 Maha	86 Yala	86/87 Maha
P.S.S.			Maintenance of canals due to cattle damage Filling pot holes in canal bunds (Rs.20,000).	60% work completion on F.C., D.C. construction.	Cleaning/weeding and earth work of main canal bunds. Repairs to regulating structures. Cost Rs.266,732
Kaudulla				Desilting and construction of channel structures cleaning F.C.s and desilting D.C. Cost Rs.25,000	Cleaning/desilting canals, earth work in channel bunds. Repairs to regulating structures. Cost Rs.28,000
Nachcheduwa		Weeding/Cleaning F.Cs Maintenance under	Maintenance under MIRP	Maintenance under MIRP	Maintenance under MIRP
Ridibendiela		Canal cleaning/desilting of 1170 m^3 of D.Cs	Constructing structures. Cleaning 10 Miles of M.C. and service roads. Rehab: service roads and removing water weeds. Cost Rs.40,000	General cleaning of M.C. (15 Miles) desilting (300 m^3), construction of structures and removing weeds. Cost Rs.140,000	
Minipe	Weeding/cleaning along M.C. & B.C. 25 km Weeding/cleaning along DC-30 km. Weeding/cleaning F.C. 14 km. Painting of radial gates in in DC/modifications to DC structure.	Weeding/cleaning in M.C. & D.C. Desilting in D.Cs. Cost Rs.307,675 Painting all radial gates	Cleaning/Weeding in M.C. & D.C. Cost Rs.250,000	Desilting/Weeding D.C. & M.C. Greasing DC gates and repairs.	Cleaning/Weeding in M.C. & D.C. Desilting in D.C. Greasing D.C. gates. Cost Rs.125,000
Nagadeepa	Cleaning/weeding of MC and gravelling of service road. Cost Rs. 18,500		Cleaning/weeding MC, BC & DC. Cost Rs.25,400	Earth work (Rehab:) 55 M^3 - Rs.5,500 structural repairs. Fixing of gates & repairs to gates. Cost Rs.2,500	Cleaning/Weeding of MC, BC & DC. Cost Rs.49,500

Table 4.17 Maintenance Work Done Through Shramadana

Scheme	84/85 Maha	85/86 Maha	86 Yala	86/87 Maha
P.S.S.	8 km of M.C. cleaning/ weeding cost - Rs.8000 21 km of D.C. cleaning/ weeding cost Rs.12,000 Earth work in bunds 50 M^3 cost Rs.4,000	Filling pot holes in canal bunds cost Rs.12,000	-	Cleaning of M.Cs, D.Cs and F.Cs (6 shramadanas) cost - 67,000
Kaudulla	-	-	Cleaning of F.Cs and desilting of D.Cs in Stage III Track 2, 6. Cost Rs.75,000	-
Ridibandiela	-	-	-	Cleaning and weeding of 105 km. of F.Cs at Rs.12,600 and 21 km. of D.Cs at Rs.3,780
Nagadeepa	-	Cleaning and weeding of M.Cs at Rs.11,000 20 km of D.Cs at Rs.1,000. Desilting of 60 km at Rs.8,800. Cleaning and weeding of 100 km of D.C. at Rs.14,200		

Sources : Irrigation Management Division, Colombo.

Table 4.18 Cleaning of Field Canals (Before IMMAS)

Scheme	Seasonally		Annually		Once in Few Years		Don't Know	
	No.	%	No.	%	No.	%	No.	%
PSS	87	94	2	2	3	3	0	0
Kaudulla	105	92	4	3	0	0	5	4
Nachchaduwa	109	93	6	5	1	0	0	0
Huruluwewa	81	98	1	1	1	1	0	0
Ridibendiela	121	94	1	0	6	4	0	0
Mee-Oya	52	100	0	0	0	0	0	0
Nagadeepa	70	63	39	35	2	1	0	0
Minipe	117	88	11	8	3	2	1	0
Siyambalangamuwa	43	100	0	0	0	0	0	0
Ridiyagama	84	93	1	1	1	1	4	4

Source : Irrigation Management Division, Colombo.

Table 4.18a Cleaning of Field Canals (After IMMAS)

Scheme	Seasonally		Annually		Once in Few Years		Don't Know	
	No.	%	No.	%	No.	%	No.	%
PSS	87	94	2	2	3	3	0	0
Kaudulla	105	92	4	3	0	0	5	4
Nachchaduwa	84	93	5	5	1	1	0	0
Huruluwewa	81	98	1	1	0	0	0	0
Ridibendiela	120	93	2	1	6	4	0	0
Mee-Oya	52	100	0	0	0	0	0	0
Nagadeepa	103	95	4	3	1	0	0	0
Minipe	118	89	12	9	2	1	0	0
Siyambalangamuwa	1	100	0	0	0	0	0	0
Ridiyagama	3	100	0	0	0	0	0	0

Source : Irrigation Management Division, Colombo.

Table 4.19 Agency Perception on Water Use Efficiency Categorised by Systems

Response Category	P.S.S.	Kaudulla	Nachchaduwa	Huruluwewa	Ridibendiela	Mee-Oya	Minipe	Nagadeepa
Positive Responses (%)	40	42	72	36	81	73	57	87
Negative Responses (%)	24	52	-	43	-	18	29	9
Not known (%)	36	6	28	21	19	9	14	4

Source : Irrigation Management Division, Colombo.

Fig. 4.1a WATER ISSUES(PARAKRAMA SAMUDRAYA)

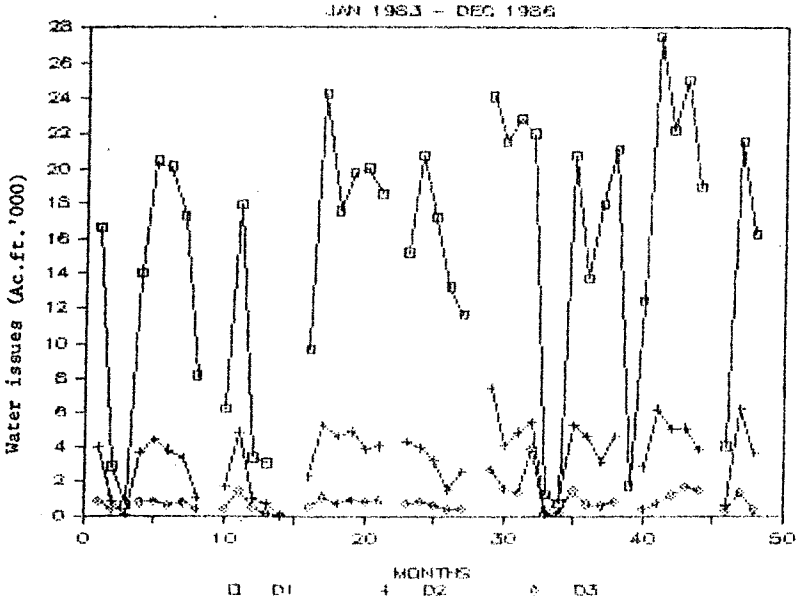


Fig. 4.1b

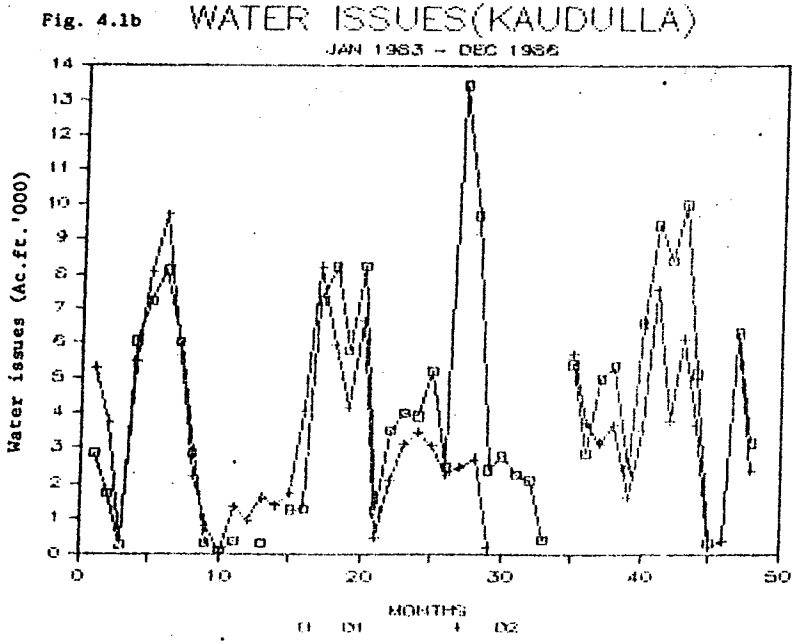

WATER ISSUES(KAUDULLA)
JAN 1983 - DEC 1986
Water issues (Ac.ft.'000)
MONTHS
01
02

Fig. 4.1c WATER ISSUES(NACHCHADUWA)

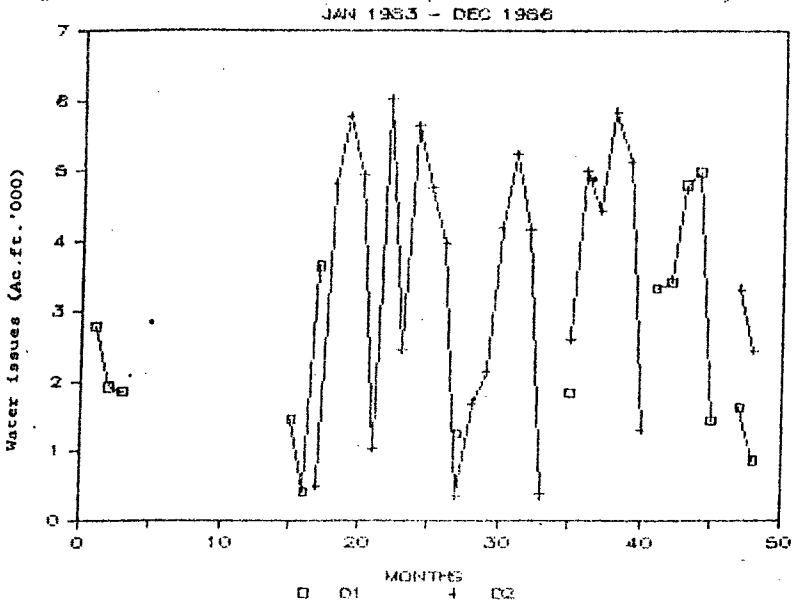


Fig. 4.1d WATER ISSUES(RIDIBEDI ELA)

