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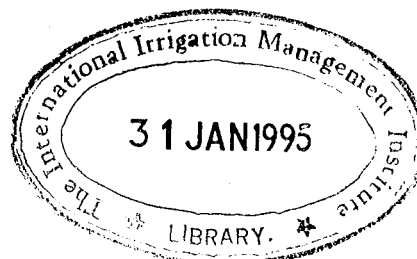
farmer-managed irrigation systems / farmer associations / irrigation management  
institutional development

## FINAL REPORT

### Program on Farmer-Managed Irrigation Systems and Support Services

#### PHASE II

#### VOLUME 2



### COMPARISON OF SUPPORT SERVICES FOR FARMER-MANAGED IRRIGATION SYSTEMS IN SRI LANKA AND NEPAL

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## **FINAL REPORT**

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#### **PHASE II**

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## Acronyms

ADB	Asian Development Bank
ADB/N	Agricultural Development Bank of Nepal
AIC	Agricultural Input Corporation
AMIS	Agency Managed Irrigation System
BTRT	Beganas Tal Rupa Tal Watershed Project
DADD	Department of Agriculture Development
DADO	District Agricultural Development Officer
DDP	Dhading Development Project
DIHM	Department of Irrigation, Hydrology and Meteorology
DIO	District Irrigation Office
DOA	Department of Agriculture
DOI	Department of Irrigation
DSCWM	Department of Soil Conservation and Watershed Management
EEC	European Economic Commission
FIWUD	Farm Irrigation and Water Utilization Division of Department of Agriculture
FMIS	Farmer-Managed Irrigation System
GO	Group Organizer (of Small Farmers Development Program)
GTZ	German Agency for Technical Cooperation
HADP	Hill Agriculture Development Program
HFPP	Hill Food Production Program
HMG/N	His Majesty's Government of Nepal
IIMI	International Irrigation Management Institute
ILC	Irrigation Line of Credit
ILO/SPWP	International Labor Organization/Special Public Works Program
IMP	Irrigation Management Project
IMSSG/IAAS	Irrigation Management Systems Study Group, Institute of Agriculture and Animal Science
IMWUD	Irrigation Management and Water Utilization Division
(I)NGO	(International) Non-Governmental Organization
IRDP	Integrated Rural Development Projects
ISP	Irrigation Sector Program
JT	Junior Technicians of Department of Agriculture
JTA	Junior Technical Assistant of Department of Agriculture
KHARDEP	Koshi Hills Agricultural and Rural Development Project
MLD	Ministry of Local Development
MOA	Ministry of Agriculture
MOWR	Ministry of Water Resources
MPLD	Ministry of Panchayat and Local Development
NARC	National Agricultural Research Center
O&M	Operation and Maintenance
RID	Regional Irrigation Directorate
RTB	Research and Training Branch of Department of Irrigation

SFDP	Small Farmers Development Program (of Agricultural Development Bank of Nepal)
SINKALAMA	Sindhupalchok, Kavrepalanchok, Lalitpur and Makwanpur Integrated Rural Development
SMB	System Management Branch (of Department of Irrigation)
SNV	Netherlands Volunteer Organization
SSP	Support Service Programs
STW	Shallow Tubewell
USAID	United States Agency for International Development
VDC	Village Development Committee
WB	World Bank
WECS	Water and Energy Commission Secretariat
WUA/O	Water Users' Association/Organization



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# **Comparison of Support Services for Farmer-Managed Irrigation Systems in Sri Lanka and Nepal**

M. Samad and G. Shivakoti<sup>1</sup>

## **CHAPTER 1**

### **Introduction**

#### **KEY ISSUES**

IRRIGATION HAS BEEN employed to increase agricultural production from very ancient times. The prosperity of the great civilizations of the past--Egyptian, Chinese, Mesopotamian, Indus Valley--relied heavily on irrigated agriculture. Although the area under irrigation increased steadily over several centuries, it is the twentieth century which is likely to be regarded as the heyday of irrigation development. From about 40 million hectares at the turn of this century, an estimated 193 million hectares of land have been added to the global irrigation base bringing the total to some 233 million hectares by 1990.<sup>2</sup> The rate of expansion has been particularly impressive from the mid 1950s to the late 1970s when the net irrigated area grew at about 2-4 percent per annum. The increase in area was predominantly in developing countries where governments, often with substantial financial assistance from international donors, embarked on irrigation development as a major strategy to boost agricultural production and economic growth.

Many of the irrigation systems created in this century are typically large-scale systems funded by state revenues and managed by public organizations. These systems are generally provided with a range of government-sponsored support services. These include assistance in operation and management of irrigation facilities, subsidized credit, special input supply, extension advice and marketing outlets. In addition, these schemes benefit from superior physical infrastructure, social welfare programs such as improved domestic water supply, better health facilities and other basic needs, and also legal provisions and institutional arrangements to facilitate efficient water management.

Outside the publicly managed systems there are a substantial number of irrigation schemes worldwide, which were developed by the local community. Not only do farmers provide the operational and managerial input, but they are also responsible for maintenance and repairs.

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<sup>2</sup>See Rangeley (1985), FAO Production Yearbook (1990), Yudelman (1993).

Many of these systems are of ancient origin. They are predominantly small surface and pump irrigation systems serving less than 250 ha, and are usually located in remote areas which makes them invisible to government functionaries and commercial services. Yet, in some countries the vast number of farmer-managed irrigation systems (FMIS) collectively account for the majority share of the irrigated area.

FMIS make a substantial contribution to agricultural production and a sizeable proportion of the rural population is dependent on these schemes for their livelihood. Yet, during the past decades of irrigation expansion, the importance of FMIS to national economies had often been overlooked. Until recently these schemes were not even included in national irrigation statistics. Government support to the schemes were minimal and generally limited to emergency repairs or minor upgrades to irrigation infrastructures. Such undertakings were usually on an ad hoc basis and there was little effort to have regular and continuous assistance as was the case with public irrigation systems.

In more recent years governments are giving more attention to farmer-managed irrigation systems. Three principal factors provide the impetus for increased government intervention in this sector. First, the growing recognition that areas served by FMIS can no longer be ignored as they represent a significant and yet, under-performing segment of the country's land and water resources.

Second, FMIS no longer consists of isolated communities of subsistence farmers, but of semi or fully commercialized producers requiring modern production inputs and services.

Third, because of the poor record of performance of publicly managed schemes in many countries, areas that were formerly served by public agencies are now being turned over to farmer management or transformed into farmer-agency jointly managed systems as they are considered to be viable alternatives to public management. These developments, combined with the rapid proliferation of privately owned small-scale lift irrigation systems worldwide, have raised the priority for effective support service programs to FMIS.

At present, many governments have only limited experience with support services and are also poorly organized institutionally to cater to the needs of the rapidly growing sector. Globally, diverse policies are being designed and various procedures are being implemented with mixed results. In some cases, providers of support services focus on certain geographic regions or specialize in particular services rather than supplying the full range of services related to irrigated agriculture. In certain countries, farmer-managed systems are subsumed under the mandate of irrigation departments. Services provided by irrigation agencies are often confined to construction/rehabilitation assistance and are driven by agency quotas and annualized budgeting constraints than by local needs. In other instances, assistance to FMIS had been channelled through some other departments: Agriculture, Local Administration, Social Services. This has acted to shield the systems from the hydraulic works which come within the purview of the formal irrigation department (Coward and Levine 1987). Such under-provision of support services may seriously constrain the productivity, profitability and the sustainability of FMIS.

The foregoing concerns and the growing interest of the State to develop policies and implement programs related to farmer-managed systems calls for more information about various support service programs.

In order to improve their capacity to effectively serve FMIS, governments need to know what types of services are required and which strategies for delivering support services are cost effective. There is growing recognition that governments cannot provide services with the same intensity and the level of subsidies as they had provided to public irrigation system. At the same time, the request for services from farmer groups are strong and persistent. In recent years the involvement of the private sector, non-

governmental organizations and community-based organizations (such as water users associations) in the supply of inputs and other services to the FMIS sector have increased substantially.

As different providers of support services have diverse arrangements, terms and conditions for delivering services, there is the need for more systematic information in the hands of farmers as well as by governments of the array of options available to them and their implications.

This report forms a part of a broader effort made by the International Irrigation Management Institute (IIMI) to build up better information on contemporary experiences of support services for FMIS by documenting and disseminating analyses of support service programs in two countries, one in Sri Lanka and the other in Nepal. In both countries FMIS are a major component of the irrigated sector.

## **SCOPE AND OBJECTIVES OF THE STUDY**

Support services include all those activities related directly to the irrigated agriculture production system of FMIS. These include: (a) physical, e.g., construction and repair of irrigation facilities; (b) agricultural, e.g., land development, provision of agricultural inputs (seeds, fertilizers, pesticide, herbicide, etc.); and (c) institutional which includes agricultural extension, financing, marketing, training, regulating and auditing and also water right issues and conflict resolution.

This study concentrates primarily on support services for irrigation. The focus is on support programs for rehabilitation of the irrigation infrastructure, institutional organizations for water management and mechanisms for resolving irrigation related disputes. Other services such as the provision of agricultural inputs, credit and marketing are only referred to in terms of how they are or are not related to the primary support services which concern this study.

Within this context, the overall objectives of this study are: (i) to analyze the support service programs to FMIS in Sri Lanka and Nepal with a view to identifying the more successful approaches being used to deliver support services; (ii) based on the synthesis of these two country experiences, to formulate broad guidelines for planning and implementing support service programs for FMIS.

Within the context of the broad aims stated above, the more specific objectives are:

- \* To identify the kind of services being provided in the FMIS sector and mechanisms being used to deliver services.
- \* To determine how geographically representative is the provision of services and with what frequency and continuity are they being provided.
- \* To identify the types of services being provided by public agencies, non-government agencies and community-based organizations.
- \* To examine whether service providers tend to specialize and cluster their services and what implications does this have for meeting the needs of FMIS for continuity, flexibility and access.
- \* To understand the legal and institutional frameworks for the promotion or hindrance of meaningful support services.

## **STUDY METHODS**

The study is based primarily on the following sources of information:

- \* A review of published and unpublished materials relating to governmental and non-governmental assistance programs to the FMIS sector.
- \* Interviews with key informants particularly, public officials and personnel from selected non-governmental organizations involved with various support service programs to the FMIS sector.
- \* Rapid appraisal of selected farmer-managed irrigation systems and interviewing of members of the farming community, and officials of agencies implementing support service programs.

## **ORGANIZATION OF THE REPORT**

After this introductory chapter, which sets out the methodology of the study, the report is organized into four other sections. Chapter 2 presents the findings of the Sri Lankan case study. Chapter 3 focuses on the Nepal experience. Chapter 4 summarizes the main conclusions of the two case studies and recommends guiding principles and sequence of activities for planning and implementing support service programs for the FMIS sector.

## CHAPTER 2

# Support Services for Farmer-Managed Irrigation Systems in Sri Lanka

### INTRODUCTION

THE TERM FARMER-MANAGED irrigation systems in Sri Lanka refers to small-scale irrigation facilities which include small tanks (reservoirs), anicuts (weirs), lift irrigation systems from open wells and other miscellaneous types developed by farmers in different agro-ecological environs. Of these various types, small tank and anicut systems predominate in terms of the number of schemes, area covered and number of farm families dependent on the schemes. In official irrigation statistics they are identified as a distinct category and referred to as minor irrigation systems.

Lift irrigation from open shallow wells was traditionally practiced in the Jaffna peninsula and few other areas in the north and north-western parts of Sri Lanka. During the last three years or so, there has been a proliferation of lift irrigation with individually owned pump sets in other parts of the country as well, especially in the north-central region. However, there are no reliable statistics of the number of such units nor the area covered. Therefore, the latter class of works is excluded from this study and the focus is support service programs for the officially designated minor irrigation systems.

### OVERVIEW OF FMIS IN SRI LANKA

#### Types of FMIS

The Irrigation Ordinance No. 32 of 1949 provided the first definitive statement on what constitutes minor or village irrigation systems: "a minor irrigation system is one constructed by farmers without government help, or with the help of masonry works and sluices supplied free of charge by the government and maintained by the farmers." According to this definition government assistance was to be limited to the provision of physical structures whereas, maintenance responsibility was to remain with the farmers.

The Agrarian Services Act No. 58 which is currently in force defines minor irrigation as an "irrigation work serving up to 200 acres (80 ha) of agricultural land."<sup>3</sup> Under the provisions of this Act, the Irrigation Department was responsible for the refurbishment and the responsibility for operation and maintenance was vested with the Department of Agrarian Services.<sup>4</sup>

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<sup>3</sup>"Irrigation Work" as defined in the same Ordinance includes: any tank, bund, anicut, *e/a*, channel, distributary, field channel or watercourse comprised in or incidental or ancillary to the irrigation work.

<sup>4</sup>These definitions have identified the role of the community and the state at different periods of time. Previously the farming community was responsible for operation and maintenance, the subsequent legislation emphasizes the role of the state in these tasks.

Although the official definition of minor irrigation systems based on the size of the command area facilitates technical and administrative inputs, it obscures the wide diversity of FMIS. The diversity is expressed in terms of the physical characteristics of the system, agronomic features, socioeconomic peculiarities, organizational structures and the way water management is pursued. The distinguishing features are related to the environment in which the systems are located. A detailed exposition of the features is beyond the scope of this report. What is attempted here is simply to highlight some of the important characteristics.

Small tank systems are located principally in the Dry Zone of Sri Lanka.<sup>5</sup> Rainfall in this region is highly seasonal and despite an average annual rainfall of 1,270-1,900 mm, year-round cultivation is impossible without irrigation.<sup>6</sup> In the small tank systems this is accomplished by the local storage of rain water by building an earthwork transversely across the line of a natural stream to harness run-off water from the catchment during the rainy season. As the general lay of the terrain is nearly flat most of the small tanks are large in area, and the earthwork dam is long rather than high. Tank water is conveyed to the field along channels by way of a sluice (*horovva*) with the *bisokotuwa* (access tower).<sup>7</sup>

As the water supply available to the community, more than any other single factor, sets the limit to the area of land that could be cultivated and hence, to the size of the population which may survive through subsistence agriculture, acquisition of water and allocating the limited supply uniformly among the users necessitate cooperation on a large scale. This fact was the most potent source of alliances that contributed to strong community formations in the tank villages;<sup>8</sup> but at the same time it was also a major source of hostility. This has demanded a set of well defined rules for spatial and temporal allocation of water in the command area.

Historical evidence suggests that irrigation rules pertaining to the Dry Zone tank system had existed from very ancient times.<sup>9</sup> The rules were based on social principles and tended to emphasize equity and adequacy in the allocation of water, rather than efficiency considerations. The precedent thus created characterizes water allocation patterns in the Dry Zone small tank systems to this day.<sup>10</sup>

Anicut systems which depend on river and stream flows, were concentrated in the hilly regions which also correspond to the Wet Zone of the country. The traditional systems consisted of temporary stick-

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<sup>5</sup>Sri Lanka is delineated into three agro-ecological zones on the basis of annual rainfall as follows: Dry Zone = 1,270-1,900 mm, Intermediate Zone = 1,900-2,540 mm and the Wet Zone = over 2,540 mm.

<sup>6</sup>The agricultural year in Sri Lanka is distinguished into the *maha* or major season which coincides with the period of the northeast monsoon from October to late January and the *yala* season from April to August which experiences the southwest monsoon. In the Dry Zone 40-60 percent of the rainfall is received in the *maha* season. The rest of the rainfall is experienced in the "inter-monsoonal" period just before and after the *maha* rains. June to September are months of rarely interrupted drought. Thus *yala* cultivation is entirely dependent on irrigation.

<sup>7</sup>A tank is usually equipped with two sluices. The main sluice (*maha horovva*) which is located at the lower level supplies water to the old or original command area. A second sluice (*meda horovva*) built at a higher level supplies water to land subsequently added to the command area.

<sup>8</sup>A notable feature of small tank systems in Sri Lanka is that a tank is ordered around a single village inhabited by a population belonging to a single caste.

<sup>9</sup>The scripts inscribed in the Kondawatuwana Pillar and the Wevelkotiya Slab in the 10th century have been interpreted as irrigation rules enacted by the monarch for the tank systems in the Dry Zone (Weerawardena 1982; Seneviratne 1990).

<sup>10</sup>A classic account of the principles of egalitarianism embedded in the social organization of a Dry Zone tank community is found in Leach (1961).

dams or *ammunas* built usually across perennial streams at appropriate places high above the level of the land. Water from the stream is directed to the field through channels built along steep slopes. In modern systems, the temporary weirs were replaced with concrete ones.

As anicut systems are dependent upon perennial sources of water the degree of integrative action required by the user community is far less than in the tank villages in the Dry Zone. There are no formal irrigation rules which govern the allocation of water among users. However, a significant feature from a socioeconomic perspective is that, much of the land area where anicuts predominate belong to monasteries and feudal families. The land was farmed by tenants under highly exacting terms and conditions. Consequently, the user community which consisted mainly of tenant farmers had little motivation to invest extraordinary efforts in system maintenance (Abeyratne 1990).<sup>11</sup>

### Geographical Distribution of FMIS

Estimates of the total number of farmer-managed irrigation schemes in Sri Lanka vary enormously from one source to another. Figures range from 30,000 tank systems and 10,000 anicuts to 9,300 and 9,800 working tanks and anicuts, respectively. According to a survey carried out recently by the Agrarian Services Department in 17 districts outside the northern and eastern provinces there are 9,111 tank systems and 9,870 anicuts irrigating about 97,290 ha and 81,575 ha, respectively.<sup>12</sup> This is about a third of the total irrigated area under rice in the country. It is estimated that some 195,200 farm families are dependent on small tank systems and about 255,650 farm households rely on the anicut systems (Department of Agrarian Services, personal communication).

In terms of geographical distribution, a majority (93 percent) of the tank systems are located in the Dry Zone. About 75 percent of the tank systems are in Anuradhapura and Kurunegala Districts. Anicut systems are predominantly in the Wet and Intermediate Zones of the country with the largest concentration in the districts of Kandy, Matara, Badulla, Nuwara-Eliya and Ratnapura. Table 1 gives the districtwise distribution of FMIS outside the northern and eastern provinces.

### Organizational and Management Arrangements

The most critical aspect of social organization as it relates to all types of irrigation systems concerns collective decisions by the community on cropping calendar for the season, the timing and distribution of tank water use, the maintenance of the tank system and the conservation of water supply. The forum for such decisions is the *kanna* meeting held prior to each cultivation season. The holding of the *kanna* meeting is a statutory requirement under the provisions of the Agrarian Services Act. The Commissioner of Agrarian Services is the one who administers the Act and was previously represented at the field level by Cultivation Officers, who were subsequently redesignated as *Grama Niladharis* (GS) with wider responsibilities.