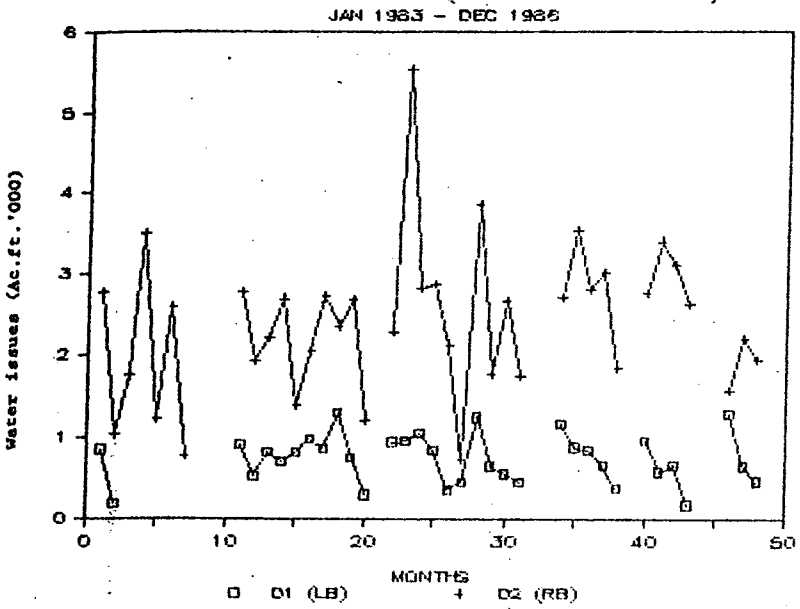
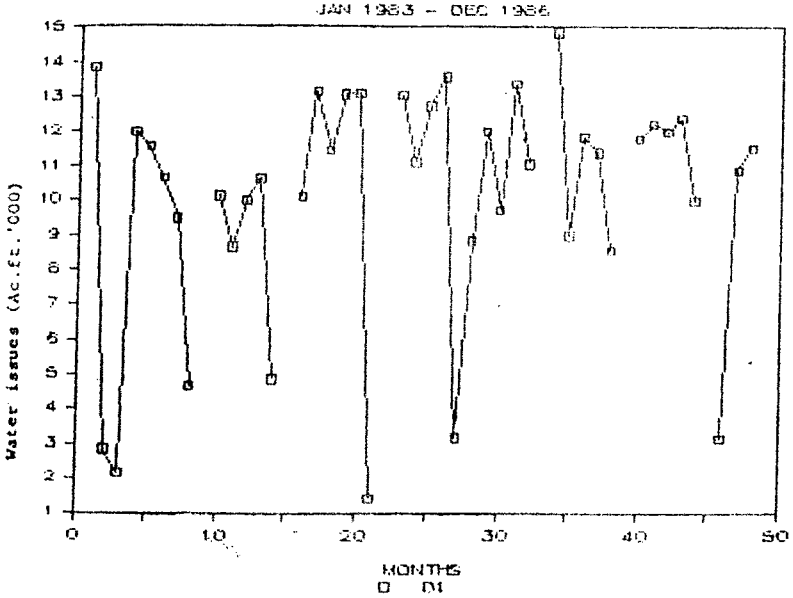


Fig. 4.1e WATER ISSUES(RIDIYAGAMA)



Chapter Five

THE INSTITUTIONAL DEVELOPMENT UNDER THE INMAS PROGRAMME

As discussed in Chapter One, the INMAS Programme envisaged farmer participation in system management. One of the mechanisms instituted for this purpose was the establishment of Farmer Organisations (FOs). This chapter examines the effectiveness of the farmer organisations formed under the INMAS Programme through which farmer participation in system management was expected to be achieved. The major aspects relating to farmer participation in agricultural settlement system management will be described and analysed paying specific attention to the following areas :

(a) Farmer awareness of the INMAS Programme, the federation of FOs and vertical integration of FOs.

(b) Leadership in FOs in relation to the resolution of problems.

(c) Role of Project Manager (PM) and Institutional Organizer (IO) in the promotion of farmer participation

(d) Training activities under the INMAS Programme.

5.1 Farmer Awareness of the INMAS Programme

The degree of farmer awareness of the INMAS Programme could be considered as an important indicator in the assessment of the effectiveness of the programme. The farmer's awareness of the programme was ascertained by questioning them about the novelty of the project activities and the new project administration.

Table 5.1 presents information on the degree of awareness of the farmers in the sample about the INMAS Programme.

It is seen that only 68% of the farmers in the total sample were aware of the INMAS Programme. Responses classified by the eight irrigation systems showed that 85% of the farmers from Huruluwewa, Parakrama Samudra and Kaudulla were aware of the INMAS Programme, while in the other schemes, awareness was less than 50%. The lowest rate of responses regarding farmer awareness about INMAS was reported from Mee Oya, where it was only 39%. In contrast, all the Farmer Representatives (FRs) in sample areas were aware of the programme.

The main reasons for the lesser degree of farmer awareness about INMAS in Mee Oya and Nachchaduwa irrigation settlement systems were as follows:

(a) **Drought** : At Mee Oya, crop cultivation had to be abandoned for four consecutive seasons due to the severe drought which made FO activities impossible. Consequently, most of the farmers in the scheme did not have sufficient opportunities to experience INMAS activities.

(b) **The complicated land tenure situation** : The majority of the farmers of the Nachchaduwa scheme were tenants, mortgagees, leasees or operators of land owned by absentee landlords. The complicated land tenure systems created difficulties for the FOs which limited their activities which in turn affected the farmer awareness of the INMAS Programme.

The analysis of the survey data on FOs (Table 5.2) revealed that, 66% of the sample farmers were aware of the formation of FOs either at field channel level or distributary channel level. At the field channel level in particular, only 38% of the farmers were aware of the formation of FOs. However, in certain schemes such as Nachchaduwa, PSS, Huruluwewa and Kaudulla, over 80% of the farmers were aware of the FOs. The lowest rate of positive farmer responses on the farmer awareness of FOs was reported from Mee Oya, the reason being the absence of FO activities in the system because of the severe drought in the area.

5.2 Federation and Vertical Integration of FO

In the social experiments conducted at Gal Oya and elsewhere on FOs for irrigation water management, certain concepts which were basic to the formation and integration of FOs were identified. These concepts were :

(a) Bottom-up approach, which emphasizes the planning and implementation of decisions to be taken at the grassroot level.

(b) Team approach which emphasizes the collective decision-making, organisational base and group responsibilities.

(c) Hydrological base which emphasizes the formation of FOs first at the field channel level and the vertical integration with higher level organisations which would be formed subsequently.

The federation and vertical integration of FOs being important aspects in the assessment of the effectiveness of the INMAS Programme, the study specifically examined the application of these basic concepts in the formation and integration of farmer organisations. The study revealed that the application of such concepts in the process of formation and federation of FOs was insufficient.

Table 5.3 which summarises the farmer responses to the formation of FOs in sample projects shows that there was only 26% responses to field channel organisations being formed first, whereas, there were 39% responses to such organisations being formed first at the distributary channel level.

If the process of integration of FOs was carried out correctly, field channel organisations should have been formed as the first step in the FO process and distributary channel organisations should have been formed subsequently. However, the study revealed that the opposite had taken place in most of the sample projects.

Farmer responses to the initiation of farmer organisations under INMAS, is shown in Table 5.4. As shown there, only 5% responded that FOs were initiated by the farmers themselves. The largest number of farmers (38%) stated that the FOs were initiated by the Project Managers in charge of the irrigation scheme. Six percent of the respondents said that FRs or Vel Vidane initiated FOs and 8% reported that the Institutional Organisers initiated FOs. Although the ideal situation of FOs would be to provide opportunities for the farmers to make decisions in planning and implementation of FO activities, in most of the sample projects, farmers have had very limited involvement in such matters. This again revealed that the concepts had not been correctly followed in the formation of FOs or the functioning of the same after being formed.

The study revealed that some of the Project Managers have

directed farmers to initiate FOs within a given period of time. For example, in one project, there were several FOs formed within one week by Vel Vidanes on the instructions of the Project Managers.

As revealed in this study, the main reasons for insufficient application of the relevant concepts in the federation process of FOs are as follows:

(a) **Non-availability of Services of IOs :**

It was found that in almost every sample project, the services of IOs (facilitators) were not obtained for the ground work of the formation of FOs themselves. In fact, even at the time of the collection of data for this study, only four sample projects had IOs deployed. The rest did not have a proper mechanism to organise farmers. Under these circumstances, Project Managers had to do all the work connected with the formation of FOs themselves. This situation led the PMs to deviate from the application of the concepts, even if they had adequate knowledge of them in the formation and federation process of FOs.

(b) **Time Constraint and the Competitive Situation Among the PMs:**

The study revealed, there was some kind of unhealthy competition among PMs in the initial stages of farmer organisational activities. The PMs appear to have considered the number of farmer organisations formed in a short time span as an indicator of their performance. At the same time, they were unwittingly given the impression that the formation of FOs and O&M fee collection would be the important indicators in the assessment of their activities by the project management. Some PMs have attempted to form the maximum number of FOs without even considering the specific needs of the project or the farmers. The ultimate result was the deviation from the application of concepts of FOs in the formation and the federation process. In addition, in an effort to meet the targets set by the IMD, the PMs had been compelled to expedite FO activities.

(c) **Limited Knowledge Among PMs on Concepts of Social Organisations :**

In most cases, the PMs had not given sufficient importance to the application of concepts in the formation of FOs. They

were more task-oriented than conscious of the correct philosophy and approaches, which were the converse of the lack of conceptual knowledge. This situation may have been avoided to a great extent if the induction training had laid greater emphasis on the importance of the use of concepts as tools in the implementation of FO programme.

5.3 Committees at Distributary Channel Level

Under the INMAS Programme, a system of hierarchial organisation was set up under which unresolved problems at the grassroots level which were related to irrigation and agriculture were brought to the notice of the Sub-Project Committees and the Project Committee where the relevant government officials met. Table 5.5 which is a summary of the responses made by the farmers on the usefulness of these committees for problem solving at different levels shows that over 40% of the farmers in seven sample projects believed that the Distributary Channel Committee was the most useful organisation in solving farmer problems.

However, farmers in one sample scheme thought otherwise. At Nagadeepa, 81% of the farmers identified Field Channel Committees as the most important committees for solving their problems. Only 10% has identified the Distributary Channel Committee as a useful committee. Inquiries about the reasons for their responses revealed that most of the irrigation and agricultural problems had been solved by the farmers at the Field Channel Committees, and only a few problems were taken up for consideration at higher level committees. Thus, it appears that the nature of the problems brought before the FOs is one factor which influences the farmer's perception about the usefulness of the FOs for the resolution of conflicts.

Farmers of the other sample projects on the other hand attached more weight to the Distributary Channel Committees or to the committees above this level for the solution of problems. They advanced two main reasons for their responses.

(a) Most of the Field Channel Committees do not meet regularly to discuss their day to day problems as they do not consider the FOs as a formal forum for this purpose.

(b) Most of the problems encountered by the farmers had to be solved with the assistance of government officials. It was found that the capacity of Field Channel Committees to solve such problems was low, due to the inadequate participation of

government officials at FOs. Very often, government officials participated only in the committees functioning above the field channel level.

5.4 Project Committee in Relation to Problem Solving

The Project Committee is at the apex of the hierarchical organisation concerning the FO programme where matters of general interests are discussed and desicions are taken. As such, the attendance of all project level officials is crucial for decision taking at Project Committee Meetings. The responses of Project Managers in respect of the attendance of government officials and FRs at Project Committee Meetings is given in Table 5.6.

It is seen that over 33% of the Project Managers have stated that the attendance at Project Committees was good or excellent. Thus, nearly 2/3 of the Project Managers did not share this view. However, the attendance of the officials of the Irrigation Department (ID) and the officials of the Department of Agriculture (DA) was reported to be high. Seventy five percent of the Project Managers stated that attendance of ID officials was excellent or very good, while 64% stated that attendance of the officials of DA was also excellent or very good. Concerning the attendance of FRs at project committees, 74% of the PMs stated that their attendance was excellent or very good. However, a relatively low degree of attendance has been reported in respect of officials representing commercial banks.

According to the PMs, the degree of decision implementation at Project Committees appeared to be generally satisfactory. Eighteen percent of the PMs stated that the degree of decision implementation was excellent or very good, while 39% stated that the degree of decision implementation was fair.

Contrary to Project Manager's assessment on the implementation of decisions taken at the Sub-Committees and Project Committees, our informal discussions with farmers and officers revealed various shortcomings in the working of the committee system. In general, the Farmer Representatives appear to be concerned largely with immediate needs and specific problems in their respective areas rather than with matters of general interest. The Minutes of the Sub-Committee Meetings collectively indicate that the types of problems discussed regularly at Committee Meetings are similar in most project areas, and have resulted in no concrete action. The common problems stated at these meetings are damaged structures, irregular supply of irrigation water, cultivation of encroached land, low quality of constructions

under irrigation rehabilitation or modernization, particularly those carried out under Major Irrigation Rehabilitation Programme (MIRP) or Integrated Rural Development Programme (IRDP) and lack of certain agricultural inputs like seeds. Official explanations on certain controversial matters were the lack of farmer co-operation, inadequate funds, lack of personnel, technical feasibility and remedial action for certain problems. The inability to implement certain project committee decisions and the non-co-operation of certain officers of some Line Agencies have resulted in a lack of confidence on the Project Committee system among farmers as well as the PMs. This would even further strain the farmer-officer relationship which is contrary to the INMAS objectives.

5.5 Leadership Qualities of Farmers and Farmer Representatives

The main focus of this section is to assess the impact of INMAS in developing effective leadership qualities among farmers and their representatives. The analysis is based on the data gathered through the field surveys and the informal discussions held with the project staff (Project Manager, IDO, IO, ID Staff and Staff of other Line Agencies).

Farmer participation in the decision taking process at all levels such as Field Channel (F.ch) level, Distributary Channel level (D.ch) and main reservoir level is considered important under the INMAS Programme. It is assumed that farmer participation is largely dependent upon leadership roles of the farmers and their active involvement in performing these roles as expected.

The PMs, with the assistance of IDOs and IOs, were responsible for training the farmers and their representatives on subjects related to FOs. On occasions, IMD officials and outside resource persons were also invited for these training programmes. The idea was training for leadership, and that the farmers and their representatives were to assume leadership roles in a democratic framework where one's ability to develop a true partnership with fellow farmer's matters most.

The following indicators of Leadership qualities were used to measure the effectiveness of training programmes conducted for developing leadership.

1. Positive relationship between farmers
2. Positive relationship between farmers and officers
3. Understanding of the concepts of farmer organisations

4. Self-confidence of farmers
5. Collective decision-taking ability of farmers

The analysis proceeded on the assumption that farmers were a resourceful community that would possess some leadership characteristics. Following this assumption, it was further considered that the main aim of the training programmes ought to have been to spell out that no one can develop another, and that only guidance could be provided for self-development. Training programmes accordingly designed would help bringing about self-motivation, initiative and willingness to assume responsibilities. This, in turn would promote social consciousness, because the individuals enter into social relations in the process of working towards their own individual objectives.

5.5.1 Positive Relationship Between Farmers

According to cultural anthropological studies, the place of origin provides a base for sharing an identity. The reason is, generally the people originating from the same area, tend to show some kind of affinity and attachment to one another. Where the place of origin differs, neighbourliness provides a base for such identity. Often, contact and interaction during farming activities foster co-operation when the circumstances and the technicalities involved in the process of production need it. But its very nature, labour intensive methods of farming are based on mutual co-operation and interdependence. In other words, there is social organisation of production, which is in the first place an economic necessity. However, such co-operation cannot be maintained when the farming community is differentiated, because, what is good for some may not be good for others. Under such circumstances, all farmers of a particular channel or a cluster will have to be brought together by design under one organisation/group in order to maintain community identity. Where this occurs, the behaviour and the rationality of the members have to be conducive to the objectives of the organisation. The survey data revealed that where there were farmer's organisations, farmers were united and there was mutual trust among them as far as production and related activities were concerned.

Table 5.8 represents an analysis of farmer responses regarding mutual trust which prevailed among farmers before the implementation of the INMAS Programme. Accordingly, mutual trust was high (93%) in the Nagadeepa project, whereas in the other seven projects, it was relatively low. The high positive

responses from the Nagadeepa project may have been due to the activities of Nation Builder's Association which were in operation prior to the INMAS Programme.

With the introduction of the INMAS Programme, there appears to be an improvement in mutual trust among the farmers in each sample project. The Kaudulla project responses indicate that mutual trust has improved from 5% to 75% when compared with the pre-INMAS period (See Table 5.9). The survey revealed that the improvement in mutual trust among farmers was due to the following reasons :

(a) Awareness created among farmers about the role of FOs
(b) PM's association with farmers and their organisations
(c) Participatory problem solving method as adopted under FOs
(d) Assurance of adequate water supply to farmers after system rehabilitation

Before FOs were established, farmers did not have a mechanism acceptable to all to solve their problems related to agriculture and irrigation. Therefore, they had to look individually for ways and means by which problems could be solved and as a result they became more self-centred. As there was a lack of "social consciousness" in the community, concern for fellow farmers declined, and ultimately led to distrust among them. According to the available data, this distrust and suspicion have gradually declined as farmer organisations were established. Constant interactions with one another opened avenues for more dialogue, as a result of which mutual understanding was broadened.

Once mutual understanding improved, trust among the group members also increased. This ultimately resulted in attitudinal changes in the group leading to positive relationships. Positive relationships were more evident in Nachchaduwa and Huruluwewa where IOs had been deployed earlier.

5.5.2 Positive Relationship Between Farmers and Officers

The irrigation officials and their technical staff handled the responsibility of system design, construction, operation and maintenance prior to the INMAS Programme. As a result, farmers who were to be the direct beneficiaries of the project were not only alienated, but also isolated from the initial planning and subsequent implementation of programmes. The overall result was that irrigation systems were often considered as belonging to the

government, but not to the farmers.

The introduction of the concept of participatory management in the irrigation and settlement systems was intended to change this situation. This would involve extensive decentralization of the decision-making process to the local level farmers. The success of this bi-lateral decision-making depends on the degree of positive relationship between the project staff and the farmers. As the INMAS Programme aims to promote participatory management, the positive relationships between farmers and officers occupy an important place in this strategy.

The assessment of the pre-INMAS situation of the sample projects was based on farmer responses as there was no baseline information available. The responses revealed that the farmer officer relationship during the pre-INMAS period was more negative than positive (See Table 5.10). Of the sample of 111 in the Nagadeepa project, 55% have responded that pre-INMAS farmer officer relationship was good. In the Huruluwewa project, 45% (N=84) have responded a positive relationship. In addition to these two projects, farmer responses of PSS was computed to be 42% (N=95). Farmer-officer-relationships in other projects under the study, namely Mee Oya, Minipe, Nachchaduwa and Ridibendiela were weak. The main cause for this state may be the scarcity of water in the respective systems. If the local environmental factors such as soil, climate, technical features of the system, etc. are not favourable, the efforts of officers (ID) will not yield good results. They were likely to become unpopular, irrespective of their contribution to the system performance. It was observed that farmers were merely concerned about obtaining water for their farm allotments. Their knowledge about the characteristics of the irrigation system, administrative resources and water availability in the main tank was meagre. The main reason for this may be lack of communication between farmers and officers.

The following steps taken under the INMAS Programme to build up a good rapport between farmers and officers are worthy of mention.

1. Inviting Line Agency officials to Sub-Project Committees (SPCs) in order to facilitate better communication (dialogue) between farmers and officers (at D.ch. level).

2. Inviting relevant field level officers to be present at training classes (conducted for farmers and FRs at F.Ch. level).

3. Inter-agency co-ordination at project committee level to enable FRs to discuss their problems with District Heads of Line Agencies.

In addition to the above activities, discussions with farmers on FOs, shramadana campaigns, cultural activities, study tours, etc., have helped farmers to widen their outlook.

Consultations by project staff (PM, IDO, IO) with farmers on various matters related to the irrigation scheme gave farmers a sense of recognition and encouraged them to participate in the affairs of system management with a positive approach. It was observed that farmers felt that they could contribute in some way or the other to the better performance of their irrigation systems. This feeling among farmers is an important element as far as improvement of management is concerned.

The analysis of responses in relation to farmer-officer relationship is set out in Table 5.10. Accordingly, more than 50% of the respondents in each sample project claimed that after the implementation of the INMAS Programme, good relationship have been established between farmers and officers. In comparison with the pre-INMAS Programme situation, the improvement of positive relationships in all schemes amounts to 717.

The detailed analysis of responses on the progress of attitudinal changes of ID staff is presented in Table 5.11. The attitudinal changes of ID staff have particularly contributed to the improved relationship. From the farmer's point of view, the improved relationships were a result of the new environment created by the IMD project staff with the co-operation of other Line Agencies.

5.5.3 Understanding of Organisational Goals by Farmers

The idea behind the concept of FOs was to inculcate a sense of ownership in the minds of farmers about their irrigation system. During the survey, it was observed that irrigation structures had been damaged by some farmers in their attempt to get the maximum amount of water into their farm allotments. This damage could also be due to a lack of knowledge about irrigation structures. Apart from these factors, structures have been subject to natural decay over time. In some systems, poorly constructed structures had undergone rapid deterioration. With the establishment of FOs, it was expected that such deliberate damages to irrigation structures would be minimised. The data gathered from records in

the project office revealed that sufficient measures have been taken to educate farmers on the purpose of different irrigation structures.

Having educated the farmers about the irrigation structures and the need for their proper maintenance, it was necessary to educate the farmers on the need for their participation in the maintenance process as a means of cutting down expenditure on system maintenance. To achieve this goal, unity among farmers had to be maintained through FOs. In the establishment of FOs, farmers were encouraged to select their FR by consensus and not by vote. By this method, it was anticipated that there would prevail harmony within the organisation, and rivalry would be avoided. It was only under such circumstances that the organisational goals could be better achieved.

The survey data revealed that in most of the INMAS projects FRs had been selected on the basis of consensus. However, in the Ridibendiela and Mee Oya project, this system had not been followed.

In Ridibendiela, 68% of the farmers responded that the FRs were selected by the PM himself, while at the Mee Oya 89% responded that FRs had been selected by popular vote (Table 5.12). This is a deviation from the concept of "selection by consensus", adopted in the establishment of FOs, for increasing farmer participation.

According to responses of farmers, the roles of the FRs were in the following order or priority.

Farmer Awareness on the Roles of the FRs

	Expected Roles	Average Scores*
1.	Equal distribution of irrigation water among the F.ch farmers	224
2.	Proper maintenance of F.ch	131
3.	Forward irrigation water problems to concerned ID officials	81
4.	Resolution of conflicts among farmers	79

* Farmers ranked the performances expected from FRs on a priority basis for which the scores (1-4) were assigned in descending order. This total score was divided by the number of sample projects to get the average figure of the total sample.

This indicates that farmer's awareness about the roles of their FRs, is in line with the objectives of FOs. In addition, the survey also revealed the following as expected roles of FRs.

(a) Communication problems encountered by FOs to the relevant Line Agency

(b) Improving positive relationship between farmers and officers

(c) Building unity among farmers

(d) Ensuring proper water distribution so that even tail-end farmers receive their due requirements.

This situation indicates that the INMAS Programme has been successful in promoting a good understanding among the farmers of the roles of FOs as well as the roles and functions of the FRs. Of the total sample, 67% have responded that their FR discusses matters pertaining to the F.ch group, before taking them up to the higher level organisations. They also have stated that the FR conveys decisions taken at the higher level organisations together with the relevant information to the F.ch. members. This indicates the existence of the bottom-up approach and the two way communication process in many FOs.

According to the analysis of responses presented in Table 5.13, FRs of Mee Oya, Minipe and Nachchaduwa appear to have a close interaction with fellow farmers of the particular F.ch. This implies that FRs are working to achieve the goals of the FOs. As stated earlier, the majority of FRs in the Mee Oya project have been selected by vote, while FRs of Minipe and Nachchaduwa by consensus. This reveals that whatever the mode of selection, the knowledge and understanding given after being selected/elected as FRs, would have facilitated their function to achieve the objectives of FOs. Of the total sample, 69% have responded that FRs were performing well.

5.5.4 Self-Confidence of Farmers

Another important quality of leadership is self-confidence, which enables them to tackle their own problems. The INMAS Programme aimed at achieving this objective by providing opportunities for farmers to interact with officers in finding solutions to their problems. According to the survey, the percentage distribution of farmers reporting a more than 75% increase in their self-confidence after the INMAS Programme in the sample projects were as follows :

Responses on Improvement of Self-Confidence by more than 75% in Sample Projects

		% Farmers
1.	Ridibendiela	- 83%
2.	Mee Oya	- 86%
3.	Huruluwewa	- 73%
4.	Nagadeepa	- 95%
5.	PSS	- 57%
6.	Minipe	- 42%
7.	Nachchaduwa	- 78%
8.	Kaudulla	- 97%

This reflects the high degree of attainment of the objectives of the programme with regard to the development of self-confidence among the farmers.