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<sup>11</sup>Irrigation management issues in anicut systems is an under-researched area. This is unfortunate. Information available is from passing references made to irrigation management in studies addressing other agrarian issues.

<sup>12</sup>The figure cited was the estimate made recently by the Department of Agrarian Services. The National Irrigation Project Appraisal Report gives the number of schemes as 22,000 with a total command area of 235,000 ha (World Bank 1991).



Table 1. Districtwise distribution of minor irrigation systems.

District	Tank systems			Anicut systems		
	Number	Area (ha)	Number of farmers	Number	Area (ha)	Number of farmers
<i>Dry and Intermediate Zones</i>						
Anuradhapura	2,481	40,458	53,621	21	490	1,050
Hambantota	433	4,497	8,097	37	327	609
Kurunegala	4,442	29,892	85,368	722	6,277	11,664
Polonnaruwa	120	2,515	2,847	98	2,331	2,318
Moneragala	229	3,699	5,893	341	2,951	4,978
Puttalam	752	8,498	16,396	106	2,088	3,252
<i>Wet Zone</i>						
Badulla	78	208	1,162	1,344	5,081	22,297
Colombo	5	98	300	222	2,715	7,854
Galle	5	66	119	297	5,901	16,799
Gampaha	47	420	1,346	536	4,626	15,696
Kandy	105	1,033	3,376	1,594	9,186	30,136
Kalutara	6	166	637	346	5,570	18,030
Kegalle	12	102	441	844	3,322	16,765
Matara	22	522	1,733	717	10,880	34,484
Matale	290	3,725	9,147	778	5,602	18,300
Nuwara Eliya	50	813	3,324	997	6,996	27,687
Ratnapura	34	576	1,410	870	7,234	23,727
Total	9,111	97,289	195,209	9,870	81,575	255,646

Source: Department of Agrarian Services.

\* Excludes districts in the Northern and Eastern provinces.

The kanna meetings are organized by the *Yaya Palaka* or Tract Representative who is elected by the cultivators for a period of three years. Attendance at the meetings is limited to the owner-cultivators or occupiers of the land coming under a particular scheme. Divisional Officers of the Department of Agrarian Services and the GS who at least theoretically represents the Agriculture Department are expected to attend the meetings.

The 1991 Amendment to the Agrarian Services Act while keeping the old institutional structure of kanna meeting intact, introduces the concept of farmer organizations (FO). These organizations are constituted from among the owner cultivators and occupiers of agricultural land. The functions of the FOs are not limited to the management of irrigation but include the formulation and implementation of agricultural programs, carry out village-level construction works, marketing of produce and the distribution of production inputs and engage in any activity approved by the Commissioner as being beneficial to the farming community (GOSL 1991).

Although a substantial number of FOs have been formed and are formally registered with the Agrarian Services Department, the actual number of FOs discharging the functions vested with them effectively is unknown.

### **Agricultural Production in FMIS**

Farming systems in the small tank systems are relatively homogenous and have been described in detail by a number of authors.<sup>13</sup> In essence, agricultural production is based on a three-fold system of land use with rice grown in the irrigated areas with tank water, a variety of nonrice annual crops cultivated under shifting cultivation in the adjacent scrub-lands, and a small home garden which is usually devoted to a few perennial crops. Such a system of land use has evolved over centuries of culture. In recent years, because of the pressure on land resources and measures taken by government to restrict shifting cultivation, farmers have tended to enclose areas in which they had practiced shifting cultivation and convert them into a regular upland plot.

Until recently, agricultural production in the small tank systems was predominantly for subsistence purposes. Production inputs such as planting material, manure and also animals for traction, were available with the farmers themselves or within the community. As a result, farmers' need for supplies and services from external sources was minimal.

The widespread cultivation of high yielding rice varieties (HYV) from the mid 1960s onwards transformed agricultural production even in the most remotely located FMIS from a subsistence to a commercially oriented mode of production. Because of the complementarity between HYVs, irrigation, and commercial inputs, farmers' reliance on external agents for production inputs and services expanded substantially. This has resulted in the emergence of a multiplicity of institutions--government departments, parastatal organizations, non-government organizations, private business establishments and other institutions--involved in the provision of production inputs and various services to the small farm sector.

Agricultural production in the anicut systems does not vary substantially from the small tank systems. The division of holding into the gravity-fed irrigated rice land and the unirrigated highland continues. However, as most of the anicut systems are located in densely populated or in areas surrounded by

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<sup>13</sup>Examples include Farmer (1957), Abeyratne (1956), Leach (1961).

large plantations, the cultivation of nonrice crops in upland plots under rainfed conditions is severely limited. However, in certain regions especially in the Badulla and Nuwara Eliya districts, farmers have taken up to the cultivation of vegetables, especially potatoes, instead of rice in the *yala* season (Hearth et al. 1984).

Figure 1 gives a comparison of the cropping intensities of major and minor irrigation systems in Sri Lanka for a five-year period.<sup>14</sup> The cropping intensities of the minor irrigation systems which include both small tank and anicut systems is below the national average for the irrigated sector and substantially lower than the cropping intensity in major systems. Figure 2 provides a comparison of cropping intensities in selected districts. It is observed that cropping intensities in Ratnapura and Matara where there is a preponderance of anicut systems are much higher than in the two districts in which tank systems are predominant.

## **NATIONAL POLICY AND INSTITUTIONAL FRAMEWORK FOR SUPPORT SERVICES**

### **Overview of Policy Objectives for Irrigated Agriculture and the FMIS Sector**

Irrigation development has been a major focus of government policy since the country gained its independence in 1948. Successive governments since independence have made heavy investments on the creation of new irrigation facilities. Irrigation development was concentrated in the Dry Zone and was closely linked to the government's land settlement program.<sup>15</sup> The principal objectives of these efforts were to increase food production, employment creation in agriculture and the resettlement of the population from the over-crowded Wet Zone in the sparsely populated Dry Zone.

From about 1980 the emphasis of government policy shifted from new construction to rehabilitation of existing irrigation facilities. It also entered a new era in public investments in irrigation as a minor system which hitherto received little attention and was taken up for rehabilitation under various government funded and donor financed projects.

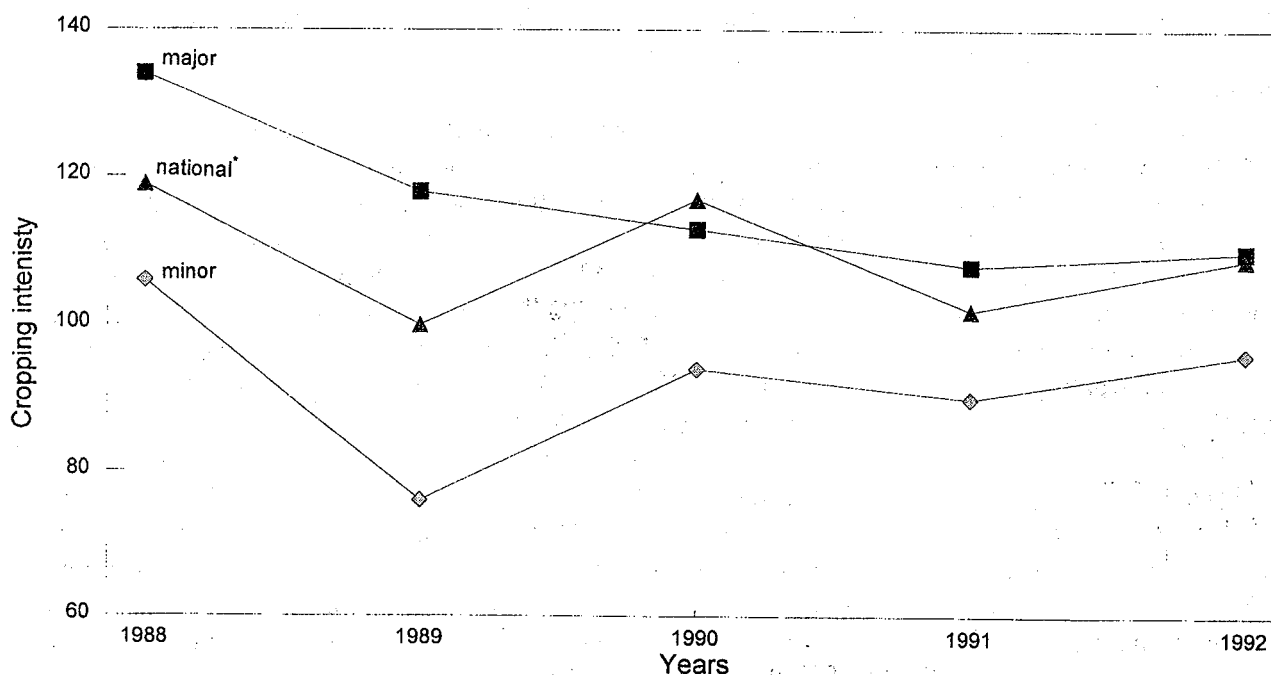
The shift in focus from construction to rehabilitation was accompanied with significant changes in the basic concepts, objectives and strategies of system rehabilitation. The conventional top-down official-dominated approach with a heavy construction bias in rehabilitation had failed to achieve the desired results. Although some of the major rehabilitation projects such as the Village Irrigation Rehabilitation Project and the Anuradhapura Dry Zone Development Project were based on the conventional approach, subsequent efforts--especially those carried out by NGOs--adopted a participatory mode with greater consultation with the water users. Provisions for this were specifically incorporated in the project design, especially for operation and maintenance functions following rehabilitation.

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<sup>14</sup>Minor irrigation includes both small tank and anicut systems. Desegregated figures are not available.

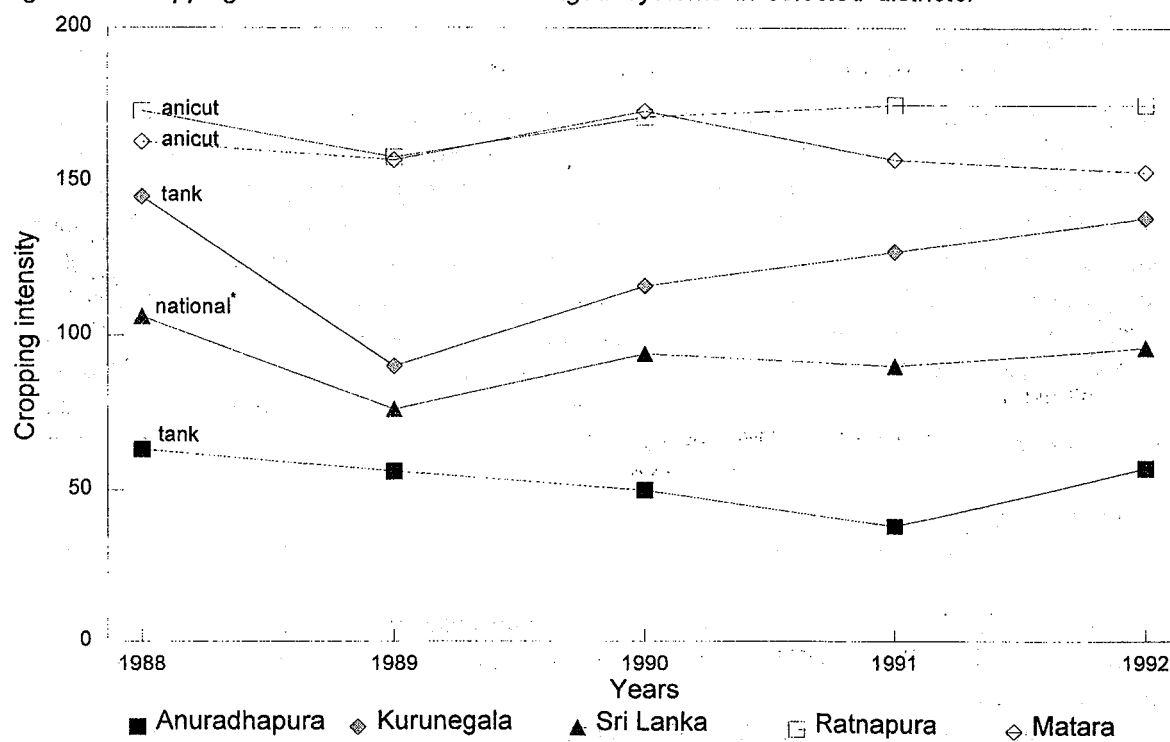
<sup>15</sup>In the early 1950s public investment in irrigation (defined as investments required to build, improve and maintain the irrigation infrastructure) amounted to 40 percent of the total public investment and about 90 percent of the investments in agriculture. In 1982 which coincided with the peak investments in the accelerated Mahaweli Development Program it amounted to 43 percent of the public investments and 84 percent of the investment in agriculture. In recent years, there has been a notable shift in the pattern of public investment with a reduction in capital expenditure in agriculture including irrigation. In 1991, investment in this sector amounted to 20 percent of the total. Commitments made under the public investment program for the period 1992 to 1994 show a further decline (Department of National Planning 1990).

Figure 1. Cropping intensities in major and minor irrigation systems (1988-1992).



\* National average for both rainfed and irrigated lands.

Figure 2. Cropping intensities in farmer-managed systems in selected districts.



\* National average of minor systems.

As noted earlier, the formation of farmer organizations under the 1991 Amendment to the Agrarian Services Act was another step to promoting the participation of water users in operation and maintenance tasks. It is believed that FOs will eventually be able to mobilize the finances required for these activities.

The devolution of political authority and public administration through provincial councils under the Thirteenth Amendment to the Constitution of Sri Lanka resulted in another significant change in government policy relating to minor irrigation systems. Among the subject matters assigned to Provincial Councils is the maintenance and rehabilitation of minor irrigation works which was previously the responsibility of the Department of Agrarian Services. However, The Department will continue to implement the provisions of the Agrarian Services Act. The Provincial Councils are also expected to enact irrigation statute to provide for the management of irrigation consistent with the central government policy of participatory management. Although the devolution of government power provides for the transition from a centralized administration to a locally managed system, organizational arrangements to cope with this line of segmentation are yet to emerge.

Recently, crop diversification has been given much encouragement as a means for improving land and water productivity. It is also considered as a potential solution to the declining profitability of rice monocropping and as a strategy to meet the demand for other food crops as the country achieves self-sufficiency in rice. Although there has been sporadic efforts to grow nonrice crops in the irrigated areas in some of the minor systems, the practice is not widespread.

## **Overview of Government Support Service Programs to FMIS**

### ***Provision of Agricultural Inputs***

Agricultural policy in Sri Lanka since independence has been heavily biased in favor of the domestic or the small farm sector. High priority was attached to increase production in this sector with a view to increasing farm incomes and the living standards of the small farm community, and also to achieve national self-sufficiency in basic foodstuffs. Thus, government policy was to ensure the ready availability of all production inputs: fertilizer, agro-chemicals, seeds, and credit. At the moment credit is subsidized. There is a small hidden subsidy in seed and planting material as the total cost of their production is not charged to the farmer. It is the government policy to remove all subsidies. The subsidy on fertilizer which had existed since 1951 was removed completely a few years back.

### ***Institutional Support***

In addition to the provision of production inputs, the government introduced legislation to give security of tenure to tenant farmers by the Agrarian Services Act which also stipulates the rent payable by the tenants.

As a means to increasing farmers' willingness to invest money and time in new techniques of cultivation, a Crop Insurance Scheme was introduced in 1958 on a pilot basis and applied compulsorily to the entire rice area in 1975.

In order to keep producer prices stable a guaranteed price scheme (GPS) has been in operation since 1948 and is operated by a parastatal agency, the Paddy Marketing Board (PMB). This scheme applies primarily for rice but certain other crops such as chili, onion, maize and some pulses could be

purchased under it by the PMB and Cooperative Societies. The GPS does not imply compulsory purchase but is intended to act as a floor support price.

Extension Services are provided by the Department of Agriculture. Until recently, field-level extension workers (*Krushikarma Viyapthi Sevaka* or KVS) were spread as widely as possible. With the redesignation of KVSs as *Grama Seva Niladharies* and the provision of diverse responsibilities, the extension service has been adversely affected.

### **State Support for Irrigation**

Government assistance specifically for irrigation falls into three broad headings:

1. Providing financial assistance for the rehabilitation, modernization and improvement of the irrigation infrastructure.
2. Institutional support for facilitating efficient water management and conflict resolution.
3. Research and development for improved cropping systems on irrigated lands.

### **Financial Assistance**

Financial assistance to rehabilitate and improve irrigation is provided from various sources. These include: block votes of the Departments of Agrarian Services and Agriculture; funds allocated by the Provincial Councils; special projects sponsored by the government such as Village Irrigation Rehabilitation Program (VIRP), Integrated Rural Development Program (IRDP), Anuradhapura Dry Zone Development Project (ADZAP), and aid under the World Food Program.

### **Institutional Support**

Institutional support for facilitating improvement is principally through the provisions of the Agrarian Services Act. As noted earlier the Act makes it compulsory for the holding of seasonal kanna meetings to decide on operation and maintenance tasks to be carried out by the water users and work out the seasonal irrigation schedule.

### **Research and Development**

Research and development for improved cropping systems in small tank system is carried out at the Dry Zone Research Station at Maha-Illupallama. The research station was established in 1956 with the specific mandate to carry out research and development on small-holder farming systems in the Dry Zone. Cropping systems research relating to anicut systems are carried out by the regional research stations of the Department of Agriculture.

## Overview of Support Programs of Non-Governmental Organizations (NGOs)

In recent years there has been growing number of NGOs involved in rural development affairs in Sri Lanka. These include international non-government organizations, locally funded NGOs and several community based organizations. There is a wide diversity of interests among the various NGOs ranging from the welfare of socially disadvantaged groups, religious affairs, moral upliftment and community development.

Only a few NGOs have direct involvement in minor irrigation by financing the rehabilitation of the physical infrastructure and/or providing various types of support services. Dayaratne (1990) identified the following NGOs involved with minor irrigation systems: the Freedom From Hunger Campaign Board (FFHC),<sup>16</sup> National Development Foundation (NDF), Cooperative American Relief Everywhere (CARE), *Sarvodaya Shramadana Samithiya* (Sarvodaya) and Plan International (Plan).

The strategies adopted by different NGOs in servicing minor irrigation systems vary in line with their philosophical orientation. For example, the Sarvodaya uses the irrigation scheme as an entry point to the village to promote its broader goals of moral and community development. FFHC bases its approach with a nostalgia for the past. The following statement "Our ancestors have built a vast number of wewas (tanks) without earth moving machinery...There is no reason why we cannot do it again, particularly if we intend to restore small tanks...why are we, the farmers of a more enlightened age, afraid to construct even a small village tanks ourselves, without external assistance?" (FFHC 1983) exemplifies the emphasis on the participatory and labor intensifying approach of FFHC to minor tank restoration or rehabilitation.