5.5.5 Collective Decision-Taking Ability of Farmers

Assessment of collective decision-making ability of farmers was attempted, based on their performance in relation to their activities such as water distribution and consultation among themselves regarding F.ch. matters. Eventhough the data revealed some improvement in collective decision-taking, there were many instances of deviation. This deviation was mainly in water distribution when there was insufficient water in channels as well as on occasions where water delivery was irregular or delayed.

5.6 The Weaknesses of the Programme Hindering the Development of Leadership Qualities

The survey revealed that in certain projects, Vel Vidane (VV) had attended the SPC meetings which should have really been attended by FRs. Consequent to this, the FRs were unable to play their leadership role, thus leading to conflicts between FRs and VVs.

Unlike the Rural Development Society and the Agrarian Services Committee, FOs had no legal recognition, and this lack of recognition has weakened farmer's active participation in organisational activities. They feel that, without legal sanction they were unable to take punitive action against any violation of the objectives of FOs.

The survey also revealed that F.c. organisations did not function

upto the expectations of the farmers. It was also revealed that in certain instances the decisions taken at the SPC meeting had not been communicated to the Field Channel level.

There were also instances where due to poor interaction with fellow farmers, the FR had not obtained accurate information for presentation at SPCs. This happened when Vel Vidanes were selected as FRs in some projects. It was also reported that in some projects, officials had taken decisions regarding Bethma without the consultation of farmers.

The talents and capabilities of IOs have not been exploited at all or to the fullest degree in certain projects. It also revealed that a distorted picture of IOs had been presented to the farmers. Under such circumstances, IOs could be constrained from imparting leadership skills to farmers.

While assessing the roles of the project staff, there were instances where weaknesses were reported. Poor inter-personal relationships of PMs, with IDOs, IOs and in some projects, poor relationship with farmers had also been reported. It was also reported that some PMs while maintaining positive relationships with Line Agencies did not maintain the same relationship with his own staff. Instances where the IDO's role as farmer trainer had been taken over by the PM were reported in certain projects. These shortcomings were reflected in the performance of FOs particularly of IOs in some projects. Some IOs were not playing their active role, and as such difficulties in facilitating FOs activities were observed in certain projects. This may have been due to insufficient conceptual understanding of their roles as IOs, or may be due to other factors mentioned earlier. Regular interactions with superiors would have improved this situation. In addition, in-service training would help to overcome these situations.

5.7 Role and Functions of Project Managers under the INMAS Programme

As indicated in Chapter One, the INMAS Programme envisages to streamline the management procedures in the major irrigation schemes through a project management system. The Project Managers (PMs) appointed under the programme were expected to play a 'Co-ordinator' role. As such, the 'Project Managers' needed to equip themselves with, and develop inter-personal skills, leadership qualities and inter-disciplinary perspectives which are more important than technical knowledge to discharge their duties as expected. The PMs were given more independence in planning, decision-taking, implementation and

operational aspects of project level activities under the programme. The following major responsibilities in overall system management were assigned to them :

1. Co-ordination of all functions of the Line Agencies in the agrarian sector at project level

2. Co-ordination of farmer organisations in the project and Chair the Project Committee

3. Oversee and arrange for the O&M activities and water issues with the Irrigation Agency

4. Encourage farmers to maximise the use of water and promote on-farm water management

5. Co-ordinate the supply of agricultural inputs, services, marketing of produce and irrigation water

6. Arrange timely Kanna (seasonal) meetings and act as the Convenor-Cum-Secretary of such meetings

7. Co-ordination of O&M fee collection

8. Organise training programmes for farmers by enhancing better knowledge in water management

9. Supervision and administration of staff (IOs, IDOs, etc.) attached to the project management.

It is difficult to assess the effectiveness of the Project Manager in relation to each of these functions. Instead, the present study would review the performances of PMs in relation to the objectives of the programme and identify trends.

According to farmer responses in sample projects, the PMs were popular enough among farmers who identified them as the key official of the project's management. Seventy four percent of farmers of the total sample were aware of the PM's presence in the projects (Table 5.14). However, further analysis of the data made in terms of the individual projects showed variations of these percentages. To illustrate, the farmer's awareness of the presence of the PM was high in Minipe, Nachchaduwa, Nagadeepa and Kaudulla schemes, while it was relatively low in PSS, Mee Oya and Ridibendiela.

Two main reasons could be attributed to these variations.

(a) Duration of PM's service to a particular project and

(b) The PM's experience as an officer in the government service in administration or field operation.

In the Kaudulla scheme, for example, the PM had been discharging the responsibilities since the inception of the programme in 1984 which assured him of more opportunities to develop relations with farmers. In contrast, in Mee Oya, where the INMAS Programme was implemented in the same year (1984), the PMs had been transferred out, and it resulted in a low degree of farmer's awareness about the PM's presence. In the Nagadeepa scheme, on the other hand, the appointed PM possessed a relatively rich experience in government service in addition to having functioned as an official of a Line Agency in the same area. His presence was well-known to the farmers of the scheme years before the INMAS Programme was launched.

The survey further revealed that, although the majority of farmers were aware of the presence of PMs in their areas, they (farmers) have not understood clearly the PMs specific functions relating to the management of the projects (Table 5.15). Forty percent of the farmers in the total sample indicated that they were unaware of the PM's specific functions. This unawareness was relatively high among sample farmers in projects such as PSS and Ridibendiela. The awareness of PM's activities was relatively high in the Nagadeepa and Minipe schemes. Thirty nine percent of the sample farmers were of the view that the PM's major function was to co-ordinate the activities of Line Agencies, whereas twelve percent considered that the PM's task was to decide on the cultivation calendar for the season.

As indicated above, the co-ordination of activities of 'different' Line Agencies is a major function of the Project Managers. The experience upto now clearly indicates that the managerial capabilities of the respective Project Managers have a very crucial bearing on ensuring co-operation among various Line Agencies. In several major schemes, Project Managers have not been able to secure the support of the officers of Line Agencies in the management process. In fact, in those schemes, officials of Line Agencies were in conflict with the PMs. They have failed to co-operate with PMs in sharing responsibilities, decision-taking and implementation of decisions taken at the Project Committees. This group mainly represents either officers of the Department of Irrigation or the Agricultural Development Authority (Table 5.16). Possible reasons for such strained

relationships are many. On the one hand, INMAS has not had an enthusiastic response from those who were directly engaged in the administration of the irrigation systems. On the other hand, officers of Line Agencies who were engaged in co-ordinating similar activities have declined to recognize the importance of INMAS. Those who were not involved in project administration previously seems to have shown the least interest in integrated management. The third category in particular, considers their participation in project committees as something outside their normal duties.

Lack of proper understanding of the INMAS Programme among officials of the Line Agencies is another reason for their minimum co-operation in project activities. Although they involve their schemes in the INMAS Programme as members of the project sub-committee or project committee, the majority of the officials interviewed were not clear about the objectives of the INMAS Programme.

Out of the total officers interviewed, eight percent of the officers were not able to state even a single objective of the INMAS. This group of officers mainly represent lower categories of the line departments. Only 46% of the officers were able to state clearly at least one objective of the programme. Answers given by the majority of the respondents are vaguely related to the short-term or long-term objectives. Further, most of them believed that the INMAS Programme was mainly focussed on irrigation issues such as protection of the irrigation system, operation and maintenance of irrigation network and collection of O&M fees through Farmer Organisation, etc (Table 5.17). Only a few officers were able to state that the INMAS as a multi objective programme, aimed at increasing production and productivity. The Project Managers would have played a key role in implanting correct understanding on the INMAS Programme among officials in order to have the desired co-ordination.

The survey further revealed that Project Managers in most of the sample areas have been involved in the co-ordination of farmer organisation activities since the inception of the INMAS. Forty percent of the farmers reported that their FOs were initiated by the PMs. Even though the initiation of FOs was not a given responsibility of the PM due to a lack of Institutional Organizers (IOs) at the initial stages of the programme, the PMs had taken on this responsibility.

The responses to the mail questionnaire administered among the PM also revealed that the majority of the PMs have given priority to the co-ordination of farmer organisations and handling farmer complaints

(Table 5.18). The PMs are still engaged in a process of strengthening necessary institutional apparatus by promoting farmer participation towards better system management. In the absence of any direct authority over the officers of the Line Agencies, the PMs are attempting to mobilize the FOs as pressure groups in order to get the active participation of the officials in the project management.

Although the formation of viable farmer organisation is essential for effective management of the irrigation schemes, a majority of the PMs have given marginal importance to the other given responsibilities such as collection of O&M fees and co-ordination of input supplies within the projects. As regards the collection of O&M fees, the PM's contribution has been seriously constrained by various factors which have been discussed elsewhere.

As the survey revealed, the problems encountered by the Project Managers in performing their duties are many. A majority stated that the lack of support from the officials of the line departments and their reluctance to co-operate with the INMAS activities was a major difficulty encountered in performing their duties. Specially their inability and lack of authority to secure support from other officials have caused limitations in performing their duties and implementing decisions taken at the project committees (Table 5.19).

They have also encountered various difficulties in working with officials in the Head Office of IMD. More often than not, the PMs have to wait for a long time for advice to take decisions on matters of importance. Many PMs reported their difficulties in dealing with the officials of district administration as well (e.g. Kachcheri in the area). They found that the district administrative officials are very unco-operative. In some areas, political interferences have hindered their activities. The inability to implement certain decisions taken at the Project meetings have also affected their performance.

As a remedial measure, the PMs seek more authority to work with Line Agencies. They prefer to have a clear demarcation of their responsibilities and necessary logistical support to improve their job performances as PMs. Further, they also expect more authority to deal with farmers who neglect channel cleaning and default O&M fees (Table 5.20).

Moreover, the Project Managers were asked to rank the most important characteristics necessary to perform their duties satisfactorily. The responses revealed that the majority of the Project Managers consider understanding the concepts and strategies of the

INMAS Programme and an ability to harness support of farmers and officials of Line Agency are important for better performance. However, they have given less importance to communication skills, knowledge of agriculture, including irrigation management and previous experiences in co-ordination activities, which are equally important in performing their duties as PMs (Table 5.21).

Based on the findings of the main questionnaire survey and our personal observations, it became evident that the Project Managers have laid heavy emphasis on the establishment of FOs, mainly due to lack of direct control over the other given responsibilities. Depending on the managerial qualities and personality differences, some Project Managers have been able to carry out very well the responsibilities assigned to them. On the other hand, some Project Managers have failed to perform most of their given duties due to a host of other factors very much beyond their control such as drought, disturbances and subversive activities.

5.8 The Effectiveness of Institutional Organizer Activities Under INMAS

At the time of the survey, IOs had been appointed only to four of the sample projects, namely, Huruluwewa, Parakrama Samudra, Nachchaduwa and Kaudulla schemes. In Nagadeepa, where IOs had not been appointed under INMAS, the IO activities have been undertaken by a NGO (Nation Builders Association).

The main role of IOs under INMAS is to act as a catalyst in accelerating the establishment of FOs to get beneficiaries participation in system management, and for improved farmer-officer interaction.

Responses of farmers in the projects where IOs are functioning, revealed that 48% of the farmers were aware of the presence of the IOs in their areas. However, this awareness was relatively higher in Huruluwewa and Nachchaduwa schemes (Table 5.22). The variation by projects may be attributed to the fact that IOs had been appointed to Kaudulla and PSS recently (end of 1987).

However, generally, the respondents who were aware of the IO's presence did not have a clear understanding of the specific role of the IOs under the programme. Only 24.5% of the farmers of the above sample projects were able to identify correctly the IOs role in organizing farmers for water management. However, there were differences in farmer responses when individual projects were considered. In Huruluwewa and Nachchaduwa schemes, the

percentages of awareness regarding IOs activities were relatively high compared with the other two projects (Table 5.23). In addition to organizing farmers for water management, the IOs have been identified by farmers as persons who were assisting to solve their water problems and develop co-operation among farmers.

The PMs were satisfied with the IOs initial activities to develop links with farmers. Our field observations also confirmed that in these two projects, the IOs have been able to gain positive acceptance of the farmers, compared to other Field Level Officers of Line Agencies.

One crucial factor which undermined the IOs performance was their own identity as officers among the farmers. It is noted that the IOs were called as Jalapalana Mahaththaya (Gentleman for Water Control/Management) by the farmers. This was contrary to the role of IO as a facilitator or change agent of a community based on irrigation. Nevertheless, the overall assessment of IOs functions in these two projects was satisfactory.

The IOs who are working in four of the above irrigation projects stated that they had faced many challenges in entering the field and working with Line Agency officials. They have experienced difficulties in establishing FOs in accordance with the concepts. On many occasions, having established FOs, farmer leaders were chosen by the PMs. In such instances, IOs were compelled to re-organize the existing FOs rather than starting the organizing process according to the concept and strategies which they have learned in their induction training. On the other hand, the IOs were faced with challenges from the Field Level Officers such as Yaya Palakas (YP) in establishing farmer organizations. They (YP) felt that the IOs were trying to undermine their authority over farmers by establishing farmer organizations and the selection of new Farmer Representatives.

However, a detail assessment of effectiveness of IOs cannot be envisaged at this stage, particularly because the deployment of IOs to most of the projects is still in progress. For example, in Kaudulla and PSS projects, IOs were fielded very recently. Consequently, farmer perception on IO activities was not sought in our surveys.

5.9 Training Activities Under INMAS

The training programmes conducted under the INMAS Programme could be categorised into two major areas, namely;

(i) Induction training programmes and inservice training programmes for officials functioning under the INMAS Programme

(ii) Training programmes for farmers, FRs and Field Level Officers of Line Agencies.

According to the progress reports of the Project Managers, the INMAS Programme has launched its training activities covering the following major subject areas.

(a) Agriculture
(b) On-Farm Water Management
(c) Popular Participation through Farm Organizations
(d) Planning, Management, Monitoring and Financial Management, etc.

The target groups of the training programmes were :

(a) Farmers and Farmer Representatives
(b) Field Level and Middle Level Officers of Line Agencies
(c) IMD officials, (IOs, IDOs, PMs, etc).

Of the three groups of trainees mentioned above, training received by groups (a) and (b) will be subjected to the analysis here, mainly because of the availability of information.

The reference period comprises the seasons '86/'87 Maha, '87 Yala and '87/'88 Maha (data available only for this period).

5.10 Training in Agriculture

5.10.1 Field Demonstrations

Agricultural field demonstration plots have been organized by the Department of Agriculture as one of the major extension programmes. Table 5.24 shows that over 60% of the targetted demonstration trials have been conducted in every project, except in the Ridibendiela scheme. During Maha '87/'88, in Kaudulla, Ridibendiela and Nachchaduwa, targets have been achieved. Nachchaduwa reported the achievement of all targets set for agricultural demonstrations during the period under review. Considering the total number of settlers in relation to the number of trials in each sample project, the number of trials implemented in Nagadeepa can be considered to be relatively high. For instance

in Maha '87/'88, thirty two agricultural demonstration trials had been conducted in Nagadeepa, providing at least one plot per 62 farmers as opposed to one plot per 436 farmers in Kaudulla.

5.10.2 Agricultural Training Classes

Table 5.25, which gives the relevant data, shows that while the Ridibendiela project has completed all its training targets in all three seasons in Nagadeepa and PSS, the corresponding rate was over 75%.

Agricultural training classes have generally been organized by the PMs with the assistance of the officials of the Department of Agriculture. Venues, times and the contents of the training programme had been decided by the officials in consultation with the IOs working in the area. The duration of programmes were either half a day or a full day. The subject matter covered in these programmes was mainly, methods of land preparation, weed control, pest/disease control, fertilizer application and cultivation of subsidiary food crops.

5.10.3 Training in On-Farm Water Management

On-farm water management training programmes have also been organized by the project management with assistance from the officials of the Department of Agriculture. As in agricultural extension training programmes, course content, venues, times and duration of training have been decided collectively.

Table 5.26 which presents data on the frequency of training classes conducted on on-farm water management in sample projects during the seasons under reference, shows that the largest number of these training programmes have been conducted at PSS. Although in terms of achievement of targets, Nagadeepa and Ridibendiela are in the lead. The lowest rate was reported from Minipe.

5.11 Attendance at Training Programmes

Attendance at the training programmes conducted under the INMAS Programme was high. As Table 5.27 shows during Maha '87/'88, four out of 8 sample projects reported 100% farmer participation. During Yala 1987, only two projects reported 100% farmer participation and during Maha '86/'87, three projects reported 100% participation. The Table reveals that, on many occasions the targets have been achieved

by the organizers of the training programme.

Table 5.28 shows that overall participation of FRs in training programmes is over 50% in every project during the reference period. In Maha '87/'88, in Nagadeepa, Kaudulla, Ridibendiela and Mee Oya, attendance reported by farmers was 100%. In Yala '87, except in Ridibendiela and Huruluwewa, all other projects reported 100% attendance at training programmes. In Maha '86/'87, four projects reported 100% attendance of FRs in training programmes.

Table 5.29 shows details on the training programmes conducted on irrigation water management, farmer organizations, popular participation, and financial management for FOs, etc. Kaudulla reports 100% farmer participation in non-agricultural training during the reference period. Nagadeepa and Mee Oya reported 100% participation during Maha '87/'88.

As Table 5.30 shows, the attendance of field level officials in officers' training programmes, appeared to be relatively lower than that of the farmers.

It was poor during Maha '87/'88 and relatively high during Yala '87 and Maha '86/'87.

The responses given by PMs on the effectiveness of the training programmes conducted for field level officials are shown in Table 5.31. It is seen that almost all Project Managers (92%) believe that the training programmes conducted for field level officials were successful. Only one Project Manager in the sample stated that training programmes were unsuccessful. No one in any of the eight sample projects indicated that the training programmes conducted were complete failures.

5.12 Major Shortcomings

The following deficiencies were observed in relation to training activities conducted :

(a) Inclination towards the completion of targets on many occasions, training targets were set and completed without respect to achieving the idea of training. During informal discussions with PMs, IDOs and IOs, it was found that the PMs were concerned largely with the number of programmes and the attendance of farmers, but not about the quality of the training.

(b) The improper identification of training needs : It was observed that almost every programme was planned and organized by the relevant officials without consulting the target groups.

(c) Lack of feedback : As far as the content of training programmes was concerned, little or no improvement was observed during the period under review because there had not been a system for feedback information from the trainees to improve future training programmes. Therefore, incorporation of new ideas into the training programmes had been minimal.

(d) Weaknesses in the training methodology adopted : It was revealed that the application of new training techniques was inadequate. Visual-aids have been utilized only on a few occasions, and training organizers explained that this weakness was unavoidable due to lack of funds.

(e) Unsuitability of the resource persons : It was also revealed that on certain occasions, appropriate resource persons had not been used in the training programmes. For example, in one sample project, some topics related to agriculture had been dealt with by the IOs instead of the specialized officials of the Department of Agriculture.

Table 5.1 Farmer's Awareness of the INMAS Programme
(Percentage Reporting)

System / Farmer Response	Ridiben-diela %	Mee-Oya %	Hurulu-wewa %	Naga-dee-pa %	PSS %	Minipe %	Nachcha-duwa %	Kaudulla %
Know	50	39	85	76	85	78	48	85
Don't know	50	61	15	24	15	22	52	15
N =	122	53	84	111	95	137	125	116

Table 5.2

Farmer's Awareness of the Formation of FOs at Field Channels and 'D' Channel Level (Percentage Reporting)

System	Ridiben-diela	Mee-Oya	Hurulu-wewa	Naga-dee-pe	PSS	Minipe	Nachcha-duwa	Kaudulla
	%	%	%	%	%	%	%	%
Aware of the formation of FOs at F.Ch. level	8	5	60	22	25	13	30	35
Aware of the formation of FOs at 'D' Ch. level or above	28	25	20	42	55	60	53	25
Don't know	64	70	20	36	20	27	17	20
N =	122	53	84	111	95	137	125	116

Table 5.3 **Farmer Responses on the Formation of FOs at the Different Levels (Percentage Reporting)**

System / Farmer Response	Ridiben-diela %	Mee-Oya %	Hurulu-wewa %	Naga-deepa %	PSS %	Minipe %	Nachcha-duwa %	Kaudulla %
F.Ch. organisations were formed first	08	05	50	20	29	15	28	56
D.Ch. organisations were formed first	20	22	20	30	40	50	41	20
Project Sub-Committee formed first		03	10	12	09	06	08	03
Project Committee formed first	03	-	0	07	01	01	04	0
Don't know	69	70	20	31	21	28	19	21
N =	122	53	84	111	95	137	125	116

Table 5.4 **Farmer Responses on the Initiation of Farmer Organisations (Percentage Reporting)**

System / Farmer Response	Ridiben-diela %	Mee-Oya %	Hurulu-wewa %	Naga-deepa %	PSS %	Minipe %	Nachche-duwa %	Kaudulla %
Initiated by :								
1. Farmers themselves	03	04	02	09	03	07	05	08
2. Project Manager	20	22	45	36	50	40	53	-
3. ID officers	-	02	0	-	21	01	-	02
4. Vel Vidane/FR	07	-	04	15	-	10	05	03
5. IO	05	-	16	08	-	05	21	07
6. Others	-	-	12	-	18	-	10	06
Don't know	65	72	21	32	22	28	19	21
N =	122	53	84	111	95	137	125	116

Table 5.5 Farmers Perception of the Most Beneficial Committees for Solving Problems Related to Irrigation and Agriculture by Schemes (Number of Farmers)

	Naga-daspe	Kau-dulla	Ridi-bandi-ela	Hurulu-wewa	Nachcha-duwa	Minipe	Moe-Oya
Field Channel Committee	81	11	7	11	29	10	7
Distributary Channel Committee	10	46	55	51	45	41	14
Sub-Project Committee	6	35	30	21	26	31	59
Project Committee	3	6	7	14		11	22
All Committees are useful	-	2	1	3	-	7	

Table 5.6 Project Manager's Responses on Attendance of Government Officials for Project Committee (Percentage Reporting)

Response Category	Irriga-tion Dept.	Dept. of Agric.	Dept. of Agrarian Services	LC	CB	Agric. Insu-rance Board	Co-op	Agric. Develop. Authori.	FR	Total
	%	%	%	%	%	%	%	%	%	%
Excellent	15	9	1	2	2	1	6	-	30	7
Very good	60	55	8	41	4	3	5	5	44	26
Fair	15	20	40	52	28	42	50	46	20	35
Poor	7	11	30	3	61	43	31	33	5	24
Very poor	3	5	21	2	5	11	8	16	01	8

Table 5.7 Project Manager's Perception of the Degree of Decision Implementation Carried out by the Project Committee (Percentage Reporting)

Response Category	Irriga-tion Dept.	Dept. of Agric.	Dept. of Agrarian Services	LC	CB	Agric. Insu-rance Board	Co-op	Agric. Develop. Authori.	FR	Total
	%	%	%	%	%	%	%	%	%	%
Excellent	30	5	1	2	5	1	-	-	1	5
Very good	20	8	12	8	30	1	9	20	2	13
Fair	35	50	45	40	35	40	29	35	45	39
Poor	12	30	40	40	25	55	48	35	40	36
Very poor	3	7	2	10	5	3	14	10	10	7

Table 5.8 Farmers Perception of the Mutual Trust which Prevailed Among Themselves During the Pre-INNAS Period (Percentage Reporting)

Prevalence of Mutual Trust	Ridiben-diela %	Mee-Oya %	Hurulu-wewa %	Naga-deepa %	PSS %	Minipe %	Nachcha-duwa %	Kaudulla %
Yes	35	12	55	93	19	27	24	05
No	65	88	45	07	81	73	76	95
Total	100	100	100	100	100	100	100	100
N	122	53	84	111	95	137	125	116

Table 5.9 Farmer's Perception of the Mutual Trust Which Prevailed Among Themselves During INMAS Period (Percentage Reporting)