There is also a strong element of a geographical bias in the operations of NGOs. The focus is more on the small tank systems of the Dry Zone, though there are few instances of NGO involvement in anicut systems in the Wet and Intermediate Zones.

Community based organizations include farmer organizations (FOs), rural development societies and many other village-level groupings. Farmer organizations are rapidly becoming a major factor in the operation and maintenance of irrigation systems and also in the provision of input supplies to the farming community. However, these organizations are still in their formative years. The achievements to date and the enthusiasm presently displayed by some of the FOs should not lead to exaggerated opinions about the ability to serve the farming community on a sustained basis. Sri Lanka has had a long history with FOs of various forms established at different periods of time, all of which started off on an optimistic footing only to collapse in later years. The Cultivation Committees established at the village level under the Paddy Lands Act of 1958 and the Agricultural Productivity Committees formed at the agrarian divisional level are typical examples in this context.

## PROCESS FOR PROVIDING SUPPORT SERVICES BY DIFFERENT AGENCIES

This section describes the arrangements and processes for support to the FMIS sector in Sri Lanka by the different agencies. The account given here is based on a previous study by Abeyratne (1990), Dayaratne (1990) and the discussions the author had with the managers of the various agencies. As

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<sup>16</sup>The FFHC is a corporate body functioning under the Ministry of Agriculture. It is not an NGO in the real sense of the term, but is regarded as an NGO as it receives direct funding from several international agencies.

the approach followed varies with different providers, the account that follows relates to specific support service programs.

## **Government-Sponsored Support Service Programs**

### ***Village Irrigation Rehabilitation Program (VIRP)***

VIRP represents the first major effort solely focussed on improving the FMIS sector. It was launched in 1980 with financial assistance from the World Bank. The project was initially conceived as a 5 year effort but subsequently extended by two years to 1987. It sought to rehabilitate 1,200 village tanks and anicuts in the country. By the end of 1990, 1,072 village tanks with a total command area of about 30,000 hectares were rehabilitated and some 672 systems have been modernized (World Bank 1991).

*Type of Intervention.* The objectives of VIRP were to increase agricultural production and farmer incomes in existing village irrigation systems by: (i) financing the physical rehabilitation of deteriorated minor irrigation schemes including repairs to and remodelling of tank bunds, sluices, spillways, anicuts and irrigation distribution systems, including the provision of appropriate field structures; (ii) implementing a systematic water management program to ensure efficient utilization of stored water once rehabilitation work was completed; (iii) modernization of working schemes with a view to facilitating the introduction of water management programs; and (iv) strengthening major government departments involved with minor irrigation, especially the Dept. Of Agrarian Services (DAS) and the Irrigation Department (ID), by providing them with the necessary training, staff, equipment, and transport (World Bank 1981).

*Geographical Spread of VIRP.* The project covered the irrigable areas commanded by small tanks and anicuts in 14 administrative districts which comprise the whole of the Dry Zone and parts of the Wet Zone. Table 2 gives the district-wise distribution of FMIS covered by the VIRP.

*Types of Schemes Selected.* The project specifies that highest priority should be given to irrigation systems that would yield maximum benefit. The selection of schemes was based on the following main criteria: a command area of not less than 8 ha, except if it is a tank in a cascade and requires improvement to provide safety for tanks downstream; tanks in inhabited areas with easy access; useful storage of not more than 3 acre feet (ac.ft); 2.5 ac.ft and 1.5 ac.ft per acre of command area in Dry, Intermediate and Wet Zones. The scheme should benefit at least 10 families (World Bank, *ibid*).

*The Delivery Support Service.* The project was implemented with the participation of the ID which was responsible for the civil works component and the DAS which was responsible for implementing the water management program. The civil works component included the improvement of tank bunds, spillways, anicuts and distribution systems including field structures. Subsequent to the physical rehabilitation, the scheme was to be handed over to the DAS to implement the water management program. For this purpose an Agricultural Planning Team (APT) was formed and consisted of three state officers: the



Table 2. Geographical spread of VIRP schemes.

District	Number of schemes
<i>Wet Zone</i>	
Colombo	11
Kalutara	18
Gampaha	12
Galle	30
Matara	38
Badulla	141
Ratnapura	131
Kandy	45
<i>Dry Zone</i>	
Monaragala	100
Anuradhapura	234
Kurunegala	57
Jaffna	10
Mauaitivu	43
Mannar	21
Vavuniya	54
Trincomalee	66
Batticaloa	36
Ampara	28
<b>Total</b>	<b>1,075</b>

Source: Teams (1992).

Technical Officer (engineering matters), Agricultural Instructor (agronomy) and the Divisional Officer (institutional aspects). A Tank Committee consisting of water users with the Vel Vidane elected under the Agrarian Services Act as Chairman, was formed to assist the APT in planning and implementing the water management program. Operation and maintenance functions were the responsibility of the farming community. The responsibility for arranging agricultural inputs and extension through the normal channels, the responsibility of the officials and conflict resolution were functions of the Vel Vidane.

*Impact of VIRP.* Post-project performance analysis of VIRP has shown mixed results (Herath et al. 1989, Teams 1992). Table 3 gives the impact of VIRP on the area cultivated and yields based on a sample survey of 180 schemes (Teams, *ibid*). Except for the systems in the Intermediate Zone, the increase in the area has been modest. In the Dry Zone there has been a 15 percent reduction in the area cultivated. This was attributed to the lack of water.

The results of a survey carried out by Herath et al. (ibid) showed that a farmer's maha rice crop increased in the post-project period only in a few cases. According to the Teams (1993) study, maha yields recorded an increase of 14, 15 and 10 in the three agro-ecological zones while yala yields recorded increases of 13 percent and 8 percent in the Wet and Dry Zone and a yield reduction of -4 percent in the Intermediate Zone (Table 3).

Table 3. Impact of VIRP on area cultivated and rice yields in selected schemes.

Region	Season	Before project		After project		Change (%)	
		Area cultivated (ha)	Yield (kg/ha)	Land area	Yield (kg/ha)	Area cultivated (ha)	Yield
Wet Zone	Maha	983	2,425	1,044	2762	6	14
	Yala	928	2,328	944	2,631	2	13
Intermediate	Maha	480	2,865	574	3,284	20	15
	Yala	260	2,745	299	2,734	15	-0.4
Dry Zone	Maha	1,834	3,273	1,907	3,593	4	10
	Yala	379	2,865	322	3,104	-15	8

Source: Teams (1992).

In yala, inadequacy of water was a feature before rehabilitation in the four districts of Galle, Moneragala, Badulla and Ratnapura. The proportion of land left fallow in these districts were reported as 33 percent, 63 percent, 33 percent and 18 percent respectively. The same study indicates that there were no significant changes in the cropping pattern or cropping intensity after rehabilitation nor was there an increase in the cultivation of NHVs. Yield increases of the maha and yala rice crops was reported from Badulla and Moneragala, Galle and Matara Districts. The study concludes that VIRP does not appear to be generally capable of achieving a second dry season crop.

The approach followed by the VIRP has been subjected to much criticism. The project was described as a "top-down" approach conventionally followed by government departments (it is also typical of most World Bank projects). There was no consultation with beneficiaries in designing the project. The construction work itself was subjected to the normal bureaucratic procedures of the government and was awarded on a tender basis to contractors who employed outside labor. This prevented farmers' participation in construction activities, although they desired it. Moreover, it has also been an example of deliberate and focussed state intervention into minor irrigation systems and an attempt at consolidation of the state role in minor irrigation. As Abeyratne (1990) observes, in doing so it conforms to farmers' perception that the state owns the system, it is also responsible for operation and maintenance tasks. As a result, the chances of motivating water users to participate in sustained group action on matters related to irrigation becomes problematic.

### ***Integrated Rural Development Programs (IRDPs)***

IRDPs form another vehicle for channelling state-sponsored assistance to FMIS. The program was set in motion in the late 1970s by the Ministry of Plan Implementation in a number of districts. At the inception of the program, IRDPs were earmarked for predominantly rural districts which do not significantly benefit from high capital cost projects undertaken by government, especially the Mahaweli Development Project. In more recent years some of the relatively urbanized areas (e.g., Gampaha, Kandy) as well as districts which have benefitted from major irrigation development projects (e.g., Anuradhapura which includes a substantial area developed under the Mahaweli project) have been included in the program.

IRDP is a multi-sectoral program. The overall aims of IRDP are to improve rural incomes, generate employment and promote a regionally balanced development. In most districts where it is implemented, the irrigation sector receives a significant proportion of the financial allocation. In 1991, the overall for irrigation infrastructure development amounted to about 23 percent of the total investments under IRDPs. The largest allocation (80 percent of the allocation for irrigation) was in the Gampaha District where anicuts predominate (MPPI records).

*Type of Intervention.* The program lays emphasis on low-cost, quick yielding, labor intensive investments which are responsive to local development needs and priorities (Dept. of National Planning, 1990). Interventions in the FMIS sector under IRDPs vary from district to district depending on the type of assistance needed and also in accordance with the aspirations and development philosophies of donor agencies. Overall, activities undertaken included the refurbishment of small-scale irrigation systems managed by the DAS which were in a state of disrepair, with a view to enable the farmers to cultivate a second seasons crop. The introduction of an improved water management program was also a major component of the assistance package. The rehabilitation work involved improvements to tank bunds, spillways, channel systems in the case of tanks, and to diversion structures and overflows in the case of anicut systems.

The strategy adopted under IRDP varies with the donor agency. Projects funded by the World Bank (e.g., Kurunegala IRDP) adopted the conventional "blue-print" approach with a strong emphasis on production increases on a few key sectors which included irrigated agriculture. IRDPs implemented by some other agencies (e.g., NORAD in Hambantota) follow a more flexible approach. Matara IRDP funded by SIDA adhered to a short-term (annual) planning with a major concern for specific target groups. A similar approach was subsequently adopted in the Dutch funded Nuwara-Eliya and Ratnapura IRDPs. The more recent IRD programs emphasize local-level participation in the planning and implementation of the program.

*Geographical Spread of IRDPs.* At present, the program is being implemented in 15 districts islandwide. These include four districts in the Dry Zone,<sup>17</sup> nine Wet Zone districts,<sup>18</sup> and one district in the Intermediate Zone.<sup>19</sup>

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<sup>17</sup>Puttalam, Trincomalee, Anuradhapura and Hambantota.

<sup>18</sup>Badulla, Nuwara-Eliya, Ratnapura, Matara, Kalutara, Gampaha, Kegalle, Galle, Matale, Kandy.

<sup>19</sup>Moneragala.

*Selection of Schemes.* The criteria for the selection of irrigation systems for rehabilitation varied from district to district. Only systems which were functioning and serving at least 10 farm families, and with a command area of about eight hectares were selected. Abandoned tanks and anicuts were not included under IRDP.

*Delivery Of Support Services.* Investments in the various sectors under IRDP are channeled through the respective government agency. In case of the minor irrigation sector, the DAS was the principal agency responsible for the minor irrigation component. In some districts (e.g., Kurunegala) the civil works was vested with the irrigation Department. On completion of the civil works the system was handed over to the DAS for the implementation of the water management program. This was an attempt to foster close collaboration between the two principal line departments concerned with the minor irrigation sector.

In some districts, especially where the system rehabilitation is carried out in conjunction with social development, the services of NGOs were enlisted in program implementation (e.g., Sarvodaya in Hambantota District).

*Impact of IRDP Intervention.* Although investments in minor irrigation systems is a major component of IRDP programs especially in the Dry and Intermediate Zone districts, recent information on the impact of the program are not readily available. Moreover, because of the wide diversity of the irrigation works selected for rehabilitation, and also because of the nature of activities (and therefore costs), it is not possible to make a meaningful inter-program comparative assessment of the various IRDP programs. An exception is the Kurunegala District IRDP, the first program implemented in the country, which has been subjected to several systematic evaluations.

Information relating to the impact of Kurunegala IRDP on the minor irrigation sector is presented in this section. However, for reasons stated earlier, especially due to the diversity in the style of IRDP intervention in the various districts, some degree of caution must be exercised in generalizing the Kurunegala experience to all other IRDP interventions in the country.

There is no doubt that IRDPs have brought about an acceleration of the process of restoration of minor irrigation systems which had long been sporadically handled by the meager resources of the DAS and other local level state institutions. The exact number of tanks restored under the various IRDPs implemented in the country is unclear. Table 4 gives the targeted number of tanks and the number actually rehabilitated under seven IRDPs. Although the original targets were an impressionistic assessment of possibilities and were not intended to be rigid targets, the figures cited in Table 4, and from the information given to the author by the relevant authorities suggest that the rate of rehabilitation had fallen short of expectations. Major reasons for this are the dearth of technical and supervisory personnel at the district level in the Irrigation Department, and the DAS being unable to handle the enhanced demand for their services.

Despite this shortcoming, the benefits of IRDP intervention seem to be immense. As Table 5 shows in the Kurunegala Program, there has been an overall increase of about 36 percent in the command area of the tanks as a result of rehabilitation.

Table 4. Number of tanks rehabilitated under selected IRDPS.

District	Project period	Number of systems targeted	Number of systems rehabilitated
Kurunegala	1978-83	500	453
Hambantota	1979 ongoing	107	18
Badulla	1983 ongoing	Not available	200
Matale	1981-85	40	20
Puttalam	1981	285	263
Nuwara Eliya	1980 ongoing	Not specified	10
Matara	1979-84	56	42

Source: Regional Development Division Records as at 15 May 1994.

Table 5. Changes in the command area of sampled tanks after IRDP intervention, Kurunegala District.

Zone	Number of tanks	Area before rehabilitation (ha)	Area after rehabilitation	Increase	
				Area (ha)	Percentage
Dry zone	195	3,984	5,312	1,328	33
Intermediate	96	2,284	3,213	929	40
Wet Zone	6	137	158	21	15
All zones	297	6,381	8,684	2,303	36

Source: ARTI (1988).

Records also indicate that there have been definite productivity gains from tank rehabilitation. Studies carried out by the ARTI show that in the Kurunegala District, overall yala yield increased by 23 percent and maha yield registered a 27 percent increase after rehabilitation (Table 6). The results of the study also indicated that cropping intensities in the tanks that were rehabilitated under IRDP were substantially higher than those which were not (Table 7).

Table 6. Comparison of land productivity (kg/ha) before and after IRDP intervention, Kurunegala District.

Agroecological zone	No. of schemes sampled	Before project		After project	
		Yala 1978	Maha 1978/1979	Yala 1984	Maha 1984/85
Wet Zone	4	2,609	2,835	3,425	3,534
Intermediate	8	2,718	2,772	3,425	3,588
Dry Zone	2	2,989	2,663	3,098	3,207
All zones	14	2,772	2,772	3,425	3,534

Source: ARTI (1988).

Table 7. Comparison of cropping intensities of IRDP rehabilitated schemes with non-rehabilitated schemes, Kurunegala District.

	Sample size	Cropping intensities (1980-85)					
		1980	1981	1982	1983	1984	1985
Rehabilitated	27	135	163	165	169	180	179
Non-rehabilitated	6	130	135	120	108	131	141

Source: ARTI (1988).

The foregoing account demonstrates the immediate benefits of IRDP interventions and illustrates that existing FMIS which had been long neglected and underperforming could be significantly improved by physical rehabilitation. However, evidence suggests that the benefit streams cannot be sustained in the long run. This is primarily because IRDP are donor funded programs which are confined by time, in most instances by a period of five years. Once the project ceases, the same level of investment will not be available and it is unlikely that the line departments will be able to maintain the schemes with their own meager financial resources.

Another major limitation of the IRDP approach which has been subjected to much criticism, was that it had been "top-down" with little involvement of the beneficiaries in planning and designing the project. The ARTI (1988) study showed that in the Kurunegala IRDP, construction work was handled by "outside" labor and only about 5 percent of the beneficiaries found employment in construction activities even though under-employment in the area was acute. This had become a grievance among the local people. Although, later IRDP program did emphasize the utilization of local labor and harness the services of local level institutions there is no evidence that this has been effectively accomplished.

As IRDP is a regionally based program there is a certain amount of decentralized decision making involved. District-level officials who have a better understanding of local needs are usually associated with the selection of schemes for rehabilitation, the design of the project and the allocation of funds for various project. However, IRDPs are known to be vulnerable to political influence. There are known cases of some powerful politicians pressurizing project management authorities to allocate an undue share of IRDP funds to the area they represent.

Another weakness in the IRDP approach is that, as the program is donor funded there is strong pressure to spend the funds according to predetermined methods. Therefore, there is a strong tendency to lay more emphasis on the attainment of the physical targets which could be easily realized and also have an immediate visual impact. The pressure to implement the project during the period for which funding is available also discourages designers of the project having to go through the tedious process of consultations with the beneficiaries. Although managers of some IRDPs claim to have had prior consultation with beneficiaries when implementing a rehabilitation or system improvement program, it is done as a matter of fact, rather than as an earnest attempt to elicit the views of the beneficiaries or enlist their participation.

### ***Services Provided by the Agrarian Services Department***

The Department of Agrarian Services was established in 1958 for the principal task of implementing the provisions of the Paddy Lands Act of 1958, especially the provisions relating to tenancy and the establishment of village-level cultivation committees. With the repealing of the Paddy Lands Act and the enactment of the Agricultural Productivity Law in 1972, its mandate was widened to include the administration of the Agrarian Services Centers which were established islandwide. This law and the institution it created sought to increase agricultural productivity by the creation of FOs with greater powers to resolve constraints and undertake development work including irrigation, to enhance agricultural production. Furthermore, for the first time the farmer representatives were given the responsibility of coordinating and retailing input supplies. The farmers also had easy access to other state-sponsored support services, such as extension, credit and other facilities at the Service Centers.

A major drawback of the FOs established under the Agricultural Productivity Law (i.e., Agricultural Productivity Committees at the divisional level, and the Cultivation Committees at the village level) was that the representatives were nominated by the Minister of Agriculture. This was as a major reason for the failure of these FOs which functioned more as political organs rather than as entities representing the farming population.

The Agricultural Productivity Law was repealed in 1979 and was replaced by the Agrarian Services Act which is currently in force. The new Act, whilst retaining some of the provisions of the Agricultural Productivity Law, vested with DAS the responsibility for overseeing improvements and management of the minor irrigation works. However, the provisions under the Act made irrigation a matter of administration rather than one of management. The Act prescribed the holding of kanna or pre-season meetings of owner-cultivators or occupiers of the land to assist the Cultivation Officer in matters relating to the protection of the irrigation works and any other matter relating to cultivation. In addition, the Agrarian Services Committee established under the Act was empowered to levy an annual "land tax." The amount collected may be utilized among other things, for the repair, maintenance and development of village irrigation systems.