Prevalence of Mutual Trust	Ridibendiela		Mee-Oya		Hurulluwewa		Nagadeepa		PSS		Minipe		Nachchaduwa		Kaudulla	
	Res-ponse	%	Res-ponse	%	Res-ponse	%	Res-ponse	%	res-ponse	%	res-ponse	%	res-ponse	%	res-ponse	%
Yes	61		96		92		85		85		53		82		75	
No	39		04		08		15		15		47		18		25	
Total	100		100		100		100		100		100		100		100	
N	122		53		84		111		95		137		125		116	

Table 5.10 Farmer's Perception of the Farmer-Officer Relationship - Pre-INMAS and INMAS by Irrigation Systems (Percentage Reporting)

Descriptions	Ridibendiela		Mee-Oya		Huruluwewa		Nagadeepa		PSS		Minipe		Nachchaduwa		Kaudulla	
	% A	% B	% A	% B	% A	% B	% A	% B	% A	% B	% A	% B	% A	% B	% A	% B
Relationship good	24	63	04	76	45	60	55	91	42	82	07	66	12	61	31	69
Relationship bad	72	37	96	4	45	40	45	9	58	18	84	28	66	19	69	14
Cannot say	4			20							9	6	22	20		17
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
N	122		53		84		111		95		137		125		116	

Note : A = Pre-INMAS

B = After INMAS

Table 5.11 Farmer's Perception of the Attitudinal Improvements of Irrigation Officers Towards FOs (Percentage Reporting)

Descriptions	Ridibendiela		Mee-Oya		Huruluwewa		Nagadeepa		PSS		Minipe		Nachchaduwa		Kaudulla	
	% A	% B	% A	% B	% A	% B	% A	% B	% A	% B	% A	% B	% A	% B	% A	% B
I.E.	62	38	66	34	58	42	76	24	63	37	73	27	67	33	73	27
T.A.	59	41	64	36	61	39	65	35	61	39	54	46	63	37	68	32
W.S.	16	24	58	42	51	49	64	36	57	43	63	37	73	27	85	15
Jalapalaka	88	12	64	36	59	41	77	23	61	31	73	27	79	21	84	16
N =	122		53		84		111		95		137		125		116	

Note = A = Improved

B = Not Improved

Table 5.12 Farmer Responses Regarding the Method of Selection of Their Representatives (Percentage Reporting)

Description	Ridibendiela %	Mee-Oya %	Huruluwewa %	Nagadeepa %	PSS %	Minipe %	Nachchaduwa %	Kaudulla %
Selected by farmers consensus	18	04	82	67	71	85	89	75
Elected by votes	14	89	17	33	29	03	11	25
Selected by the PM	68	07	01	-	-	12		
Total	100	100	100	100	100	100	100	100
N	122	53	84	111	95	137	125	116

Table 5.13 Farmer Responses on the Practice Two-Way Communication Method by Farmer Representatives (Percentage Reporting)

Descriptions	Ridibendiela %	Mee-Oya %	Huruluwewa %	Nagadeepa %	PSS %	Minipe %	Nachchaduwa %	Kaudulla %
Practised two-way communication	70	92	68	66	55	82	85	60
No two-way communication	30	08	32	34	45	18	15	40
Total	100	100	100	100	100	100	100	100
N	122	53	84	111	95	137	125	116

Table 5.14 Farmer's Awareness of the Presence of Project Managers by Projects (Percentage Reporting)

Projects	Ridibandiela	Mee-Oya	Hurulu-wewa	Nagadee-pe	PSS	Minipe	Nachcha-duwa	Kau-dulla	Total
	%	%	%	%	%	%	%	%	%
Know	61	58	68	91	62	83	86	88	74
Don't know	39	42	32	09	38	17	14	12	26
Total	100	100	100	100	100	100	100	100	100
N :	131	53	84	116	95	137	113	120	849

Table 5.15 Farmers' Perception of the Role of Project Managers by Projects (Percentage Reporting)

Role	Ridibendiela	Mee-Oya	Hurulu-wewa	Nagadeepa	Pss	Minipe	Nachchaduwa	Kaudulla	Total
1. Co-ordination of activities of the line agencies	09	30	45	70	12	80	43	23	39
2. Collection of O&M fees	04	00	00	07	00	00	01	05	02
3. Supervision of IOs	00	00	00	01	00	00	14	00	02
4. Deciding the cultivation calendar	17	53	03	03	02	02	07	01	12
5. Organizing of Training Programmes for farmers	04	09	13	01	02	02	05	01	05
6. Don't know	66	08	39	18	84	07	30	70	40
N	131	53	84	116	95	137	113	120	840

Table 5.16 **Officers' Perception of the Relationship Between Line Agency Officers and the Project Managers (Officers Reporting)**

Nature of Relationship	ID	DAS	DA_S	LCD	ADA	BANK	TOTAL
Very good	08 (15.7)	18 (40.9)	16 (30.8)	19 (44.2)	01 (12.5)	01 (25)	63 (31.2)
Good	40 (78.4)	26 (59.09)	36 (69.2)	24 (55.8)	03 (37.5)	02 (50)	131 (64.8)
Bad	02 (3.9)	- -	- -	- -	04 (40)	01 (25)	07 (3.5)
Very bad	01 (1.9)	- -	- -	- -	- -	- -	01 (0.5)
N:	51	44	52	43	08	04	202 (100)

Note : Percentages are given in paranthesis

Table 5.17 Objectives of IMAS as Stated by Officers of Line Agencies (Officers Reporting)

Objectives / Agency	ID	DAS	DA	LDG	ADA	Bank	All
1. To obtain farmers participation in Project Management and decision making	14 (9.5)	19 (6.4)	11 (5.7)	12 (8.0)	02 (7.1)	02 (20)	7.4 (50)
2. To improve farmer-officer relationship	18 (12.1)	15 (10.2)	24 (12.6)	25 (16.7)	03 (10.8)	03 (30)	13.1 (88)
3. To establish farmer organisations to resolve farmers' problems and better co-operation among them	14 (9.5)	16 (10.8)	31 (16.3)	07 (4.9)	04 (14.2)		13.5 (89)
4. To improve farmers' socio-economic status	15 (10.2)	11 (7.5)	13 (6.8)	08 (5.3)	02 (7.1)	01 (10)	7.4 (50)
5. To increase paddy production	20 (13.6)	11 (7.5)	14 (7.3)	14 (9.4)	12 (7.1)	01 (10)	9.2 (62)
6. To protect irrigation network and ensure proper water management and O&M for the systems	26 (17.7)	38 (25.8)	39 (20.5)	26 (17.4)	07 (25)		20.2 (136)
7. Promote modern cultivation practices among farmers	01 (0.6)	05 (3.3)	06 (33)	04 (2.6)	01 (3.6)		2.5 (17)
8. Arrange O&M fee collection and give O&M responsibilities to farmers	24 (16.2)	29 (19.8)	26 (13.7)	18 (12.0)	06 (21.5)	01 (10)	14.7 (99)
9. Co-ordination of the activities of line agencies	13 (8.7)	07 (4.7)	20 (10.5)	28 (18.8)	01 (3.6)	01 (10)	8.6 (58)
10. To train farmers in proper water management and cultivation practices	02 (1.3)	06 (4.0)	06 (3.3)	07 (4.9)		01 (10)	3.4 (22)
Total Responses	21.9 (147)	21.9 (147)	28.3 (190)	22.2 (149)	4.2 (28)	1.5 (10)	100 (671)

Note : Percentages are given in paranthesis.

Table 5.18 The Time Allocation for Various Project Activities by Project Managers

Priority Score	10	9	8	7	6	5	4	3	2	1	Total Overall Priority		
Order or Priority	1	2	3	4	5	6	7	8	9	10	Score		Order
Activities													
1. Attending to farmer complaints	90	45	64	14	-	5	-	6	-	1	225		2
	9	5	8	2	-	1	-	2	-	1			
2. Resolution of farmer-officer conflicts	10	27	32	21	30	-	16	-	8	4	148		5
	1	3	4	3	5	-	4	-	4	4			
3. Co-ordination of farmer organisational activities	140	63	32	21							256		1
	14	7	4	3	-	-	-	-	-	-			
4. Organizing Project Committee Meetings	10	27	32	25	18	35	-	3	8	-	168		3
	1	3	4	5	3	7	-	1	4	-			
5. Communication with Head Office (including attending meetings)	8	10	18	8	-	18	20	12	6	8	6	106	
		3	2	1	-	3	4	3	2	4	6		
6. Collection of data	-	-	8	21	36	25	8	18	6	2	124		6
	-	-	1	3	6	5	2	6	3	2			
7. Preparation of reports	-	36	-	28	6	20	24	9	4	4	88		10
	-	4	-	4	1	4	6	3	2	4			
8. Organizing training programmes for farmers	4	-	27	24	14	24	30	15	12	6	2	154	
	-	3	3	2	4	5	3	3	3	2			
9. Input supplies within project	-	-	-	28	36	10	16	12	15	3	120		7
	-	-	-	4	6	2	4	4	5	3			
10. Collection of O&M fees and disbursement	-	9	24	14	-	-	24	21	6	6	104		9
	-	1	3	2	-	-	6	7	3	6			

Note : Respondents were asked to rank the activities on priority basis. Scores were assigned to each case in descending order. For example, any activity ranked 1st carried 10 marks, activity ranked 2nd carried 9 marks and so on.

Table 5.19 The Difficulties Encountered by Project Managers in Performing Their Duties

Major Problems	No. of P.M.	%
1. Lack of legal authority to implement the project committee decisions	10	18.2
2. Lack of awareness among farmers and officials on the INMAS Programme	4	7.2
3. Difficulties in maintaining links with Head Office and District Administrative bodies eg: Kachcheri	9	16.3
4. Lack of co-operation for the INMAS activities the officials of line agencies	18	32.7
5. Political interferences	3	5.6
6. Poor farmers participation in system management activities	2	3.6
7. Difficulties in collecting O&M fee from farmers	3	7.2
8. Lack of logistical and financial support	4	7.2

Table 5.20 The Project Managers' Responses on the Changes Required to Improve Their Performance

Type of Changes	No. of Responses	%
1. More authority to work with line agencies	19	31.7
2. More authority to work with farmers	12	20.0
3. More logistical support	13	21.7
4. More financial support	09	15.0
Other	07	11.6
Total :	60	100.0

Table 5.21 Project Manager's Perceptions of the Characteristics Required to Perform Their Duties by Order of Importance

Characteristics	Priority Score / Ranking Order	10 / 1	9 / 2	8 / 3	7 / 4	6 / 5	5 / 6	4 / 7	3 / 8	2 / 9	1 / 10	Total Score	Order of Importance
1. Understanding the concepts of INMAS		120 12	27 3	16 2	7 1	- -	10 2	12 3	6 2	2 1	1 1	201	1
2. Understanding the strategies of INMAS		- -	72 8	16 2	42 6	24 4	- -	16 4	3 1	- -	2 2	175	3
3. Leadership potential		20 2	27 3	16 2	14 2	42 7	15 3	8 2	6 2	4 2	2 2	152	5
4. Ability to harness support of farmers		40 4	36 4	48 6	35 5	12 2	15 3	4 1	6 2	- -	- -	196	2
5. Ability to harness support of officials		20 2	45 5	21 3	35 5	24 4	15 3	4 1	- 2	2 1	1 1	167	4
6. Developing friendly working relationship with officials		- -	- -	32 4	28 4	24 4	20 4	28 7	6 2	4 2	- -	142	6
7. Possessing a sound academic knowledge of the disciplines involved in agriculture, including irrigation management		20 2	18 1	0 4	28 4	6 1	20 4	20 5	6 2	2 1	5 -	133	8
8. Adequate legal support		- -	- -	- -	- -	12 2	15 2	4 1	12 4	14 7	10 10	67	10
9. Communication skills		- -	9 1	27 3	- -	12 2	20 4	10 2	18 6	14 7	2 2	112	9
10. Previous expression in inter-departmental		50 5	9 1	32 4	- -	6 1	5 1	5 1	12 4	12 6	4 4	135	7