With the 13th amendment to the constitution in 1988, the construction, rehabilitation and maintenance of minor irrigation works was developed to the Provincial Councils and the functions of the DAS was

restricted to the administration of the Agrarian Services Act, especially the provisions governing land tenure, through the Agrarian Services Committee and Service Centers. There are some 530 such committees and centers throughout the country.

With the 1991 Amendment of the Agrarian Services Act, the DAS was given the important task of fostering, coordinating and registering farmer organizations throughout the country. Farmer Organizations are conceived as multi-functional entities and can be formed for a wide variety of purposes including but not limited to irrigation. Statistics available with the DAS show that up to December 1991, 8,150 farmer organizations have been established islandwide. This includes FOs in FMIS as well as agency-managed systems. Of these, 1,286 organizations have been formally registered with the Department (Department of Agrarian Services 1991).

As regards maintenance and improvement of irrigation systems, the DAS has a very modest budget. But as stated earlier, it has been centrally involved in the implementation of donor funded projects such as IRDPs, VIRP and, more recently, with implementation of the National Irrigation Rehabilitation Project.

### **Recent Government-Sponsored Assistance Programs**

This section provides an overview of three major state-sponsored programs which are currently ongoing. These programs are in the very early stages of implementation. This section provides a short description of the salient features of these programs.

#### ***National Irrigation Rehabilitation Project (NIRP)***

NIRP is a nationwide program jointly funded by the Government of Sri Lanka (GOSL), the World Bank and the European Economic Commission (EEC). The aim of the project is to support GOSL's current strategy for improving the performance of the existing irrigation schemes in order to stabilize and increase the production of rice and other food crops in the country, and raise the living standards of the farming community through rehabilitation and improved O&M of existing schemes (World Bank 1991).

As far as the minor irrigation sector is concerned, it is envisaged that about 1,000 small tank and anicut systems covering an area of some 25,000 ha forming various parts of the country would be rehabilitated and improved.

The program would build on the experience gained from the VIRP. The systems selected for rehabilitation will be those with a command area of not less than 4 ha and benefiting not less than 10 farm families. The formation and formal registration of FOs is the qualification for selection. The FOs would have to agree to contribute at least 10 percent of the cost of rehabilitation and improvement in the form of free labor or any other acceptable form and also bear the full cost of O&M after rehabilitation.

The project was conceived as a seven-year effort (1991-1997). To date, only 19 minor irrigation schemes have been rehabilitated under NIRP (Irrigation Department, personal communication).

#### ***World Food Program (WFP)/GOSL Project on Rehabilitation of Minor Irrigation Systems***

In 1993, the WFP initiated a project to assist the GOSL's efforts to rehabilitate and improve production conditions in minor irrigation systems in the country. This is a five-year project which focuses exclusively on the minor irrigation sector. The financial commitments of the WFP amounts to approximately US\$8.3 million and the GOSL's share is about US\$4.3 at 1992 prices.



The aims of the project are to rehabilitate minor irrigation systems in eight districts in the Dry and Intermediate Zones of Sri Lanka;<sup>20</sup> improve rural access roads and thereby promote greater access to irrigation facilities, input supplies and marketing; train farmers and group leaders in the operation of the schemes; and establish demonstration plots for improving agricultural production and crop diversification (WFP Mission Report 1993).

Under the project, 760 small tank and anicut systems benefiting some 30,500 farm families will be rehabilitated. In addition, some 380 kilometers (km) of rural roads, 190 multi-purpose buildings, 760 demonstration plots to demonstrate the benefits of diversified cropping under minor irrigation schemes will be established. The project also envisages the training of 45 farmers and group leaders and enlisting the services of 380 Institutional Organizers.

A unique feature of the project is the high emphasis on beneficiary participation. The project will not employ outside labor but enlist the participation of beneficiaries on a self-help basis for project work for which food aid will be provided as an incentive. In addition, FOs are expected to play an important role in guiding the rehabilitation of irrigation facilities, road construction and in O&M functions.

The DAS will be the principal state agency responsible for the implementation of the program in collaboration with WFP staff.

### ***North Western Province Water Resources Development Project***

This project which is confined to the North Western Province is being implemented with financial support from the Asian Development Bank. The aim of the project is to assist the provincial administration and the GOSL to increase agricultural production and income levels of farmers in the region, foster crop diversification, and increase employment opportunities.

The major components of the project are: (i) rehabilitation, improvement and restoration of irrigation systems; (ii) credit lines to promote development of farmer owned on-farm irrigation systems using wells and lift pumps, and to rural women for establishing income generating activities; and (iii) institutional support.

The project expects to rehabilitate about 300 minor irrigation systems covering a command area of about 6,000 ha. Only systems with a command area of not less than 4 ha and benefitting at least 10 farm-households are included. In addition, 80 small tanks with a total command area of about 600 ha are expected to be restored. Restoration of these tanks is expected to provide some relief to the acute agrarian pressure in the region.

### **Services Provided By NGOs**

As noted earlier there are several NGOs in Sri Lanka which provide some form of assistance to the FMIS sector. In this study the focus is on two NGOs--the Freedom From Hunger Campaign (FFHC) and the National Development Foundation (NDF). Direct assistance to FMIS is a major component of the activities of these NGOs.

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<sup>20</sup>The districts are Anuradhapura, Puttalam, Kurunegala, Matale, Badulla, Moneragala, Hambantota and Ratnapura.

### ***Freedom From Hunger Campaign Program***

The FFHC was established in 1973. It functions as a statutory body under the Ministry of Agricultural Development and Research with a broad mandate which includes rural poverty alleviation, implementing labor intensive projects, and stabilization of shifting cultivation by providing irrigation facilities (FFHC, undated). Its Village Tank Rehabilitation Program (VTR) is one of the major activities of this organization.

*Type of Intervention.* The FFHC uses the irrigation system as the entry point to foster an integrated socioeconomic development of small tank communities. A further aim is to introduce land reforms in the Dry Zone villages it had selected (Fernando, undated).

The program involves renovation of tank bunds and repairs to sluices, spillways and the canal network to facilitate the proper and equitable distribution of water. Besides civil works the program includes land settlement under abandoned tanks; provision of agricultural extension, seeds and fertilizers on interest-free credit; and the promotion of market gardening in the uplands (FFHC 1983). In addition, the program also includes land consolidation programs in the developed areas.

*Geographical Spread of FFHC Projects.* The FFHC's efforts are concentrated on small tank systems in the Dry and Intermediate Zones. Table 8 gives the districtwise distribution of small tank systems which are supported by the FFHC.

*Selection of Tanks.* FFHC's program covers three categories of tanks: (a) ancient tanks, i.e., tanks which are still supporting "traditional communities" but are in a state of disrepair; (b) abandoned tanks in the vicinity of communities engaged in shifting cultivation; (c) working tanks which require some repairs for maximizing the benefits to the community (Fernando 1990).

A tank is selected for renovation only at the request of the village community. According to the selection criteria, only tanks with a command area of not less 4 ha and benefiting at least 10 families are taken up for development. The pro-rata cost should not exceed Rs 37,500 per hectare except under exceptional circumstances (Fernando, *ibid*).

*Delivery of Support Services.* FFHC adopts a holistic approach to small tank development. Besides intervening in the rehabilitation of the irrigation facilities, its program envisages the provision of a range of services such as extension, home garden development, land consolidation and environmental protection, by attempting to stabilize shifting cultivation.

A key element in FFHC's strategy is the formation of *wew sabhas* (tank committees) for each tank consisting of members of the beneficiary community. The office bearers are elected annually by the community. All services are channeled through this organization. It is also made responsible for mobilization of labor for civil works, regulating and control of water issues, and planning the cropping calendar. These organizations are expected to function as a catalyst within the community to motivate the members. They also act as the link between the FFHC and the village community. They are also responsible for water management, operation and maintenance tasks. For this purpose it maintains a "reservoir maintenance fund" and farmers are expected to contribute 2 bushels or its equivalent in cash towards this fund (FFHC 1983).

Table 8. Geographical distribution of FFHC projects.

Name of project	District	Number of tanks	Management pattern
Tantirimale	Anuradhapura	71	Wew sabha, Resident Project Officer, Assistant Project Office, indirectly by Government Agent, Superintendent of Surveys
Weguruwela	Moneragala	35	Same as above
Siyambalanduwa	Moneragala	15	Same as above, Agriswiss (NGO)
Bibile	Moneragala	10	Same as above
Kauwelagaswewa	Puttalam	19	Same as Tantirimale
Meegaswewa	Moneragala	15	Same as above
Mihintale	Anuradhapura	10	Same as above
Mahawa	Kurunegala	10	Same as above

Source: FFHC Office Records. Note: Wew Sabha = Tank Committee.

Being a statutory body under the Ministry of Agriculture, FFHC has the advantage of drawing in the services of other government agencies for the programs it sponsors. At the district level, the Government Agent is indirectly involved in the management of the projects implemented by FFHC.

*Impact of FFHC's Intervention.* According to FFHC officials, about 200 small tank systems covering an area of some 3,000 ha have been rehabilitated, benefiting about 3,500 farm families. The lack of data precludes a quantitative assessment of impact. Results of a study by Dayaratne and Moragoda (1991) of 14 out of the 71 tank systems under the Tantirimale Project rehabilitated by FFHC (i.e., Tantirimale) revealed that cropping intensities remained low. It was found that during the eight-year period 1981-1988, a successful maha crop was realized only in 1-3 seasons in the tanks surveyed following rehabilitation. The actual extent of land cultivated varied from 3 to 42 percent in the different tanks and in one tank (Saman Eliya) there was no cultivation at all (see Table 9).

Production data compiled by the FFHC authorities for maha 1982/83 and cited by Dayaratne and Moragoda (ibid), show a considerable increase from 1,576 kg/ha to 2,866 kg/ha. This refers to a single seasons production which cannot be generalized.

The same study showed that the wew sabhas which were fundamental to FFHC's small tank development philosophy, were malfunctioning and inefficient. The authors attribute this to the fact that the wew sabhas were imposed on the community rather than being organizations which evolved due to the independent actions of the members of the farming community.

Table 9. Extent cultivated after rehabilitation in selected tank systems, 1981 to 1988.

Name of tank	Command area (ha)	Number of seasons cultivated	Extent cultivated (ha)
Pahala Tantirimale	4.9	2	2.0 (40)
Hetamuna Wewa	7.3	3	1.6 (21)
Kuda Malmaduwa	5.7	3	2.0 (35)
Manel Wewa	8.1	2	2.4 (29)
Malwana Wewa	8.1	2	2.0 (24)
Manewa Wewa	12.1	1	0.4 (3)
Sandagama Wewa	3.2	1	0.6 (18)
Ranpathwila	4.0	1	0.8 (19)
Saman Eliya	2.4	-	-
Ulpathgama	5.7	3	1.2 (21)
Randeniya	6.5	3	1.6 (24)
Sadungama	5.7	3	2.4 (42)
Pahalaweli Wewa	13.8	2	2.0 (14)
Kosabewa	11.3	2	2.0 (17)

Source: Dayaratne and Moragoda (1991). Note: figures in parenthesis give the percentages.

The guiding principle of FFHC's efforts is based on an appeal to the past. Its vision is to recreate the ancient small tank community of the Dry Zone which was supposed to be a self-supporting entity, displaying a high degree of social cohesion and existing in harmony with the environment (Wimaladharma 1990).

During a visit to one of the FFHC project sites it became apparent to the author that this "model village" remains a vision. The only replica of the past, was the exclusive use of manual labor and animals for construction works. To this extent, the FFHC approach attempts at fully utilizing local resources, especially human resources. However, as Wimaladharma (ibid) observes, planning for romantic ideals had inevitably required a "top-down" approach which denied the participation of the beneficiaries in formulating the program, except for the contribution of labor for construction works.

Overall, the FFHC's approach is to provide a "package" of services rather than focusing attention only on irrigation. The formation of wew sabhas as it confers a sense of identity of the beneficiaries with the irrigation system, is a more effective method for support service delivery than the more traditional methods adopted by state agencies. FFHC's experience also suggests the importance of external agents guiding the farmer associations in the responsibilities, at least in the formative years.

### ***National Development Foundation (NDF)***

Unlike the FFHC, NDF is a full fledged NGO established in 1979 and is registered under the Societies Ordinance as a non-profit organization. NDF is involved with rural development activities of various sorts. Its aims are to: (i) build confidence among villagers to handle their political, economic, cultural and social affairs by themselves; (ii) help rural people to identify their resources and mobilize them to their advantage with minimal external assistance; (iii) educate villages about their rights; and (iv) foster village-based institutions to facilitate closer interaction between the farming community and government agencies (Magederagamage 1990).

*Geographical Spread of NDF Programs.* In 1984, NDF initiated a program to assist small tank systems. Its activities are confined to the small tank systems in the North Western Province. Sixteen tanks from the Kurunegala District were selected for the Phase 1 Program. Phase 2 is currently in progress in the Puttalam District.

*Type of Intervention.* The activities carried out by the NDF involve the physical rehabilitation of tanks and the implementation of a social development program. These include: (a) renovation of the tank with the participation of the beneficiaries; (b) initiating suitable institutional arrangements with which to foster better coordination between farmers and government officials; (c) introduce modern cultivation techniques to farm groups including the growing of other field crops in place of rice; (d) training local youth to act as change agents for agricultural development; and (e) organizing informal educational programs for farmers.

*Types of Schemes Selected.* NDF's intervention is presently confined to small tank systems. The selection of the tanks was based on the following criteria: (i) very small tanks that were usually not benefiting from other development programs; (ii) economic backwardness of the community dependent on the tank; and (iii) farmers' desire for external help to improve their irrigation system and landownership pattern under the tank (Magederagamage 1990). Unlike FFHC, NDF selects only tanks which are in working order. Abandoned or neglected systems are not included in the program.

*Delivery of Support Services.* Three institutional forms are central to NDF's intervention in small tank systems. These are: (i) Field Coordinators; (ii) Farmer Organizations; and (iii) Small Farmers' Federation.

Field Coordinators (FCs) are employees of NDF who are resident in the project area and function as "change agents." FCs play an important role in the early stages of the program when they train village-level volunteers in community work, assist in the formation of FOs, and function as unofficial Liaison Officers to obtain and coordinate services from various state agencies and other bodies servicing the small-farm sector.

The FOs are the principal body through which NDF's assistance is channeled. NDF involves the beneficiaries right from the beginning of a planned intervention. This was achieved by encouraging Farmer Groups to discuss and evaluate the rehabilitation plan which was formulated by the DAS. It is only after the proposed intervention is ratified by the Farmer Groups that it is taken up for implementation. FOs are responsible for O&M of irrigation facilities. They collect a fee and also mobilize labor for maintenance works and also plan out the irrigation schedule.

The third institution created under NDF's strategy is the Small Farmers' Federation. This is an umbrella organization encompassing all the FOs in the project area. The functions are: (i) coordination of inter-village farmer activities; (ii) agricultural planning and decision making regarding crop diversification; (iii) liaison between FOs and state agencies; and (iv) providing financial assistance to FOs when needed (Dayaratne 1993).

*Impact of NDF Intervention.* Paucity of data prevents a quantitative assessment of the impact of NDF's intervention in the FMIS sector. However, results from a few inquiries on NDF's program indicate that there has been some gain to the farmer community. Dayaratne (1993) estimated that in six of the 10 tanks refurbished by NDF, the command area had increased by 14 to 38 percent. In four tanks the command had remained the same due to the unavailability of land for expansion (Table 10). The results of the study also show that in the same there has been a substantial increase in the productivity of land. Prior to rehabilitation, the yields in six of the 10 tanks were below 3,800 kg/ha (60 bushels/acre). With the project, six tank systems had realized a yield of over 5,000 kg/ha (over 80 bushels per acre), with three tanks realizing yields of over 7,700 kg/ha (over 120 bushels/acre) which represents over a 100 percent increase (Table 11).

Table 10. Impact of NDF intervention in the command area of selected tanks.

Tank name	Number of farmers	Command area (ha)		Increase in area (ha)
		Before	After	
Arulgaswewa	34	9.0	10.7	1.1 (14)
Dalupothuwewa	14	7.3	7.3	-
Habawewa	18	7.3	10.1	2.8 (38)
Mawathagama Wewa	18	9.7	13.4	3.7 (38)
Nabadathenge Wewa	15	6.1	6.1	-
Pannala-Aluthwewa	13	6.5	8.1	1.6 (25)
Uswewa	22	9.7	9.7	-
Wegollagama Wewa	7	2.8	2.8	-
Weligara Wewa	17	5.9	7.9	2.0 (35)
Yakadapotha Wewa	18	10.9	14.6	3.7 (33)
Total	176	75.2	90.1	14.9 (20)

Source: Dayaratne (1993).

More than the achievements in physical outputs, several observers (Perera 1988, Wimaladharma 1990, Dayaratne 1993) have commented on the NDF's strategy in intervening in the FMIS. Unlike the FFHC's approach which is based on paternalism and has idealistic aims, NDF emphasizes beneficiary participation from the beginning of its planned intervention. In addition, the beneficiaries are expected to contribute financially as well as in terms of labor. Dayaratne (ibid) estimated that cash contributions towards rehabilitation in the 10 tank systems amounted to about US\$3,300 in cash and labor which amounts to about six percent of the total expenditure of US\$53,000 (Magederagamage 1990).

The Field Coordinator System introduced by NDF has proved to be very effective. Its role is similar to the Institutional Organizers System successfully experimented with and subsequently set up as a formal institution in the large agency-managed systems. FC is a novel system to the FMIS sector, though one could argue that the Project Officers of FFHC and the Divisional Officers of the DAS perform similar tasks. The novelty is in the attitude of the NDF Field Coordinators who also have the added advantage of not being unduly constrained by government regulations and procedures.

*Table 11. Impact of NFD intervention on land productivity (kg/ha) in selected tank systems.*

Yield (kg/ha)	Before project (number of tanks)	After project (number of tanks)
< 1,900	1	
1,900 < 2,570	4	
2,570 < 3,800	1	1
3,800 < 5,000	4	3
5,000 < 7,700		3
> 7,700		3

## CONCLUSIONS

Support service programs to improve production conditions in minor irrigation systems have expanded substantially since the late 1970s. Although there is a vast amount of literature on the support programs of various agencies, with a few exceptions, most studies focus primarily on processes rather than on an assessment of their impacts. An exception is the VIRP post-project studies which have been carried out.

Even though publications and eloquent accounts by service providers describing the process of delivering support services are very appealing, and some successes have been reported, field realities of the delivery process give a different impression. Therefore, it is difficult to derive conclusions with any reasonable degree of confidence about successful support service programs. What is attempted in this section is to hypothesize characteristics of a potentially successful support service program on the basis of the specific programs reviewed in the preceding section.