Table 5.22 Farmers' Awareness of the Presence of Institutional Organisers in the Area

Awareness	Ridi-bendi-ela	Mee-Oya	Hurulu-wewa	Naga-deepa	PSS	Minipe	Nach cha-duwa	Kaudulla	Total Aver-age
1. Aware of I.O presence	-	-	52	54	36	-	73	32	48.3
2. Unaware of I.O presence	100	100	48	46	64	100	27	68	51.7
N =	131	53	84	116	95	137	113	120	849

Table 5.23 Farmers' Perception of I.Os Role by Irrigation Schemes

Perceived Role	Ridibendiela	Mee-Oya	Hurulumeva	Nagadeepa	PSS	Minipe	Nachchaduwa	Kendulla	Total Average
1. Distribution of water and decide water rotations	-	-	01	27	02	-	04	05	3.0
2. Collection of O&M fees	-	-	-	01	04	-	-	-	1.0
3. Organise farmers for water management	-	-	38	20	08	-	36	16	24.5
4. Establish links between farmers and officers	-	-	05	03	03	-	03	03	3.5
5. Encourage co-operation and cohesiveness among farmers	-	-	14	01	-	-	12	-	6.5
6. Solve farmers water problem	-	-	12	01	08	-	10	02	8
7. Not known	100	100	30	46	75	100	34	76	53.5
n	131	53	84	116	95	137	113	120	849

Table 5.24 Agricultural Demonstration Plots Implemented in Sample Projects

Project	Maha 87/88			Yala 87			Maha 86/87			Total		
	No. of Demo trials targeted	No. of trials con-ducted	Per-cen-tage	No. of Demo trials targeted	No. of trials con-ducted	Per-cen-tage	No. of Demo trials targeted	No. of trials con-ducted	Per-cen-tage	No. of Demo trials targeted	No. of trials con-ducted	Per-cen-tage
Nagadeepa	40	32	80	40	25	62	22	24	100	102	81	79
Kaudulla	11	11	100	-	-	28	18	64	39	29	74	
Ridibendiela	10	10	100	6	-	-	18	06	33	34	16	47
Huruluwewa	40	30	75	24	18	75	32	18	56	96	66	68
Nachchaduwa	10	16	100	05	-	-	15	15	100	30	31	100
Minipe	17	17	100	70	50	71	80	52	65	167	119	71
Mee-Oya	20	15	75	01	07	100	56	50	89	77	72	93
PSS	68	37	54	54	42	78	56	32	57	178	111	62

Source : Progress Reports of Project Managers

Table 5.25 Agricultural Extension Training Classes Conducted for the Farmers of Sample Projects

Project	Maha 87/88			Yala 87			Maha 86/87			Total		
	No. of Demo trials targeted	No. of trials con-ducted	Per-cen-tage	No. of Demo trials targeted	No. of trials con-ducted	Per-cen-tage	No. of Demo trials targeted	No. of trials con-ducted	Per-cen-tage	No. of Demo trials targeted	No. of trials con-ducted	Per-cen-tage
Nagadeepa	24	21	87	20	18	90	30	26	86	74	65	87
Kaudulla	40	33	82	800	250	31	68	64	94	908	347	38
Ridibendiela	60	60	100	96	107	100	113	113	100	269	280	100
Huruluwewa	43	27	62	40	15	37	37	28	75	120	70	58
Nachchaduwa	24	10	42	03	01	33	25	25	100	79	36	45
Minipe	140	140	100	150	62	41	150	94	63	440	296	67
Mee-Oya	20	20	100	07	07	100	54	52	96	81	79	37
PSS	112	108	96	126	106	84	112	62	55	350	276	78

Source : Progress Reports of Project Managers

Table 5.26 On-Farm Water Management Training Classes Conducted for Farmers of Sample Projects

Project	Maha 87/88			Yala 87			Maha 86/87			Total		
	No. of Demo trials targeted	No. of trials conducted	Percentage	No. of Demo trials targeted	No. of trials conducted	Percentage	No. of Demo trials targeted	No. of trials conducted	Percentage	No. of Demo trials targeted	No. of trials conducted	Percentage
Nagadeepa	04	05	100	05	06	100	10	10	100	19	21	100
Kaudulla	10	08	80	10	03	30	-	-	-	20	11	55
Ridibendiela	60	60	100	96	107	100	06	06	100	162	173	100
Huruluwewa	11	02	18	20	16	80	27	27	100	58	45	77
Nachchaduwa	15	10	67	05	08	100	10	-	-	30	18	60
Minipe	15	-	-	08	06	75	04	03	75	27	09	33
Mee-Oya	40	30	75	07	07	100	04	07	100	51	44	86
PSS	112	62	55	126	106	84	112	86	77	350	254	72

Source : Progress Reports of Project Managers

Table 5.27 Farmers' Attendance in Agricultural Extension Training Programmes Conducted in Sample Projects

Project	Maha 87/88			Yala 87			Maha 86/87			Total		
	No. of Demo trials targeted	No. of trials con-ducted	Per-cen-tage	No. of Demo trials targeted	No. of trials con-ducted	Per-cen-tage	No. of Demo trials targeted	No. of trials con-ducted	Per-cen-tage	No. of Demo trials targeted	No. of trials con-ducted	Per-cen-tage
Nagadeepa	480	630	100	600	500	83	900	910	100	1980	2040	100
Kaudulla	1600	835	52	4320	720	16	-	985	-	5920	2540	42
Ridibendiela	1200	1200	100	120	1096	100	1810	2100	100	3130	4396	100
Huruluwewa	995	1440	100	480	394	82	-	-	-	1475	1834	100
Nachchaduwa	480	250	52	100	50	50	500	500	100	1080	800	75
Minipe	3000	3000	100	5000	1300	26	4500	2629	58	12500	6929	55
Mee-Oya	90	838	93	218	218	100	500	600	100	1618	1656	100
PSS	-	-	-	126	106	84	2378	1327	55	2504	1433	57

Source : Progress Reports of Project Managers

Table 5.28 Attendance of FRs in the Training Classes Conducted in Sample Projects

Project	Maha 87/88			Yala 87			Maha 86/87			Total		
	No. of Demo trials targeted	No. of trials conducted	Percentage	No. of Demo trials targeted	No. of trials conducted	Percentage	No. of Demo trials targeted	No. of trials conducted	Percentage	No. of Demo trials targeted	No. of trials conducted	Percentage
Nagadeepa	92	186	100	91	92	100	91	91	100	274	369	100
Kaudulla	60	60	100	120	120	100	140	258	100	320	438	100
Ridibendiela	58	58	100	51	21	41	-	-	-	109	79	72
Huruluwewa	200	190	95	04	03	75	400	143	35	604	336	55
Nachchaduwa	154	58	37	154	154	100	154	62	40	462	274	59
Minipe	140	59	38	70	70	100	270	123	45	480	252	52
Mee-Oya	114	114	100	114	114	100	115	115	100	343	343	100
PSS	-	-	-	202	218	100	187	202	100	389	420	100

Source : Progress Reports of Project Managers

Table 5.29 Farmer Attendance in Non-Agricultural Training Programmes in Sample Projects

Project	Maha 87/88			Yala 87			Maha 86/87			Total		
	No. of Demo. trials targeted	No. of trials conducted	Percentage	No. of Demo. trials targeted	No. of trials conducted	Percentage	No. of Demo. trials targeted	No. of trials conducted	Percentage	No. of Demo. trials targeted	No. of trials conducted	Percentage
Nagadeepa	600	780	100	600	440	73	1200	1080	90	2400	2300	96
Kaudulla	60	60	100	1800	1800	100	4653	4653	100	6513	6513	100
Ridibendiela	1400	-	-	-	1020	-	-	-	-	1400	1020	73
Huruluwewa	1000	37	3	2000	888	44	2759	2087	76	5759	3012	52
Nachchaduwa	500	346	69	1500	369	25	500	241	48	2500	956	38
Minipe	-	-	-	100	-	-	500	-	-	600	-	-
Mee-Oya	450	600	100	400	400	100	500	442	88	1350	1442	100
PSS	-	-	-	380	265	70	400	186	46	780	451	58

Source : Progress Reports of Project Managers

Table 5.30

Attendance of Field Level Officials in Training Programmes

Project	Maha 87/88			Yala 87			Maha 86/87			Total		
	No. of Demo. trials targeted	No. of trials conducted	Percentage	No. of Demo. trials targeted	No. of trials conducted	Percentage	No. of Demo. trials targeted	No. of trials conducted	Percentage	No. of Demo. trials targeted	No. of trials conducted	Percentage
Nagadeepa	21	16	76	21	10	48	21	18	85	63	44	69
Kaudulla	43	43	100	40	40	100	40	80	100	123	163	100
Ridibendiela	23	-	-	23	32	100	-	-	-	46	32	70
Huruluwewa	44	-	-	64	44	69	35	35	100	143	79	55
Nachchaduwa	14	-	-	14	14	100	12	-	-	40	14	35
Minipe	-	-	-	75	-	-	75	75	100	150	75	50
Mee-Oya	80	80	100	80	80	100	80	-	-	240	160	67
PSS	-	-	-	59	58	98	62	37	60	121	95	78

Source : Progress Reports of Project Managers

Table 5.31

Project Manager's Perception of the Effectiveness of the Training Programmes Conducted for the Field Level Officials

	Response Categories	Frequency of Responses	Response %
1.	Very successful	7	25
2.	Successful	19	67
3.	Unsuccessful	1	4
4.	Complete failure	1	4
	Total :	28	100

Chapter Six

CONCLUSIONS

6.1 Summary

1. The INMAS Programme was launched in 1984 to remedy the problem of low productivity in the major agricultural settlements located outside the Mahaweli Development Project. This programme was based on the premise that the problem of low productivity was a result of lack of co-ordination/integration of input supply and farmer participation in the management of agricultural settlements. The concept of project management was operationalized under INMAS in order to achieve integration, whilst the farmer organizations were meant to enlist farmer participation in project management. A cadre of Project Managers and Institutional Organizers was appointed and trained, and a committee system was introduced to ensure overall supervision at the district and national levels.

2. The present study was conducted in 1987 with a view to assess the effectiveness of the INMAS Programme for the purpose of providing feedback information to the policy-makers concerned. It reviewed the concepts involved, examined the strategy adopted and proposed suggestions on suitable monitoring.

3. The methodology adopted in this study included a review of available literature, followed by sample surveys of farmers and officers as well as informal interviews with persons associated with the project. Out of 41 major irrigation schemes coming under INMAS, Huruluwewa, Ridibendiela, Parakrama Samudra Schemes (PSS), Nachchaduwa, Mee Oya, Nagadeepa, Minipe and Kaudulla schemes were selected for detailed investigation. In addition, Siyambalangamuwa and Ridiyagama were selected outside INMAS as control units. 886 farmers, 90 farmer representatives and 210 officers, belonging to Line Agencies and all the Project Managers (38) were interviewed using a structured questionnaire.

4. The study observed significant similarities between INMAS perspectives and other concepts of management put into practice both in time and space in Sri Lanka. It was discernible that the INMAS Programme conceived the problem of lack of productivity as arising from the lack of co-ordination and the consultation of farmers. Accordingly, the INMAS package sought to rectify this problem by way of implementing a project management system which included representation by farmers. The Project Manager's role was to co-ordinate the activities of the Line Agencies.

5. Since the Project Manager did not have formal administrative authority over the staff of the Line Agencies, his success - if achieved at all - as the Project Manager in ensuring co-operation of the officials depended heavily on the personality factor. The line agency officials who were directly managing the schemes previously did not offer an enthusiastic response to the new approach. The officials who were not involved in management were also not interested in the new approach and considered it to be outside their normal duties.

6. The basic concepts relating to the formation and the integration of farmer organizations - the bottom-up approach, the team approach, the hydrological base - were found to have been insufficiently applied. The main reasons were, the non-availability of the services of the Institutional Organizers at the initial stage, the time constraints and the competitiveness among the Project Managers, and the limited conceptual knowledge of Project Managers about the social dimensions of the farmer organizations. Consequently, the farmer organizations at the grass roots level were found to be either remarkably weak or non existent.