In Sri Lanka, the government had for long been the principal provider of support services to the small farm sector. Smallholder agriculture was supported by an impressive array of state-sponsored support programs such as subsidized credit, inputs, extension, tractor services, irrigation development, agricultural research and various legislation aimed at safeguarding the interests of smallholder cultivators. Yet, the performance of the various government agencies in the delivery of support services has been poor. This is specifically the case with the FMIS sector. As Government interest focussed primarily on the large-scale publicly managed irrigation systems, the needs of the FMIS sector had largely been overlooked except for the sporadic rehabilitation of some of the small-scale irrigation systems.

During the past two decades, government had taken major initiatives to develop the FMIS sector. The firm evidence cited in the reports shows that some 2,100 farmer-managed irrigation schemes have been rehabilitated under various major state-sponsored programs.<sup>21</sup> It is expected that by 1997 another 2,000 tanks will be rehabilitated under three major ongoing programs.<sup>22</sup> If one considers the 185 tanks rehabilitated by the FFHC and 10 systems refurbished by the NDF, the total number of schemes already rehabilitated or identified for renovation amounts to 4,360 systems. This accounts for about 20 percent of the farmer-managed irrigation schemes in the country. This is undoubtedly a very conservative estimate in view of the fact that several other schemes have been refurbished under various state and NGO sponsored programs not cited in this study. This indeed is a significant achievement realized during the last two decades, especially because the FMIS had been overlooked for several previous decades.

Although state intervention through donor assisted programs such as the VIRP, IRDP have shown some tangible benefits, as pointed out in the previous section, the long-term sustainability of the benefit stream remains doubtful. One of the major reasons for this is that the state may not be able to intervene as intensively as it has done through these special programs after the duration of the project. There are simply too many tanks for the government to effectively maintain.

One main drawback of past state-sponsored programs was that they had been very centralized, and were designed and implemented without the participation of the beneficiaries. This reflects to an extent, the welfarism that had dominated every aspect of Sri Lankan society for several decades, and in particular the paternalistic attitude of the state to the small-farm sector.

The exclusion of beneficiary participation in the designing and implementing rehabilitation programs, had created the impression in the minds of the farming community that the irrigation system belongs to the state and therefore, the government was responsible for its operation and maintenance. Although the O&M of FMIS responsibilities have been recently decentralized to Provincial Councils and Farmer Organizations, the organizational framework to carry out these functions effectively has yet to emerge.

This report also reviewed the support programs of two NGOs which are directly involved in minor irrigation schemes. As pointed out in the text, the objectives of NGOs operating in Sri Lanka go beyond tank rehabilitation to broader aims of community development. The irrigation system is used as an entry point to the village.

Paucity of data does not permit a thorough analysis of NGO support programs. Evidence suggests that NGOs are comparatively better providers of support services than public agencies. This is primarily

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<sup>21</sup>This includes 1,075 systems under VIRP, 1,006 systems in the seven IRDPs cited in this report and 83 tanks under the ADZAP Project. This number could be substantially higher if one takes into account the systems rehabilitated under the other IRDPs of which data were not readily available.

<sup>22</sup>This would include 1,000 systems under NIRP, 700 systems under the WFP Project and another 300 systems under the North Western Province Water Resources Development Project.



because NGOs put in a more concentrated effort both in terms of manpower, are very selective in their choice of systems for rehabilitation and are relatively better at mobilizing the participation of water users. In fact, they have made the formation of Farmer Organizations an essential qualifier for its assistance program. In addition, NGOs concentrate on a few tanks, and are not bound by the stringent administrative and financial regulations which govern public agencies. However, two issues merit attention in this context. First, NGOs will not be able to maintain continuity of their programs because of funding constraints and thus, limit their activities to the period for which funds are available. Second, it is doubtful whether the NGO approach could be replicated on a wider scale. Public agencies are vested with the responsibility of assisting a much larger number, but lack the resources and the personnel to deliver support services with the same degree of intensity as an NGO.<sup>23</sup>

The setting up of Farmer Organizations has had an enthusiastic response from policy makers, politicians, donor agencies and farmers. There is evidence of some FOs effectively organizing support services for their membership. The more successful programs are those carried out by FOs which have provided a range of services such as input supplies and marketing. Such FOs are primarily in the larger agency-managed systems and well supported by the public officials. The supply of production inputs and the resolving of farmers' marketing problems instilled confidence of the farming community in the FO as they realized direct benefits immediately. This in turn facilitated the leadership of the FOs to mobilize the membership for maintenance works of the irrigation system which is relatively easier than those FOs which tended to focus solely on this function.<sup>24</sup>

As noted earlier, the state has been and continues to be, the principal provider of support services for irrigation system rehabilitation, system operation and maintenance and in matters related to conflict resolution. Although measures have been taken recently to transfer these functions, especially O&M activities, to irrigator organizations, the limited experience especially in FMIS precludes a realistic assessment of their efficacy. Nonetheless, on the basis of the experience to date, the following are some of the hypothesized characteristics for an effective support service program.

### **Proper Coordination among Various Agencies and Programs**

Fragmentation of control over the tank and the associated components has been a major reason for the decline of minor irrigation systems. The problem has been exacerbated by the multiplicity of government departments and various institutional forms established at different times with blurring lines of responsibility exercising some ill-defined authority over the systems. As various government agencies, parastatal bodies and NGOs are involved in the provision of support services, effective coordination of the activities of the providers is fundamental to reach out and support the FMIS sector.

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<sup>23</sup>For example, in the Maho area, the FFHC has one Project Officer who oversees about 10 small systems, whereas the Divisional Officer of the Agrarian Services Department attached to the Divisional Office has in some instances to administer over 100 small-scale irrigation systems.

<sup>24</sup>As these organizations are new, some degree of caution is necessary in arriving at firm conclusions about their effectiveness based on their early successes. This is specially because, although irrigator organizations are a recent innovation, Sri Lanka has had previous experience with other forms of organizations such as Cultivation Committees established under the Paddy Lands Act of 1958, and Agricultural Productivity Committees created under the Agricultural Productivity Law of 1972. The Agrarian Service Centers established countrywide were for the specific purpose of providing support services to the farming community. These organizations started off with much promise, but collapsed subsequently.

## **Decentralization**

Decentralization of support service activities with village institutions which are easily accessible to the farming community plays a major role in coordinating and delivering support services. Local plans and programs must be well articulated with national plans and interrelationships between the various agencies defined clearly.

## **Consistency in Policy**

National policy regarding support services should be consistent in order to minimize uncertainties in the program and instil confidence among the beneficiaries. Minor irrigation systems, especially the tank systems are complex technical as well as social systems. The physical rehabilitation of such systems is necessary but not a sufficient condition to foster their improvement. There is a need for cohesive and sustainable management structures. Preparing the groundwork for such local management institutions should be given high priority in any planned intervention (Ambler 1993).

## **Key Roles of Farmers and Farmer Organizations**

1. The involvement of the beneficiaries could enhance the effectiveness of the support programs, especially those in which improvements to the irrigation infrastructure are envisaged. But a necessary concomitant is that the farming community must be made true partners and be made decision making peers over priorities, design and scale of investments.

Experience also suggests that when the beneficiaries contribute in cash or kind to the cost of rehabilitation and maintenance, they manage the system more productively and sustainably. It is important that any levy must be set locally and must be reinvested locally and not channeled to state agencies.

2. Farmer Organizations can only function effectively if they are empowered to raise sufficient funds to reinvest them in maintaining irrigation facilities and in the provision of other support services. Empirical evidence suggests that FOs which perform diverse functions, especially in the supply of production inputs and marketing could be more effective than those solely concerned with irrigation.
3. Although this study does not provide evidence, experience suggests that small functional groups could play a useful role in improving access and facilitate local consultation and identification of their real needs and difficulties. Farmers readily join such groups and participate freely and not feel overwhelmed by large numbers.
4. Evidence also suggests that external support through trained field workers attached to state agencies or NGOs is essential to organize FOs and sustain their activities, at least in the early phase of development.

## **Roles for the Private Sector**

With the private sector playing an increasingly dominant role in the economy, the involvement of private business establishments should be encouraged, especially in the provision of material inputs and services.

## CHAPTER 3

### Support Services for Farmer-Managed Irrigation Systems in Nepal<sup>25</sup>

#### INTRODUCTION

SUPPORT SERVICES RELATED to the irrigated agriculture production system of FMIS in Nepal are limited to the rehabilitation/improvement of the system and some assistance for operation and maintenance of the system. Other agricultural production related provisions such as supply and marketing facilities and cooperatives for purchasing inputs and marketing outputs are not even coordinated with related agencies. Institutional supports for either strengthening existing organizations or providing foundations for the establishment of the new organizations are limited. Legal provisions for the protection of water rights and existing location specific rules of the FMIS are not clearly spelled out.

During the last few years many agencies (both governmental and non-governmental) have started either providing a modest level of support services or trying to coordinate with relevant agencies to make provision for providing essential services which are mostly limited to the project areas. The level and types of support services vary with the agencies involved. In the past few years, the major agencies and institutions providing assistance to FMIS include: DOI through its regular assistance program for FMIS through each of the District Irrigation Offices (DIOs), ISP and ILC, ADB/N, SNV (Mechi Hill Project), ILO/SPWP (Dhaulagiri Project), GTZ (Dhading Project), CARE/Nepal, IRDPs with MLD (such as WB assisted Rasuwa-Nuwakot Project and EEC assisted Gulmi Arghakhanchi Project) and irrigation projects under DSCWM (such as EEC assisted Bagmati Watershed Project and Begnas Tal Rupa Tal Watershed Project [(BTRT)] assisted by CARE/Nepal), and Koshi Hills Agriculture and Rural Development Project (KHARDEP). Shallow tubewells at the individual/community level in Terai have also been tried out at a limited level which demand a different type and level of service from that of the surface irrigation systems which supply fuel, electricity, maintenance backup for the pumps, and most importantly, the training for efficient use of water because of cost effectiveness.

To document a comprehensive process of the activities listed above, an attempt was made to probe the following questions: (i) what are the more successful approaches being used to deliver the different types of services? (ii) how are the costs being shared? (iii) what services are the users paying for? (iv) what services are being provided by external funds? (v) how continuous and financially viable is the program? (vi) what is the budget allocated for providing assistance to FMIS? and (vii) how many systems are being assisted so far?

An attempt was made to list support service programs to be able to analyze selected FMIS based on the field visits to successful systems. But due to huge natural disasters and heavy rain and flooding, we could not acquire sufficient information from the field. Further, whatever information we collected and documented may have undergone significant changes due to either washing away of the systems or

<sup>25</sup>The author acknowledges the help of Sam Johnson and Douglas Vermillion who designed the concept paper and guide for the study and also provided helpful comments in the earlier versions of the draft report. Thanks are also due to Ujjwal Pradhan and Alfredo Valera who provided intellectual support throughout the course of the study and also provided helpful comments on the draft report.

major damage to the irrigation structures after the collection of information from the field at least in two systems, namely Rapti-Nawalpur and Kumroj 2. The other new systems--Atmara and Gahatadi--were visited during latter stages after the tragic flood to collect additional information.

## OVERVIEW OF THE PHYSIO-TECHNICAL TYPES OF FMIS IN NEPAL

Farmer-managed irrigation systems in Nepal are not restricted to small units. Irrigation systems may be less than one hectare while farmer-managed systems as large as 15,000 ha in size have been identified. The irrigation organizations of large or small systems perform water acquisition, allocation and distribution, resource mobilization, system maintenance, communication, and decision making (Uphoff et al. 1985).

How many farmer-managed irrigation systems there are in Nepal is a matter, at this point, of guesswork. Prachanda Pradhan estimated in 1989, that there were 1,700 farmer-managed irrigation systems in the Terai and 15,000 in the hills (P. Pradhan 1988: 3). Similarly, Aryal in his recent estimate has put the number of systems to be 16,000 in the mountains and hills with an estimated irrigated area of 322,000 ha (Aryal 1992: 9), which is 74 percent of the total irrigated land in the mountains and the hills. He has also estimated a total number of irrigation systems to be 1,700 irrigating a total of 520,000 ha of land in the Terai which is 68 percent of the total irrigated land in the Terai. Since then, however, the German Agency for Technical Cooperation has done an inventory of irrigation systems in Dhading District, a middle-hills district in Central Nepal. GTZ counted almost 3,000 farmer-managed irrigation systems in this one district. If we can consider Dhading to be a relatively typical hill district and count just 60 (excluding the Himalayan districts) of Nepal's 75 districts to be similar, we would arrive at an astonishing number. Water and Energy Commission Secretariat (WECS) has already inventoried irrigation systems with service areas of more than 5 ha in the high hills and the lower hills, and systems with more than 50 ha of service area in the Terai in 69 out of 75 districts. We would be in a position to make a fair estimate of the numbers of irrigation in Nepal in the near future.

The nature and characteristics of traditional farmer-managed irrigation systems in Nepal are related to the environment in which they are found. Systems differ according to their location in the hills, river valley, or the Terai. P. Pradhan (1989) and Benjamin (1992) have described irrigation systems in these three areas according to a number of attributes of irrigation systems. These attributes include intake and diversion location, canal type and length, farm types and types of organizations which are discussed below in brief.

The intake of the hill irrigation systems is located in a spring or stream in the hills. Sometimes, specific advantage is taken with large boulders or other "permanent" natural structures, such as exposed bedrock, for construction of a canal intake. Several intakes might be constructed on one stream, but older systems have priority and no new canals can be built upstream within a specified distance. Usually rocks, brush, or even tree trunks are used to build a small dam that diverts part or all of the stream flow into the canal. Holes in the dam are plugged with leaves or small branches (Yoder 1984). The intake requires annual repair before irrigation begins for the rice season. If it is washed away during heavy rain, farmers within the service area must mobilize to rebuild the intake. Since this is the part of the system that is farthest from the service area, it consumes the most travel time for irrigators.

Intake in the river valley irrigation systems, a diversion dam consisting of boulders, stones, branches, and mud is constructed annually by the farmers. The nature of the intake and the timing of its

construction are determined by the type and size of the river. In larger streams and rivers, where there is sufficient water for irrigation during the dry season, farmers construct the diversion dam for irrigation in the dry season well before the monsoon starts. During the monsoon period, the level of water becomes so high that irrigation activity with river water becomes difficult. Farmers then abandon all irrigation-related activities, and rely on rainfall instead.

Similarly, in Terai irrigation systems, the diversion dam and intake are made of boulders, stones, and tree branches. Intake reconstruction is required annually. The type of intake depends on the type of river and the location of the command area. If the command area is higher than the river bed, the farmers dam the river to raise the level of water upstream and divert water to the canal. In other systems, diversion dams are sufficient. Whatever type is used, it requires many people to construct and repair it regularly.

The canal length of the hill irrigation systems may be 3-4 km long before it reaches the service area but some are even longer. The canal may pass through rocky slopes and frequently such systems have tunnels cut into rocky cliffs. Tunnels are constructed by traditional tunnel digger artisans called *agris*. Where there is a gentle side slope and little danger from landslides, the canal can be wider and flatter than where the side slope is steep and rocky. Where the excavation is difficult, the cross-section is made smaller and the canal slope steeper to allow the full flow of the canal to pass. This improves slope stability and reduces seepage loss.

In the river valley irrigation systems, the canals, on the other hand, earthen canals carry water to the farms. Since the canals run through relatively flat areas in the river valley systems, conveyance is not much of a problem and maintenance requirements are minimal. Once every five or six years, the alignment of the canal may be changed because of leakage caused by burrowing crabs.

In Terai irrigation systems usually the main canals without lining are constructed and water is delivered through them. Secondary canals are also constructed to deliver water to individual villagers who have participated in the repair and maintenance of the intake. Water conveyance is not a difficult task for the irrigation organization.

In hill irrigation systems, farm types include most of the land under rice cultivation which is in terraced farms. It can take five to ten years to complete the terracing, by farmers using their own resources, for rice cultivation in an irrigation system. Sometimes land with more than a 30° slope is used for permanent terraced field cultivation (Schroeder 1985: 35). One study has shown that whereas some rice terraces were on steep 30° slopes, two-thirds of the terraces were on lands with less than 10° slopes (Zurick 1990: 27).

Farms in river valley irrigation systems are flat with some sloping ground. Often, they will be found on a plateau, called a *tar*, elevated fifty to one hundred meters above a large river. The river and the cliff will bound one side and the mountains will bound another side of the *tar*.

Farms in the Terai are flat, with even less slope than in farms in river valleys. Farms tend to be larger than either in the hills or in river valleys, and field size will be larger as well. While waterlogging will be a problem, as indicated above, percolation and seepage losses will be less in the Terai than in either the hills or in river valley systems.

Generally, simple organization with a single executive committee and a single set of rules applying to all irrigators are present in the hill irrigation systems. In river valley irrigation systems also simple organizations are found, but occasionally there are systems with greater complexity. Streams may be larger and would entail more complex relationships between a number of irrigation systems. Within an irrigation organization itself, there may be a number of "sub-groups." Each sub-group would have its own

rules and rights of access to irrigation water resources but would participate in overall governance of the system.

The Terai irrigation organizational structure can be highly complex with several layers of organization. Chhattis Mauja in Rupendehi District in Nepal, for example, has four levels of organization: (i) at the branch canal level, (ii) at the canal cluster level (several canals), (iii) at the main canal organization level, and (iv) at the Tinahu River organization level. It is a federation, with each lower level participating in higher levels of organization.

## OVERVIEW OF FMIS AND AMIS IN DIFFERENT TERRAINS IN NEPAL

A recent study by Ostrom, Benjamin and Shivakoti (1992) and IMSSG/IAAS (1994) on an overview of the 127 irrigation systems (103 FMIS and 24 AMIS) in Nepal (in 1994, 173 irrigation systems reported with 127 FMIS and 46 AMIS with augmentation of Nepal Irrigation database) report that while most irrigation systems were initially constructed by farmers, most FMIS have received some form of external assistance at one time or another. Only 17 percent of the FMIS have not received any government or donor assistance. Government assistance has been extended to 26 percent and donor assistance has been extended to 57 percent. The amount of this assistance has varied widely from small grants that enable farmers to replace a wooden aqueduct with a PBC pipe all the way to the construction or rehabilitation of an entire system.

The average service area of AMIS is 939 ha, while FMIS average about one-third of that size--273 ha. The variability among FMIS is higher than the variability among AMIS in regard to the amount of land served by these systems. There is also a substantial difference between the average size of the systems in the hills and those in the Terai. The AMIS in the Terai have an average area of 2,089 ha whereas the AMIS systems in the hills average only 192 ha. But FMIS are substantially smaller systems on the average than AMIS in all terrains. In the hills and in the hills-river valleys, FMIS are about one-fourth the size of AMIS systems.

In Nepal, labor is mobilized for routine cleaning of the canals and repairing of the intake. This usually occurs during the driest part of the year in preparation for the monsoon season. Some routine maintenance is continued on a regular basis throughout the year. Emergency repairs of the intake or main canal can occur at any time. The rules that relate to emergency repair are usually different than the rules used for routine maintenance. Many systems require all irrigators to be present for a large emergency repair. Labor can be mobilized for routine maintenance based on any of the following: (i) the amount of land owned, (ii) the quantity of water received, (iii) according to family or kinship rights and duties, (iv) the rule that every household sends an equal number of workers, (v) the rule that every household sends whoever it wants on a labor-day, and (vi) a variety of other rules. In Nepal, most systems rely on the amount of land irrigated as the basis for *routine* labor mobilization. Fifty nine percent of the FMIS and 47 percent of the AMIS mobilize labor for routine maintenance on the basis of land. Around one-third of both AMIS and FMIS require equal participation of each household as the basis for this labor mobilization.

The average number of households in these systems is 431 in the FMIS whereas it averages 1,328 in the AMIS. Systems serve on the average a smaller number of households in the hills (FMIS-112, AMIS-335), than in the hills-river valleys (FMIS-168, AMIS-1,402), or in the Terai (FMIS-829, AMIS-

2,104). The variation in size measured by a standard deviation is substantial across all types of systems and terrains.

Agency-managed irrigation systems on an average have recorded 5.1 tons per hectare of production of major cereals while the FMIS have recorded an average of 5.9 tons per hectare of output in a year. The higher productivity of FMIS as contrasted to AMIS is even stronger when one controls for terrain. The highest average yields obtained in any terrain were those of FMIS in the hills-river valleys of Nepal (6.8 metric tons). The lowest recorded average yields were obtained in the AMIS located in the hills (4.5 metric tons).

Average cropping intensities at the head are higher in the FMIS than those in the AMIS based on data from 118 systems. On the average FMIS had a cropping intensity at the head end of systems of 246.2 percent (or the equivalent of two seasons of full cropping and a third season of half cropping) and the AMIS had a cropping intensity at the head end of systems of 208.3 percent (or the equivalent of two seasons of full cropping and a third season with about an 8 percent of the tail end planted). FMIS in the Terai achieved the highest head end cropping intensities--over 250 percent. FMIS in the hills came very close to matching this level at least in the head ends (see table in Annex).

### **POLICY AND INSTITUTIONAL ENVIRONMENT FOR FMIS SUPPORT SERVICES (SS)**

The current Eighth Five-Year Plan (1992-97) has three important objectives, namely, sustainable economic growth, poverty alleviation and reducing regional imbalance. Priority has been given to agricultural intensification, diversification and commercialization. The development of the programs are conceptually based on sustainability, farmers' resource endowments, geographical areas of comparative advantage, utilization of transport and market accessibility, and the interrelationship among different programs. The main executing agency for meeting the plan objectives is the Ministry of Agriculture (MOA) which has to obtain support from many other organizations, agencies, institutions, and private entities. The objectives of agricultural development pursued by the MOA are:

- \* To increase agricultural production on the basis of geographical specialization contributing to the national economy.
- \* To increase production and productivity in meeting the growing domestic demand for food, and raw materials for agro-based industries.
- \* To expand employment opportunities for the numerous small farmers.
- \* To achieve a balance between agricultural development and the environment.

To examine the policy and institutional environment for FMIS SS, it is necessary to lay out the irrigation development strategy of the government for the current Eighth Plan (1992-97) which is guided by four long-term objectives:

- \* Increase agricultural production and benefits from irrigation land through a combination of agricultural and irrigation management programs.



- \* Improve the delivery efficiency of irrigation related services, through institutional improvements within government agencies and the maximum possible of the private sector.
- \* Implement small irrigation projects with improved procedures to identify, design and construct them, with active participation of beneficiary farmers in all the phases.
- \* Select and implement new large- and medium-scale irrigation projects in the Terai, and in some of the river basins in the hills as a means of augmenting national agricultural production by significant amounts.

Thus, the government has put emphasis on: (i) the improvement of production from existing irrigated area through coordination of agricultural and water supply units; (ii) improvement of institutional efficiency; and (iii) implementation of small irrigation projects.

Even with all these strategies outlined, food production in Nepal is not yet sufficient to meet the needs of the total population, and, in particular, many hill areas are food deficit areas. Increased agricultural production can still be absorbed within the immediate neighboring area of production. The main reasons for these obstacles include the following:

1. The plans prepared for carrying out field activities are based on casual evaluations and appraisals of the situation and potential beneficiaries are not sufficiently involved in the process.
2. There is a lack of coordination among Ministries related with natural resource management, especially water resources, and within the Ministry of Agriculture as well.
3. Inadequacy of facilities, equipment and supplies, as well as, well-trained manpower severely constrained the effectiveness of irrigation improvement programs over the years. The field sub-overseer and the overseer are not trained to the level that they could handle the common field problems as they occurred. Furthermore, these technicians are spread too thinly over large geographical areas.
4. Material resources also were not available to the farmers to the required extent. Technical services were lacking in most of the rural areas which slowed down the pace of agricultural development.
5. Where new production enterprises were taken up, marketing facilities did not develop automatically. Also, a very limited effort was made to develop markets and this restricted agricultural development severely.
6. Agro-ecological zoning and identification of appropriate technological packages that are consistent with the enterprise opportunities available on the basis of comparative advantages are generally overlooked.

The combined effect of all these weaknesses has contributed to the slow growth in agricultural production. The farmers have inadequate confidence on the ability of the public sector to provide the necessary inputs and technical knowhow in time they want and in quantities they want.

Many FMIS in Nepal in the hills are in very isolated locations with the nearest road often being several hours of walk away. For such systems, the marketing of surplus production is limited to the local market. Where such an irrigation system is in a food deficit area, the local market is typically able to absorb available surpluses. The cost of transportation of surpluses out of these areas is high, making production for markets external to the areas uncompetitive. Conversely, transportation costs raise the costs of inputs for local farmers.

The following are the direct support service providers to the farmers besides Department of Irrigation and other irrigation development related agencies which provide services mainly for the improvement of the water delivery mechanisms.

The Department of Agriculture Development (DOAD) is responsible for the implementation of MOA policy and planning and programming for agriculture development of the country. The District Agricultural Development Offices (DADOs) are responsible for supervising the works carried out by the Agricultural Service Centers (ASCs). The ASCs are organized throughout the country on the basis of seven service centers in each of the 16 Terai and 4 selected hill districts and six in each of the remaining districts.

Public corporations and institutions operating within the MOA are: Agriculture Inputs Corporation, Agricultural Projects Services Centre, Dairy Development Board, Dairy Development Corporation, Tea Development Corporation, Animal Feed Production and Development Board, Agriculture Tools Factory, Agriculture Lime Factory, Cotton Development Board, and Jute Development and Trading Corporation.

The district-level institution for development is the "District Development Committee" and assumes accountability for self-reliance and maximum participation of the people in development activities. In addition, there are a number of private organizations and individuals involved in agricultural development.

Market participants involved other than the parastatals, private suppliers of agro-inputs and credit (informal money lenders and relatives) and private agencies providing investment inputs such as forestry, irrigation, and physical facilities.

Thus, the support institutions in Nepal are: research; the suppliers of agro-inputs (whether public, such as AIC, or private sector dealers); marketing systems (whether these are local *haat-bazaars*, association of commodity producers, or whole-sale markets); credit agents (whether formal or informal lending agencies); and the various government and private agencies providing investment inputs (such as forestry, irrigation and physical communications).

### **Department of Agricultural Development (DOAD)**

Since the early 70s, the Department of Agricultural Development (DOAD)--which operates in all 75 districts with each district supported by several agricultural service centers and sub-centers--has had the mandate to provide agricultural extension services throughout Nepal. Irrigation has been identified as one of the most important activities at the service center level due to its potential in increasing production and direct impact on the farming practices due to ready response of the crops to water availability, especially during the dry seasons. The National Agricultural Research Center (NARC) operates its outreach programs designed to expand production of specific crops. Lumle and Pakhribas Agricultural Research Centers have also developed effective research-extension linkages by conducting many on-farm research trials and variety screening.

During the last decade, DOAD implemented several activities related to development of irrigated agriculture. Farm Irrigation and Water Utilization Division (FIWUD), Hill Food Production Project, SINKALAMA (Hill Agriculture Development Project), and Integrated Rural Development Projects (IRDPs) are some of the irrigation related activities which are discussed in detail in the latter section of this report. DOAD is responsible for designing and implementing agricultural extension programs in areas where FMIS predominate. However, on large DOI irrigation schemes run through the Irrigation Project Board, each project has its own Agriculture Division looking after agricultural development programs in the project command area.

## **Cooperatives**

Cooperatives have been assumed to be one of the most important mechanisms of reaching people in the past for mobilizing savings and delivering services. At present, with the promulgation of a new Cooperative Act, a cooperative society has to be registered in the Registrar's office and its rules and regulations have to be approved by the Registrar. At the district level, each district has a cooperative office which coordinates all the activities of purchasing inputs and daily necessities with Agricultural Input Corporation (AIC) and Salt Trading Corporation. Also, the district office coordinates all the legal and administrative matters with other line agencies besides negotiating with the Agricultural Development Bank branch and sub-branch offices for providing production and input purchasing of short-term loans to the village-level cooperatives.

The Department of Cooperatives, now under the Ministry of Agriculture, is responsible for the promotion of cooperatives. About 760 cooperatives or Sajhas exist throughout the country, including virtually all districts. They were intended to be the main channel for the distribution of agricultural credit, but have not been successful due to farmers' debt delinquency, over 500 cooperatives having in turn defaulted and become ineligible for further loans from the ADB/N. Thus, there has been a dramatic decrease in the share of the cooperative in the total loans disbursed by the ADB/N (from 54% in the early seventies to 11% in 1993).

## **Agricultural Input Corporation**

The Agricultural Input Corporation (AIC) was first established in 1966 as the Agricultural Supply Corporation for the procurement and distribution of agricultural inputs, viz., seeds, fertilizers, plant protection herbicides, insecticides and pesticides, and agricultural implements. The AIC's main objective is to ensure the timely supply of an adequate amount of agricultural inputs to different parts of the country. It performs its functions through its regional branch, and district offices, depots and cooperative societies.

The AIC with its headquarters in Kathmandu and 11 zonal offices and some 70 branch offices located in almost all districts has 149 warehouses with a total capacity of 71,848 mt of agricultural inputs. The Government of Nepal provides transport subsidy to the corporation on the transport of imported fertilizers and an indirect subsidy to stabilize prices. Cooperatives are the major dealers of agricultural inputs through the AIC and they get a commission for it. But this favorable treatment to the dealers in comparison to individuals has been abolished recently.

### **Local and District Development Committee**

Currently, the Village and District Development Committees are two elected local bodies at the village and district level which are legally mandated to perform a wide variety of functions in the field of rural development in their respective areas. The preamble of the Village Development Committee (VDC) Act 1991 emphasizes the need for enhancing people's participation in self-government and village development through decentralization, which has been the main rationale for the creation of these VDCs at the grassroots level. At the district level, the District Development Act 1991 provides for the creation of a District Council comprising the presidents and vice presidents of all VDCs and the mayors and deputy mayors of the municipalities in the district. The District Development Committee (DDC) functions as the Executive Committee of the Council.

Although the local institution for development has been organized as the "District Development Committee" to assume accountability for self-rule and maximum participation of the people in development activities through decentralization promoting bottom up institutional development to contribute to the overall development of the country; in practice, there is no coordination among all the line agencies, and they go on with their own program setting and implementation.

### **Agricultural Development Bank**

Farmers are many times short of working capital and have to rely on the different sources of lending. The informal sector is still predominant in rural Nepal where the rate of interest is two to five times more than the government fixed rates. Agricultural credit has been supplied in much of Nepal by the Agricultural Development Bank of Nepal (ADB/N), and the village *sajha* cooperatives (the source for the production loan for these cooperatives is also ADB/N District Office), and small amounts have been available from the Small Farmers Development Program (SFDP) and the Intensive Banking Program of the commercial banks. Thus, due to unavailability of sufficient credits, the farmers purchase a lesser quantity of inputs, and the marginal and tenant farmers are more disadvantaged; and hence, the national productivity goes down.

The Agricultural Development Bank of Nepal (ADB/N) was established in 1968; and its direct involvement in irrigation development started in 1975 mainly under the Small Farmers' Development Program (SFDP). SFDP provides credit facilities to small farmers in a group without collateral on surface water and groundwater irrigation projects based on the self-help approach. Until the end of 1992, ADB/N has supported new construction and improvement of about 12,000 ha of FMIS and provided loans for additional 105,880 ha of groundwater coverage to purchase shallow tubewells (STWs) to the small farmer groups (with subsidy) and individual large farmers. The government has put heavy responsibility on ADB/N to improve/rehabilitate an additional 227,000 ha of FMIS by the year 2000.

### **Transport Infrastructure**

In Nepal's transport systems the road sub-sector has been given high priority. Nepal has 8,328 km lengths of roads (1991 statistics). Out of 75 districts, only 53 districts have access to motorable roads. Road densities in Nepal are considerably low comparative to other low-income countries. Road density of paved and earthen village access roads for various terrain includes 12.88 km/sq km in Terai and 5.76

programs which have been financed by the World Bank. HFPP maintains its own cadre of technicians to implement the project. The irrigation schemes are identified, based on the collective request of the users, and the process of approval and implementation of the schemes are the same as that of FIWUD. Farmers form the construction committee and deposit 5 percent of the estimated cost in the bank in the name of the scheme and commit another 20 percent worth of estimated cost in the form of labor contribution. Like FIWUD, construction works are implemented by the construction committee under the technical supervision of HFPP technicians. Usually assistance is provided for head work, lining the main canal and the retaining wall of the existing FMIS. Once the construction is complete, a users' committee is formed and they take over the system for O&M.

### ***Ministry of Local Development (MLD)***

The assistance process of the then Ministry of Panchayat and Local Development (MPLD) now MLD, started with the central treasury allocating budget for local development activities within the district. The then District Panchayat allocated funds for village-level projects. According to the level of funds allocated and after identification of projects, the villages request approval from the District Panchayat. The district office approves the project only after the district technical office submits design and cost estimates. Once the project is approved, the district administrative office asks respective villages to form a construction committee and a formal contract is signed between the construction committee and the district administration. With the initial 50 percent of the estimated cost released, construction work starts under the supervision of the district technical office. Additional funds are released on the basis of work progress as certified by the technicians. When the project is complete, the construction committee is dissolved and usually a users' committee formed.

Although MLD assisted projects were to be funded only after the district technical office submits design and cost estimates, what usually happened was that the projects were not funded as per cost estimates due to a very low proportion of budget allocated. Thus, estimates were made according to the proportionate availability of funds for the particular year. After the reorganization of the DOI in 1988, the irrigation systems are being handled by the DOI itself.

### ***Integrated Rural Development Programs (IRDPs)***

With the inception of the first IRDP--Rasuwa Nuwakot Integrated Rural Development Program under the loan assistance of World Bank in late 70s--Nepal has experienced many IRDPs in operation (and many of them are discontinued). Important ones are Koshi Hills (British aid), Sagarmatha IRDP (ADB/N loan assistance), Resource Conservation and Utilization Project and Rapti IRDPs (USAID supported), Karnali-Bheri IRDP (Canadian assistance), Integrated Hill Development Program (Swiss assisted) and Gulmi-Argkhanchi IRDP (EEC/France assisted). All of these projects were designed to improve the productivity of the project area; and hence, irrigation is (was) one of the activities in the total development project. But, once the funds were allocated to the related line agency (DOI and ADB/N in case of irrigation), the responsibility of the project was considered to be finished; and external evaluation of the projects were done at the end of different phases of project implementation.

In most of the projects, the implementing agency is the project office maintained in Kathmandu and the district headquarters is usually the Local Development Office of the District Development Council under the Ministry of Local Development which is the coordinating agency based on the philosophy of decentralization. But improvement/repair and maintenance of the irrigation systems are the responsibility

of the DIO engineers and overseers. Upon the recommendations of the individual village development council representatives, the overseer of the DIO makes the feasibility and detailed engineering survey; and the contracts are awarded either to the users themselves or to outside contractors. The payments are made directly to the contractor upon the certification of completion of satisfactory works by the user group chairman and the supervising overseer/engineer from the DIO.

Some of the agencies, however, have been trying to integrate their activities with NGOs such as CARE/Nepal; and these projects have been far better in performance (both in the fund utilization and quality of works and increase in the productivity by acquisition of a reliable and adequate quantity of water). Rapti IRDP funded under USAID has coordinated with CARE/Nepal on providing the technical assistance both for the engineering and agricultural aspects. Recent evaluation of the EEC-assisted Gulmi Arghakhanchi IRDP irrigation projects have pointed out that: (i) irrigation systems contracted out (to outside contractors) performed poorly due to miscommunication, poor standard of work done, and financial aspects being kept secret and thus suspect; (ii) there is lack of coordination among the line agencies at the district level; and (iii) there is non-involvement of beneficiary farmers (Polge 1993). The report also points out that the best results were observed in those projects where the villagers managed by themselves.

### ***Dhading District Development Project (DDDP)***

During the second phase (1989-93), the Dhading District Development Project (DDDP) assisted by the German Agency for Technical Cooperation (GTZ) undertook a program to support FMIS. The ADB/DDP Cooperation Program supported rehabilitation of a total of 24 FMIS covering 380 ha and 608 households in Dhading District. The objectives of the program included the promotion of farmers' self-help organizations through creation/strengthening of irrigation organizations and the improvement of food supply situation through irrigated agricultural development. Farmers were provided with a grant subsidy of up to 60 percent of the total costs through ADB/N branch offices or through SFDP offices. Out of the remaining 40 percent, ten percent came as the labor contribution from the farmers and 30 percent was contributed through a long-term loan from the bank.

The process started with the demand collection by the project and the bank branches and the Group Organizers of SFDP appraising the farmers for their respective areas about the package and the conditions attached to the program. After the approval of loans and assistance, the farmers form a construction committee to implement the project. The irrigation users' group transforms itself into an irrigation maintenance group. The group members are then provided with opportunities for learning in various fields such as leadership development and agricultural skill development.

### ***Koshi Hill Agricultural and Rural development Project (KHARDEP)***

During the Phase I and Phase II periods of KHARDEP, several small irrigation systems were implemented in four districts of Koshi Hills, namely, Dhankuta, Sankhuwasabha, Bhojpur and Tehrathum. Having a command area ranging from 10/15 ha to 80/100 ha, the systems are gravity fed without any major intake structure at the intake, canal and command area. By the end of 1988, KHARDEP had improved a total of 44 irrigation systems (Metcon 1988).