   Some officers as well as farmers were unaware of the INMAS objectives. This had an adverse effect on their active participation in planning project activities and implementation of committee decisions. The farmer awareness of the INMAS objectives varied from 39% to 85% among the schemes and this reflected the intensity of the activities carried out by the farmer organizations.

7. There is agreement between the farmers and the officials, that the project committee system has facilitated communication of farmer's problems to the relevant implementing agencies. It is the farmer's view, however, that this has not brought about

concrete actions. The Project Managers, while contradicting this position complained of lack of farmer's co-operation and financial constraints as being responsible for the delay in implementing certain decisions. The study revealed that the type of problems brought up by the farmers are of a localized and immediate nature which affect only a selected few rather than the farming community as such. All the same, the inability to implement the project committee decisions has resulted in losing the confidence of the farmers in the project committee system.

8. Although the absence of speedy concrete actions on the part of the project management has distanced the farmers and officers as groups, in the process of the implementation of INMAS, a closer interaction has developed between these two groups. The farmers at least feel that the system has provided them with a forum to present their problems - a mechanism which was not available before. On the other hand, the project management has also realized that it is important to consult the farmers in carrying out the project activities.

9. The Institutional Organizers, whose role was to act as catalysts in the establishment of farmer organizations, were in general constrained to perform their role as envisaged. The major problems were the delay in making the appointments, formation of farmer organization or the selection of their leaders by the Project Managers themselves, conflicts of interest between the Project Managers and the Institutional Organizers, and misconception of their role by the farmers. However, the Institutional Organizers have won the confidence of the farmers.

10. Although a large number of training programmes have been conducted, they have also suffered from several drawbacks. The Project Managers were more oriented towards meeting the targets and competing with each other for the same. The identification of training needs was not properly done and the absence of feedback information was noticeable. Inadequacies were observed in relation to the use of training techniques and selection of resource persons.

11. The survey revealed that double cropping has become possible only in PSS and the head and middle areas of Minipe, Ridibendiela and Kaudulla schemes. The yala paddy cultivation has become virtually impossible in Mee Oya, Huruluwewa and

Nagadeepa due to the inadequate supply of water. The cropping intensities for the Yala seasons indicate wide variations across the sample schemes. The average cropping intensity has not appreciably increased as a result of INMAS.

12. The crop failures in sample schemes ranged from 2 to 15 percent according to the estimates prepared by the Project Managers. The survey revealed that a substantial section of the farmers (21-50%) have experienced some kind of crop damage with varying degrees of severity. The reasons for crop damages, in order of importance are lack of irrigation water, drought, insect and pest attacks and floods of rain. However, alternative steps such as (a) the implementation of "Bethma" cultivation, (b) the promotion of cash crop cultivation during the water deficit Yala, have been taken after 1984 to avert crop damages from lack of irrigation in a systematic way.

13. On lowlands, a tendency to grow cash crops, both in Yala and Maha was observed with certain schemes specializing in specific cash crops. In the case of highlands, however, there was no tendency towards crop diversification. The cultivation of cash crops on lowlands during Yala in particular, could be further intensified by resorting to strict water scheduling.

14. No changes were observed in land preparation methods which could be attributed to the INMAS Programme. The wet land preparation technique has been universally adopted indicating that the method of land preparation is not related to the water supply situation. The project management also has not taken an interest to popularize the dry land preparation method as a means of conserving water.

The majority of the farmers have used tractor power or animal power, while a few farmers have used mammoties for land preparation. The use of buffaloes is common in schemes such as PSS, Kaudulla, Minipe and Nagadeepa. Ownership and availability are the main determinants behind the selection of draught power. However, the need to adhere to the cultivation schedule has motivated the farmers to use tractors for land preparation over-riding their general preference for buffaloes to tractors. Location specific variations were noted in regard to the selection of draught power in that the farms located at the head end tend to use more buffaloes than those located at the tail end. There were no significant changes

observable in regard to the use of farm power and the selection of draught power sources did not vary according to the seasons. Those who hire draught power considered factors like availability, quality, speed and profitability.

The common method of plant establishment is broadcasting of seed, and the other methods reported are transplanting and row seeding. The total extent of paddy land transplanted is higher in the Maha season as transplanting is significantly influenced by the favourable water availability. It is also higher in the head and middle areas than in the tail end areas. However, the total land extent sown has increased considerably due to the cultivation of short term varieties.

The survey revealed widespread adoption of New High Yielding Varieties (NHYV) such as BG 34-8, BG 276-5, BG 379-2, BG 400-1 and BG 94-1. Some of these are of short duration (3-3 1/2 months), cultivated particularly during Yala. The shift to the cultivation of short term varieties can be described as a major outcome of the INMAS Programme. The project management has taken special care to promote short duration paddy varieties during Yala in an effort to conserve water.

Due to lack of time series data, it is hard to establish if there are any changes in the application of fertilizer attributable to INMAS. The percentage of farmers applying fertilizer and the percentage of extent receiving all three types of fertilizer recommended by the Department of Agriculture, vary across the sample areas. (The percentage of farmers applying Urea, TDM and V_1 ranged between 88-100%, 50-93% and 68-98% respectively). No definite conclusions can therefore be drawn. However, the application of fertilizer appear to be closely associated with the water availability. In terms of quantity applied, the application of V_1 was well below what is recommended, while Urea and TDM were over used. The imbalance in the application of fertilizer may have affected the yield level.

The analysis of time series data points to an increasing trend of adoption of weed control methods. Weedicides have been extensively used in addition to manual and rotary weeding. A spatial pattern emerges in connection with weed control, reflecting a relationship with water availability. In fact, the adoption of weed control measures was found to be greater in water deficit Yala which is conducive to the spread of weeds.

Adherence by the farmers to a common cultivation calendar ranged between 48% to 98% across the sample areas. The delay in land preparation activities was the main reason for non-adherence.

The other decisions taken at the Kanna meetings are generally adhered to by the majority. Strict water scheduling has facilitated the timeliness of land preparation and cultivation of short duration varieties. Consequently, an appreciable reduction in the staggering of the cultivation season has occurred in many schemes which may be described as a significant outcome of the INMAS Programme.

With regard to labour use, the emerging trend is towards using hired labour. The main reasons for this are water scheduling, inadequacy of available family and exchange labour for agriculture, and adoption of NHYV. Both family labour and hired labour have been used in all the schemes, while a few schemes reported the limited use of exchange labour. The variations in labour use are primarily due to the variations in agronomic practices adopted.

15. Yield data by schemes do not show a consistent upward trend. In the context of wide variations in yield levels, no definite conclusions about the effect of the INMAS on yield level could be drawn. The seasonal fluctuations in yield levels appear to have been influenced more by the climatic factors rather than any substantial change in the farm management practices.

16. On the composition of production costs, the highest cost item in all schemes was in respect of labour which ranged between 45% to 68% of the total cost. The second highest was the cost of tractor (3%-26%) followed by buffaloes, fertilizer, seed paddy and agro-chemicals.

The total cost of production per hectare ranged between Rs.6506 to Rs.10,506 across the sample schemes. The variation in production costs appears to be closely associated with the intensity of agricultural activities. In Maha, where the intensity of cultivation is greater, production cost is invariably higher.

The highest net returns per hectare were recorded by the farmers in Nachchaduwa, Kaudulla and PSS. Negative returns

were reported from Ridibendiela, Nagadeepa and Minipe. Comparatively higher labour cost and poor yields are mainly responsible for the negative returns. However, when the imputed cost of family and exchange labour is excluded, the net returns per hectare in all schemes are positive.

The analysis of time series data pertaining to the districts in which the schemes in the sample are located, clearly indicated a gradual erosion in the net returns per hectare between 1982 Yala and 1986 Yala seasons. This is attributed to the escalation of prices of most of the production inputs which were not met by the increased farm gate price of rice.

17. The analysis of the farmer's perception about the O&M fee and reasons for non-payment, revealed that 30% of the farmers believe that O&M rates are government taxes levied on them for the use of irrigation water. The rest are aware of the objectives behind the collection of O&M fee. However, only 37% of the farmers have paid O&M fee at least once since the implementation of the INMAS Programme.

Over 35% of the officers believe that farmer's default in payment of O&M fees for genuine reasons like low income, low yield and non-cultivation due to lack of water. The majority of the farmers confirmed this observation. Among the other reasons reported by the farmers are the unreasonably high rate, dissatisfaction with the method of mobilization of funds and political interference. In addition, the recent disturbances and subversive activities have also affected the collections as well as contributions. Imperfection in legal procedures have also encouraged non-payment.

18. The private sector dominates the supply of inputs which are adequately available. Lack of working capital and seed paddy however, are problems for the farmers.

19. Marketing is one area which has not received due attention. Low prices at the harvesting time, inadequacies in the institutional arrangements including lack of purchasing points, unfavourable pricing policies and terms of trade are the problems faced by the farmers. The private sector dominates the market.

20. With regard to equity, adequacy and reliability of irrigation water, certain improvements have been observed. As for

rehabilitation, farmers are consulted at the design stage. In certain schemes, planning for regular maintenance has been systematized, and now it is carried out jointly by the farmers and officials.

21. The major tools available to the IMD for monitoring the activities at field level are periodical meetings, regular communications and progress reports prepared by the PMs. The PMs are expected to prepare an implementation plan prior to the cultivation season, followed by monthly progress reports and seasonal reports. The study revealed major deficiencies in these methods. Among them are non-completion, inconsistencies and unreliability. Some PMs have exaggerated the real situation in the field. The inevitable consequence manifested itself in the limited usefulness of these progress reports for project monitoring purposes.

6.2 Recommendations

1. The INMAS message should be communicated to the farmers and the field level officials of Line Agencies. In this connection, an awareness programme must be promoted through such mechanisms as Project Level Committee, Kanna Meetings, Farmer Organizations, Institutional Organizers, Educational Institutions, Religious Institutions, Community Centres, media, public days and ceremonies etc.

2. To create an awareness among farmers on the objectives of INMAS, a sufficient number of trained IOs should be deployed. The following densities are recommended based on past experience :

   (a) One IO for every 200 farmers at the initial stage when there are no FOs

   (b) The density of the IO can be thinned down gradually to one in thousand five hundred depending on the strength of the FOs

3. In recruiting the new PMs, the following factors should be considered :

   (a) Managerial skills

   (b) Relevant experience and background

   (c) Social status

For those who are already in service facilities should be provided to achieve the above

4. The PMs should be adequately trained on the concepts of FOs prior to their deployment irrespective of the time constraints.

5. The bottom-up approach should be followed in establishing FOs at different levels, which means that the first step should be to establish field channel organizations. Distributory channel organizations have to be formed only after strengthening FOs.

6. The IOs, IDOs and PMs should be moved to the scheme simultaneously to avoid top-down approach being adopted by the PMs in the absence of field staff in forming the FOs.

7. The PMs, IDOs and IOs should work as a cohesive team and not as members of a bureaucratic chain.

8. The respective committees should not take decisions which are not implementable due to various limitations.

9. Strong farmer organizations should be given the responsibility to collect O&M fees.

10. Arrangements should be made to allow the farmers to pay O&M fees in cash or kind.

11. The legal procedure on O&M recoveries should also be reviewed in their entirety and necessary amendments be made to the Irrigation Ordinance as it is vital to achieve the objectives of the O&M collection.

12. The Project Managers should take necessary measures to improve the marketing facilities in their respective areas.

13. When designing training programmes, it is essential to have a needs assessment done, prior to the training for making the programme more result-oriented.

14. The monitoring and evaluation of the project by IMD should be improved; there should be regular feedback to PMs from the Head Office. An efficient data-base management system should be developed to ensure easy accessibility to data. A project profile including information on production-related variables, water related variables and social variables should be developed

and maintained by each Project Manager. This would facilitate effective benefits and progress-monitoring.