The schemes were all implemented through the then District Panchayat. Initially, the schemes were identified by the Village Panchayat, especially the locally elected representatives. Such schemes were

then discussed in the District Assembly to enable incorporation into the annual district activities. Thus, the socioeconomic and technical analysis of the proposed schemes were not undertaken.

#### ***Department of Soil Conservation and Watershed Management/European Community (DSCWM/EC)***

Since 1985, DSCWM with the assistance from different donor agencies, is involved in the activity of soil conservation and watershed management and at the same time the upliftment of the standard of living of the rural poor in Nepal. The watershed management approach is an integrated approach which combines especially the improved method of hill farming and conservation practices with other methods of gully control, methods of checking soil losses, river bank protection and control of landslide occurrence. Thus, in helping these measures, irrigation repair and maintenance activities at landslide prone areas are considered to be one of the important factors in helping protect watershed area. Thus, projects such as the Bagmati Watershed, assisted through the technical and financial assistance of EC, has been helping farmers to build/improve their irrigation systems. Beganas Tal Rupa Tal Watershed Project in the Kaski District is a similar activity of DSCWM assisted by CARE/Nepal.

#### ***International NGOs (INGOs) and Parastatals***

INGOs and parastatals have played a significant role in irrigation development in Nepal. The contribution of ADB/N by itself and in partnership with other INGOs has played a key role in the improvement of FMIS during the last decade. The roles of ILO and IIMI have already been discussed. Besides them, CARE/Nepal and SNV are currently making significant contributions in this area. SNV has been recently involved in irrigation development as compared to CARE/Nepal. The principal involvement of SNV is in the Mechi Integrated Rural Development Project.

#### ***CARE/Nepal-Agricultural Development Bank of Nepal (CARE/N-ADB/N)***

The process of CARE/ADB/N joint support to the FMIS started with the farmers approaching a Small Farmer Development Program Office after the beneficiaries, through a group meeting, had decided to request the help of the Group Organizer (GO) and initiated the process by helping farmers to apply for assistance. The application was forwarded to the CARE/Nepal Central Office for a feasibility survey by the Small Farmer Division of ADB/N. Based on the feasibility survey by the CARE technicians, approval of the project became the joint responsibility of CARE officials and ADB management. Once the project was approved, the approval notice was sent to the SFDP Office; and following that, design estimates were done by CARE technicians and the expense details were made known to the farmers. Of the total costs incurred, CARE provided 50 percent of the total costs, mainly construction materials such as cement, gabon and rods; 30 percent came as loan from ADB; and the remaining 20 percent was to be borne by the farmers mainly as labor contribution. The construction was the responsibility of the construction committee which was formed from among the beneficiary members. When the construction was completed, the system would be handed over to the farmers by forming a Water Users' Association for the operation and maintenance of the system.

The cooperative arrangement of CARE/Nepal and ADB/N has been discontinued for the last three years. Thus, ADB/N is preparing itself with its technical manpower to help the farmers. But however,

in the field it can be observed easily that ADB/N is severely constrained in providing required technical supervision and assistance needed for quality system maintenance and repair.

### ***Agricultural Development Bank of Nepal (ADB/N)***

The process of ADB/N support has started recently with project identification through a Small Farmer Development Project Baseline Survey. Then perceived needs of the farmers are prioritized and usually irrigation gets top priority provided water sources are available. ADB/N then conducts a feasibility study; and if irrigation projects are feasible, an irrigation group is formed. The group contributes 10 percent as their labor contribution, 60 percent of the total cost comes as a government grant and ADB/N provides 30 percent as a loan to the group. Technical assistance is provided by ADB/N and construction works are usually done by the farmers, where there is no local expertise, petty contractors are usually used. After the project is complete, ADB/N hands it over to the irrigation group, and technical service, if needed, continues to be provided by ADB/N. ADB/N maintains its own cadre of technicians to offer engineering advice to the users during rehabilitation/construction.

The source of the 60 percent of the government grant is in most cases, some sort of bilateral aid/assistance to the government. The important ones are Dhading District Development Project funded by the German Agency for Technical Cooperation (GTZ), DANIDA contribution to the Palpa Development Project, EEC contribution to the Gulmi-Argghakhanchi IRDP and USAID/CARE contribution to the Rapti IRDP.

### ***CARE/Nepal (CARE/N)***

CARE/Nepal in its first phase as an NGO entered into an agreement with ADB/N or with farmer groups on its level of involvement in canal construction especially with the Small Farmer Development Program (SFDP) of ADB/N, as mentioned earlier. The project organized groups of farmers to implement irrigation, community forestry and agriculture activities. The project aimed to strengthen the capabilities of the communities to manage the activities after the phase-out of the project.

In the Western Hill Region, CARE has adopted an integrated watershed development approach. The main purpose of the watershed development approach is to improve the quality of life of people in the area through maximum local participation without disturbing the ecological balance. CARE technical field staff, together with farmers identify projects and if feasible, the request for inclusion of the program is channeled to the overall development plan of HMG. The request is channeled through the District Local Development Office to the Ministry of Local Development. Once HMG approves the scheme as a local development program, there is a direct working relationship between the users and the CARE field technicians. Community contribution is in terms of labor; and CARE purchases the required materials directly. Thus, the users are provided with materials, skilled labor and technical expertise. Users have to bear 30 percent of the total project costs, mainly as a labor contribution and the rest is borne by CARE. This report has discussed the field observation in detail of one of the systems assisted through this program.

More recently, CARE/Nepal has also started two more activities called Natural Resource Management Project in each district of the hills and Terai, which is a more focused area program concerned with the sustainable management of natural resources in the project area. Irrigation activities happen to be one of the components of the integrated approach to resource management. In the remote hills of Bajura and Solukhumbu, in order to fulfill the basic needs of the poor people in the area,



CARE/Nepal has started its irrigation support activities, recognizing the fact that irrigation increases the production by at least 50 percent if backed up by technical advice on the farming practices.

### ***SNV/Nepal-Mechi Hill Irrigation and Related Development Program***

The Mechi Hill Irrigation and Related Development Program is a bilateral multi-sector rural development program, implemented by HMG/N and assisted by the Netherlands Development Organization (SNV-Nepal). It started in 1987 for a period of four years in Mechi Zone (Ilam, Panchthar, Taplejung). The program is based on experience of the earlier SNV-financed Terrace Irrigation Project (MPLD/ILO). Thus, in Phase I, the main sector of the project was irrigation, supported by agricultural extension and some infrastructural improvement works and buildings. Initially, the program was implemented through MPLD, MOA and SNV. After 1988, irrigation activities were shifted to MOWR.

The second phase (1992-97) has recommended (i) creating post of Community Organizer at village level; (ii) improving on the quality and speed of construction, and the sustainability of the infrastructural works, the role of User Assembly and User Committee to be strengthened formally and informally (transparency criteria); (iii) directing the field of irrigation as assistance to FMIS, resulting in a production increase of at least 50 percent in an area of 2,000 ha (the program will only assist in those parts of the works which go beyond the technical and financial means of the beneficiaries); and (iv) making the direct objective of the agricultural component the increase of food and cash crop production within a context of low external input sustainable agriculture. The main tools will be agricultural extension, seed multiplication and farmer-to-farmer marketing.

### ***Seed Multiplication Program***

Of primary interest to us and as one of the most important support service activity, the seed multiplication program (MSP) is mainly launched through Group Approach. The aim of this program is to run a quality seed production program in the farmers' field on "Farmer to Farmer Seed Production and Marketing Approach" by involving seed producing farmers in groups and individuals. MSP implemented most of the targeted activities in the field through the line agencies under their budget or directly through their budget. The main activities included the seed production, seed kits distribution, informal kits distribution, training/tours, group in MSP and marketing and storage. This program seems to have very important impact on the irrigated agricultural system development especially in the remote rural areas of Nepal where the bulk of the produce cannot be transported and marketed in the far distance market. Thus, farmer-to-farmer seed production and marketing approach is a way of providing effective support service to the irrigated agriculture.

Aims of SNV initiated irrigation activities include: (i) selecting new projects on the basis of the Zonal Irrigation Profile in order to get more needed and feasible projects; (ii) increasing coordination and integration with agriculture; (iii) improving training for users; (iv) starting monitoring effects of irrigation projects on water availability and agricultural production; and (v) assessing the existence of possibilities for improving irrigation water management.

The users have to contribute 20 percent of the total project costs mostly in terms of labor contribution. Once the construction is complete, the program supports needed repair request within six months after completion of construction.

## ASSESSMENT OF SECTOR SUPPORT SERVICES

Table 12 presents a comparative analysis of the number of systems, total command area and cost per hectare of improvement/rehabilitation of different FMIS supported by different agencies during the last five years. A total of 636 community irrigation systems have been reported improved/rehabilitated by major agencies supporting irrigation development in Nepal. Out of these 636 systems, 475 systems are located in the hills and remaining 161 systems are located in the Terai. Considering the large number of FMIS in the hills, the proportion of improvement assistance seems in the right direction. The single dominant program providing assistance is the ISP under loan from World Bank Irrigation Line of Credit (ILC) and Asian Development Bank assisted Irrigation Sector Program (ISP) under Irrigation Sector Support Program (ISSP). The second largest agency is ADB/N. CARE/Nepal comes as the third largest INGO providing assistance in improving FMIS under its different programs where irrigation happens to be one of the activities of overall resource management in the project area. Out of 98 irrigation systems supported by CARE/Nepal, 56 of the systems are implemented through the joint program of ADB/N in its first phase of irrigation development. These systems have been reported twice here. Thus, the discussion to follow will deal with these systems in each agency which is a delicate issue, and the reader should be made aware that these 56 irrigation systems covering about 8,000 ha are considered twice while presenting the analysis in this report. The partnership between CARE/Nepal and ADB/N has been discontinued recently.

Although there are a total of 56 newly constructed irrigation systems, most of these irrigation systems are not completely new in the sense that there were small tributaries and natural springs from which farmers were irrigating part of their systems during the main paddy season in monsoon. Thus, we can also consider these systems as the expanded/rehabilitated systems.

A total of 61,582.6 ha of command area of FMIS have been improved by major agencies during the last five years or so out of which nearly half of the area (29,279 ha) is located in the Terai; and the remaining area is located in the hills. Although the number of systems improved in the hills is nearly three times more than in the Terai, the area covered by individual systems is much smaller in the hills than in the Terai. Again in terms of area coverage, DOI/ISP has covered a large number of hectareage, and ADB/N and CARE/Nepal have an almost equal area covered in the improvement of irrigated agriculture. One important point to note here is that improvement of FMIS by all the agencies except DOI has taken a longer period of time in a smaller scale, which has direct impact on the quality and cost of improvement of the individual systems, the discussion of which comes in the later section.

Table 12 also presents the cost of improvement of different FMIS on a per hectare basis assisted by different agencies. The trend clearly indicates that the systems assisted by the INGOs such as CARE/Nepal, SNV, IIMI and under the loan assistance of ADB/N are far less than those assisted through the regular government line agencies such as DOI, MLD and DSCWM. It is argued that the INGOs do not account for the personnel salaries and other office maintenance expenses; and hence the per hectare cost of improvement comes low. But under the ISP and other programs, these figures presented here do not account for the other expenses as well. These figures are the actual amount being allocated for the improvement of particular system. It might be interesting, however, to compare the overall per hectare cost of improvement including the cost of personnel salaries and office maintenance. As expected, the cost of improvement is higher in the hills than in the Terai due to difficult terrain and landslide prone areas being prevalent in the hill. Also, the systems assisted by INGOs and ADB/N loan are based on low cost technologies, are also smaller in size, and per hectare costs are relatively lower.

Table 13 presents the cost sharing criteria of different intervening agencies in the improvement of the FMIS. Farmers have contributed between 75 percent and 1 percent of the total cost. As discussed earlier, DOI requires under its ISP Program a cash contribution of 1 to 5 percent of the total improvement/rehabilitation cost, percentage depending on the total costs incurred. The cash provided through the ADB/N is as high as 30 percent of the total costs. The repayment schedule of the ADB/N loan is usually three and five years, two additional years' grace period being given without interest for systems suffering major damage during the construction period. ADB/N has also started providing higher subsidies to the improvement of irrigation systems to follow the standard procedure set by the working policy of the DOI. Thus, in Table 13 there are two different farmer and agency contributions reported.

Table 12. Total number of households, irrigated area and cost of improvement/rehabilitation of irrigation systems in Nepal on a per hectare basis supported by different agencies.

Intervening agency and irrigation type	Reference years	Total number of households	Total number of systems	Total command area (ha)	Cost of construction/improvement (Rs/ha)
<b>DOI/ILC:</b>	1990-93				
1. New Construction in Hills		NA	10	3,255	66,426.00
2. Rehab. Hills		NA	147	8,166	27,514.00
Terai		NA	33	16,475	10,919.00
<b>DOI/ISP:</b>	1990-93				
1. New Construction in Hills		NA	9	611	34,626.00
Terai		NA	1	495	13,190.00
2. Rehab. Hills		NA	64	4,461	24,360.00
Terai		NA	29	6,767	10,518.00
<b>DOI/SINKALAMA:</b>	1988-92				
1. New Construction all in Hills		NA	25	1,307	14,548.00
2. Rehab. Hills		NA	27	1,448	12,847.00
<b>ILO/SPWP/DOI:</b>	1990-93				
1. New Construction all in Hills		211	3	92.5	50,090.00
2. Rehab. Hills		1,814	22	696.5	33,950.00
<b>WECS/IIMI:</b>	1985-90				
1. All rehab. and improvement Hills		NA	19	974	3,286.00

(Continued)

Table 12. (Continued)

<b>SNV-Mechi Program/DOI:</b> 1. New Construction all in Hills 2. Rehab. Hills	1987-92	555 1,070	6 12	140 816	25,270.00 6,172.00
<b>EEC-Gulmi Arghakhanchi IRDP/MLD:</b> 1. New Construction all in Hills 2. Rehab. Hills	1987-92	165 519	2 14	69 100	4,159.00 21,256.00
<b>Bagmati Watershed/DSCWM/EEC:</b> 1. All rehab. and improvement in Hills	1985-93	NA	13	162.5	25,667.00
<b>CARE/Nepal:</b> 1. ADB/N: SFDP-Central/East 2. BTRT/DSCWM 3. ADB/N: SFDP-Rapti 4. NRM Project - Mustang Hills - Mahottari Hills 5. Remote Area: Basic Need Program - Solu Hills - Bajura Hills	1984-92 1984-88 1986-92 1985-92 1990-92 1990-92 1991-92 1991-92	9,141 3,111 1,615 2,031 835 1,342 69 138	98 33 17 23 14 6 1 4	7,047.6 3,200.0 102.0 2,047.6 384.0 1,342.0 25.0 95.0	5,039.90 4,559.00 5,634.00 4,581.30 13,252.00 4,133.50 12,939.00 6,532.00
<b>ADB/N:</b> Hills Terai	1986-92	3,739 5,477	88 70	3,162.5 5,337.0	5,121.00 5,552.00

Notes: Rehab. = Rehabilitation. NA = Not available.

Source: Documents (listed in the references) and the end-of-the-year statement (as of 15 July 1993) of the respective agencies.

The District Irrigation Offices (DIOs) have allocated a fixed amount of the annual maintenance budget and the DIOs coordinate distribution of different material assistance such as gabon wires and cement from the environmental programs to help repair and maintain FMIS in the district. Depending upon the demand from the farmers, these materials and the annual maintenance budgets are distributed to the FMIS. Thus, there is wide variation in the contribution to be borne by the farmers. Most of the agencies

supporting the improvement of the FMIS have contributed more than 75 percent of the total cost. The variability in the contribution percentage by the farmers is minimum in case of CARE/Nepal projects than other projects. Farmers' contribution in all the intervention programs is mostly in terms of labor contribution.

Table 13. Farmers' contribution towards rehabilitation/construction cost.

Agency providing support services	Farmers' contribution as % of total cost				Agency contribution (%)
	Cash (%)	Labor (%)	Other (%)	Total (%)	
DOI/District Irrigation Offices	Neg.	10-50	5-25**	15-75	25-85***
DOI/ILC/ISP	1-5	6-20	-	7-25	75-93
DOI/SINKALAMA	5	20	-	25	75
DOI/ILO/SPWP	1-5	6-20	20-25***	27-50	50-73
WECS/IIMI	0-5	5-25	-	5-30	70-95
SNV-Mechi Program/DOI	-	15-25	-	15-25	75-25@
EEC-Gulmi Arghakhanchi IRDP/MLD/DOI	1-3	5-30	-	6-33	67-94
Bagmati Watershed DSCWM/EEC	-	1.5-12.5	-	1.5-2.5	87.5-98.5
CARE/NEPAL					
1. ADB/N:SFDP	-	20	20*	40	60
2. BTRT/DSCWM	-	30	-	30	70
3. NRM Project	-	25-30	-	25-30	70-77
4. Remote area	-	25	-	25	75
ADB/Nepal	- 1-5	20 -	30* 6-20*	50 7-25	50 75-93

\* Loan from the bank.

\*\* Mostly assistance in gabon wire, cement and other materials.

\*\*\* ILO has provided support to the ADB/N to provide loans in selected systems.

Notes: @ = SNV adjusted contribution to the standard percentages set by DOI Working Policy.

Neg. = Negligible.

Source: Documents (listed in the references) and the end-of-the-year statement (as of 15 July 1993) of the respective agencies.

## SELECTED SUPPORT SERVICE PROGRAMS

This section presents a short description of successful cases and makes comparisons on the changes in physical and organizational structures, and their effect on agricultural performance. The description also includes the essential support services provided by different intervention programs and also makes comparison of the process of assistance provided by these service providing institutions. For the comparison of the before-after scenario, past experience of the author with these systems and published documents and reports (listed in the references), besides discussion and inspection of the irrigation systems with the key informants were followed. The study team consisted of an agricultural scientist and a social scientist. Besides discussion with farmers, the related local-level support service officials such as the Group Organizer of the Small Farmers Development Program, JT/As in the Agricultural Services Center, Manager of Sajha Cooperatives, Chairman and other members of the Cooperative Society, WUO Chairs, Secretaries and the farmers from the head and tail end were also interviewed. The instrument used for interviewing this range of respondents was a checklist prepared before the field study. Thus, these findings are based on the information provided by these respondents.

During the month of July 1993, four systems were visited which are considered as the most successful FMIS supported by different agencies. But due to tragic natural disasters such as floods in late July, more time could not be spent in each of these systems. Thus, during the month of December 1993, two of the earlier systems and three more systems were visited to gather more information from these systems and the related support service providing local institutions. The two systems described here in which intakes were washed away by the flood immediately after our visit include Rapti-Nawalpur in Makwanpur District and Kumroj 2 in the Chitwan District. Thus, the information presented here is of the situation before the floods in these two systems.

In total, the following seven cases were selected for the study of support service programs.

### Atmara Irrigation System

Atmara Irrigation System is located in the western hill district of Kaski supported through the provision of material assistance by CARE/Nepal under its Begnas Tal Rupa Tal (BTRT) Watershed Development Program, executed jointly by CARE and the Department of Soil Conservation and Watershed Management (DSCWM).

Atmara is an old irrigation system being managed by the farmers without any help from an outside agency until 1989. It was only in 1989 that the BTRT Watershed Development Project identified the source of this irrigation system as a heavy carrier of gravel to the Begnas Lake in the downstream area. Thus, in the process of developing bank protection measures and sedimentation control, this irrigation system was chosen for improvement in the intake and in many points in the main canal through user participation. The materials that are not available locally are provided by CARE under its assistance program, and the wages of the skilled laborers are paid by the project. But the community has to contribute labor for the transportation of the outside materials from the nearest motorable road point. Thus, community participation in the improvement of this system was more than 50 percent due to high labor contribution.

Due to the problem of transportation, the cooperatives operate at two levels. Sisuwa Cooperative is the regional cooperative of the district cooperative which maintains fertilizer stocks and other daily needed items. Saure Cooperative at Majhthana VDC is located within one mile radius from the Atmara

Irrigation System. This cooperative serves two other VDCs in the north at more remote places. There are only 60 primary members in the cooperative who have purchased a share of Rs 110 each, but the goods and fertilizers are sold even to nonmembers. At present, there are three persons employed for maintaining transactions.

There is also a Small Farmers Development Program (SFDP) Office of the ADB/N in the adjoining village called Khudi which works independently, but the majority of the farmers irrigating their fields from the Atmara System are group members of the SFDP. These farmers take group loans mainly for production purposes to buy improved seeds and fertilizers. There is also a Community Development Committee along the watershed area of the BTBT where all the support service providing agencies meet and coordinate different activities supporting environmental protection, and at the same time conduct community-based economic activities.

### **Banskot Irrigation System**

Banskot Irrigation System is located in the Tupche VDC in the central hill district of Nuwakot supported and rehabilitated by the users themselves through grant assistance from the Irrigation Sector Program (ISP) of DOI executed through the Central Regional Irrigation Directorate.

Banskot Irrigation System irrigates 90 ha of land in the Tupche Village Development Committee (VDC). The total number of beneficiary households is nearly 1,000. The source of this system is a perennial stream called Salakhu Khola. The canal discharge is 300 liters/second and the total canal length is 3.2 km with an idle length of only 155 meters. The system was rehabilitated with grant assistance under the Irrigation Support Program of DOI in 1988/89. The total amount was Rs 15,07,520, out of which 12.5 percent came as community labor contribution and 2.5 percent as cash deposit by the users themselves, and the rest was borne by the ISP. The improvement cost/ha was Rs 16,750. Under the present arrangement of the ISP, the construction/improvement contract was awarded to the user committee and thus all the works were completed by the user committee under the supervision of the District Irrigation Office.

This system has had support services available for the last one and a half decades. One of the first SFDP programs of ADB/N was implemented at this VDC, and the Tupche Sajha Cooperative has also been serving the community since then. There is also an Agriculture Service Center to provide services to the farmers. The Small Farmers' Community Orchard Program, land improvement programs and pioneering programs which are running successfully in the area. The small farmers themselves have formed informal marketing cooperatives and the representatives negotiate market prices with the buyers and the truckers so that they get reasonable prices for their produce.

### **Gahatadi Irrigation System**

Gahatadi Irrigation System is located in the western Terai district of Nawal Parasi expended and constructed through the loan assistance of ADB/N Branch Office at Rajahar.

Under the resettlement and land development program of the government, forest was cleared in the inner Terai district of Nawalparasi during the late seventies and the early eighties. Many foot-hill farmers migrated to this area and resettled after clearance of forest. Amarapuri VDC is one of the several

resettled villages where 92 farmers irrigate their 67 ha of land from the Gahatadi Irrigation System. The water source for this system is a perennial stream called Jharre Khola. Before the rehabilitation/expansion of this system under the grant/assistance from HMG and loan assistance from the ADB/N Branch Office at Rajahar during 1988/89, only 17 ha of land were irrigated during the rainy season.

ADB/N Branch Office at Rajahar maintains its own irrigation overseer to supervise the improvement/construction activities. Besides the ADB/N Branch Office there is an Agriculture Sub-Center where five technicians provide technical advice to the farmers and offer suggestions on the impact on agricultural performance once the loan assistance program is made available.

The Beldiha Cooperative is responsible for the supply of improved inputs to the farmers of Gahatadi Irrigation System. The maximum demand for fertilizer is during winter for mustard and wheat cultivation. There are six staffs employed by the cooperative and there are 250 members with a purchase share of Rs 105 each. The cooperative also takes short-term loans to buy fertilizers. The main problem of the cooperative is inability to make fertilizers available in time from the Agricultural Input Corporation.

### **Kukhuredhap Community Irrigation System**

Kukhuredhap Irrigation System is located in the western hill district of Palpa expanded and constructed with the loan assistance of ADB/N-DANIDA through its Khasauli SFDP Sub-Project Office. Before improvement, only 5 ha of land were irrigated of 20 farm households. After intervention, the total number of households served by the system has risen to 44; and design irrigated command area is 29 ha and the actual irrigated area at present is 24 ha during the monsoon (rainy) season and only 12 ha during winter.

The new concept on loan disbursement by the bank is the introduction of long-term loans for the improvement of land to make the upland suitable for rice cultivation. The farmers have a mixed feeling about the loan program due to its long gestation period for the complete conversion of the land into suitable lowlands from uplands. There are also environmental concerns raised about the sustainability of the land improvement program itself.

The total amount of money spent on the rehabilitation of the system was Rs 2,96,711.00, out of which 60 percent came as the DANIDA contribution equivalent to Rs 178,026.60. Thirty percent of the total cost was forwarded as the loan at an amount of Rs 89,013.30, out of which the small farmers' actual loan was Rs 70,982 and the rest of the amount was either paid by the large farmers or taken as a loan from the ADB/N branch office at Tansen, Palpa. The remaining 10 percent of the cost came as people's participation equivalent to Rs 29,761.00. The money was spent on the construction of the following: intakes=1, level crossings=1; covered canals=3; dividers=1; pipe intakes=2 and syphons=3" pipe 400 meters. During construction, the construction committee consisted of a chairman, secretary, treasurer and six members.

Harthok Cooperative Society is responsible for the sale of inputs and other required plant protection services in the system area. The cooperative society being a multiple purpose society also deals with the Salt Trading Corporation which sells salt, sugar, kerosene and other daily necessities to the local population. At present there are 263 households as primary members and the membership share fee is only Rs 12 as opposed to Rs 100 in other cooperatives. The cooperative also takes loans from the ADB/N Office to mainly buy fertilizers and sell to the farmers. With the increase in the irrigated area, there is an increase in the demand of inorganic fertilizers from the farmers mainly for the winter crops.



But the cooperative is not functioning efficiently and it has become very difficult to sustain it without government assistance and subsidy.

There is also the Agriculture Service Center at Khasauli, and there are five technicians working on agriculture related problems of the farmers.

### **Kumroj 2 Irrigation System**

Kumroj 2 Irrigation System is located in the inner Terai valley in the eastern Chitwan Valley, constructed and rehabilitated through the assistance of CARE/Nepal and loan assistance of the Agricultural Development Bank of Nepal (ADB/N) through its Kumroj Small Farmer Development Program (SFDP). It is now being supported through SNV mainly on environmental protection issues. This system is one of the first relatively large irrigation projects carried out in the community irrigation program. The community irrigation program aims at the construction and rehabilitation of FMIS. The 390 ha irrigated system with 318 beneficiaries was completed in 1988 with a total cost of Rs 1,002,326.00 out of which 20 percent came as SFDP loan, 20 percent as farmer labor contribution and the remaining 60 percent as Care/Nepal contribution. At this moment, the irrigation program is carried out by ADB/N with technical personnel support from SNV (Netherlands Development Organization).

Khairahani Cooperative Office is responsible for providing required inputs to the Kumroj farmers. But transaction was very low during past few years. The main reason for low transaction of the improved fertilizers and seeds was higher (increased) price of the inputs, whereas the price of the output did not increase proportionally, hence the use of improved inputs did not pay.

The cooperative also forwards loan applications to the SFDP and ADB/N branch offices for production loans including the community purchase of tractors with the consolidated 20 *bigha* (13.6 ha) of land among the cooperative members.

A minimum share of Rs 100 should be purchased to be a member of the cooperative. Individuals cannot purchase more than 20 percent of the total shares in the cooperative. Although farmers can purchase inputs without being a member of the cooperative, farmers must buy shares to be eligible for an ADB/N loan of more than Rs 10,000. Nine executive members are elected/selected for a tenure of five years.

There is an SFDP Office in the command area which provides technical assistance (provided by the sub-overseer of the SFDP and the SNV engineer). Improved farming advise is provided by the Agriculture Sub-Center located in the Parsa Market, about 4 km north along the Bharatpur-Hetauda highway.

### **Rapti-Nawalpur Irrigation System**

Rapti-Nawalpur Irrigation System is located in the inner Terai valley of Makwanpur District, supported through FIWUD, and recently supported by ISP of DOI.

The Rapti-Nawalpur System has been able to mobilize cash from MPLD in 1966 and 1972 besides hume pipes in 1977. But the low carrying capacity of the canal, the absence of a permanent structure, excessive demand for water and the availability of water at the source provided sufficient ground for the FIWUD to intervene in the system during 1987-88.

The Rapti-Nawalpur Irrigation System has been one of the FIWUD-sponsored projects designed to incorporate the ideas and experiences of farmers without killing their self-help attitude, and executed with a high rate of farmer participation. As per the FIWUD strategy and requirements for getting joint finance in the process of intervention in existing irrigation schemes, 75 percent of the cost of the project was shared by FIWUD and the rest by users. Farmers in Nawalpur were trying to divert water from the Rapti River since 1964 with limited success. FIWUD took a positive decision to intervene in the system when the users requested its help in the improvement of their existing scheme. Under its supervision, FIWUD awarded contracts for the construction of canals to the construction committee formed by the users. By the time the construction activities were completed, the farmers already had a user association which could take over most of the management activities.

In the 175 ha of irrigated land, there are 208 beneficiaries receiving water in variable proportions. The tail enders, although paid an annual maintenance cost of Rs 350/ha which is just double to that paid by the head enders, never received an equal share to that received by the head enders. Thus, in 1990 the farmers approached the DIO to apply for ISP assistance, and their request was approved. According to the working policy of the ISP, the construction contract was awarded to the Water Users' Committee at an estimated amount of Rs 1600,000.00, at an average rate of Rs 9,142/ha of irrigated land. The farmers while constructing the system substituted by the labor work now have a saving of Rs 113,000.00 after completion of the work, which is deposited in bank in the name of the WUA. The farmers are planning to open a cooperative which will purchase the necessary inputs and market outputs. Negotiations are under way whether the cooperative should be under the WUA or the cooperative works as an individual entity. At present there is no cooperative within the system area. Due to the proximity of the district headquarters, all the inputs are purchased through the district AIC sales office and dealers. The produce is sold directly at the Hetauda Grain Market.

The improved farming advise is also directly provided by the technicians from the District Agriculture Development Office (DADO). The DIO provides the necessary technical advise if consulted. The District Administration is also helpful in processing and registering the regulation of the WUA. The WUA also receives its income by selling its irrigation water to the individual houses and factories and restaurants.

The WUA includes the president, vice president, secretary, joint secretary and five members. Besides the WUA, there is also an Advisory Board consisting of five members consisting of past presidents, and the present president and secretary as ex-officio members.

### **Satra Saya Phant Irrigation System**

Satra Saya Irrigation System is located in the western hill district of Tanahu supported through grant assistance from the Irrigation Line of Credit (ILC) under the Irrigation Sector Program (ISP) of DOI executed through the Western Regional Irrigation Directorate.

This system was supported through the ILC of DOI under a World Bank loan assistance of Rs 1400,986.00 and 83 beneficiary households contributing a sum of Rs 36,487.00 for irrigating 60 ha of land. Unlike the working principle of the Asian Development Bank assisted ISP, ILC does not contract out construction work to the WUA. Thus, it was contracted out although the work done by the outside contractor was to be approved by the WUA functionaries.

This system is supposed to be more than 300 years old. The length of the main canal is 3 km. The first formal WUO was formed after the 1978 cadastral survey, before which the water monitor locally called *Jimwala* was responsible for operation and maintenance of the system. The primary responsibility

of the representatives of the WUO was to mobilize the labor and cash required for the maintenance of the system. The equivalent of ten man-days/ha was required. If that became insufficient, labor was mobilized on a per household basis locally known as *Sitthe*. The penalty and gradation of the sanction were observed strictly. For the distribution of water a monitor is employed who is only authorized to distribute water to the individual fields. He is paid in kind at the rate of 75 kg rice per hectare of irrigated land.

During the ILC intervention, different rates were fixed for the labor and contribution. These rates were as follows: Rs 900/ha for prior users; Rs 2,000/ha for the upland farmers; Rs 1,500/ha for the other farmers who are irrigating from seasonal sources but want to be included in the new system; and Rs 1,980/ha for the head drain user farmers. The total number of beneficiaries after intervention was 83 households.

Farmers' perception regarding involvement of farmers in construction is that: (a) they have knowledge about the system; (b) quality is controlled; and (c) local employment opportunity exists.

Akala Cooperative, also being managed by the members of the WUO, is facing competition from the private dealers due to the government policy of providing the same (2%) commission to the private dealers as well as to the cooperatives. The private dealers are also selling deceptively by misinforming the buyers about the content of NPK in the fertilizers. Thus, it has been extremely difficult for the local cooperative, which was one of the most effective cooperatives until a year ago, to continue.

The most effective support service, although not directly implemented within the system area, is the outreach research and extension service provided by the Lumle Agriculture Center (LAC) in the adjoining village of the Yampa Phant. The farmers were of the opinion that the research trials at the farmers' field and their visible effect is much more than in any other government program.

## COMPARISON OF SELECTED IRRIGATION SYSTEMS

### Basic Information

Table 14 presents the basic information on the selected irrigation systems. The command area reported here consists of the areas which can at least be irrigated during the wet season. During the dry period, almost all the systems listed below get reduced to only half their size either due to unavailability of water in the source or due to farmers generally growing crops in a limited area which needs irrigation due to competitive demands of other inputs as well. The highest amount of cost per hectare of irrigated land is in Satra Saya Phant Irrigation System which was supported through the assistance of ILC under DOI. The minimum amount of the cost of improvement comes under the assistance program of CARE/Nepal either with the ADB/N or with DSCWM. The reasons for lower cost per hectare of improvement of these systems are higher rate of participation from among the beneficiaries, better quality control, availability of sound technical assistance during the improvement period and the loans to be paid by the farmers. But in the case of ILC assisted projects, participation rate of the farmers is lower and the contractors are selected outside of the user group members. Thus, quality control is from the outside while the users do not have full control over the outside contractors. The service areas of the flat land Terai systems are greater than in the hill irrigation systems, but the households per hectare are higher in the hills than in the Terai being served by the individual systems.

Table 14. Basic information on selected irrigation systems.

S. no.	Name of system	Command area (ha)	Number of households	Support/ intervening agency	Cost of improvement (NRs/ha)	District	Terrain
1.	Atmara	16	36	CARE/ Nepal	6,705.00	Kaski	Hill
2.	Banskot	90	1,000	ISP/DOI	16,750.00	Nuwakot	Hill
3.	Gahatadi	67	92	ADB/N	15,277.00	Nawalparasi	Terai
4.	Kukuhure Dhap	24	44	ADB/N-DANIDA	12,363.00	Palpa	Hill
5.	Kumroj 2	390	318	CARE/ N-SFDP/ ADBN	2,570.00	Chitwan	Terai
6.	Rapti-Nawalpur	175	208	ISP/DOI	9,143.00	Makwanpur	Terai
7.	Satra Saya Phant	60	83	ILC/DOI	24,931.00	Tanahu	Hill

## Organization

During the period of implementation of the intervention process, the farmers have to organize themselves to meet certain commitments on their part. Some FMIS have formal while some other systems have informal organizations. Even prior to the provision of support services, the organization process is started. Formal organization in this report is defined very loosely. If the users' committee exists with written minutes of meetings, the organization is termed as formal. When there is mass gathering of users as and when needed and they pass resolutions without written records, such organizations are termed here as informal organizations. Many support service providing agencies, especially for the improvement and rehabilitation of the systems, require organization in the system, such as a construction committee or a water users' group, as a pre-condition for providing assistance. Thus, many informal organizations have formalized themselves, and in the systems with 150 ha or more to be irrigated (Rapti-Nawalpur in our case) there are sometimes even two tiers of organizational structures at the system level and the branch canal level. The changes in organizational structure before and after intervention are presented in Table 15.

provider. This is particularly the case with NGO interventions (e.g., FFHC support programs in Sri Lanka). The involvement of service recipients in the planning and implementation of support programs as was the case of the NDF intervention in Sri Lanka and the initiatives taken by the farmers of Satra Saya Phant and Gahatadi irrigation systems in Nepal. These examples show that a necessary commitment is that the farming community should be made true partners and be given decision making powers over priorities, design and the scale and scope of the intervention.

Related to the issue of beneficiary participation is the crucial role of user groups. In most of the assistance programs discussed in this study the formation of farmer organizations was an essential precondition for intervention. Evidence from Nepal and to a limited extent from the Sri Lankan case suggest that such groups could play an effective role in improving access to services, facilitate local consultation and identification of local level needs and in O&M tasks once the systems are rehabilitated. But for farmer organizations to function effectively, they must be empowered to raise sufficient funds to maintain irrigation facilities. Evidence suggests that FOs which perform diverse functions, especially in the supply of production inputs and services, are more effective than those solely concerned with irrigation. This was clear in some of the larger schemes (e.g., Kaudulla) in Sri Lanka where the FOs had invested resources in input supply and secured user rights to state-owned storage facilities for purchasing and storing rice from the farmers. Through its intervention in the local rice market, the FOs were successful in pushing up the prevailing open market price of rice by about Rs 1. In addition, FOs through federated action had been able to function as a strong political lobby to ensure that they received adequate water for the dry season crop. Similarly, some of the active user groups in Nepal had formed cooperatives to carry out activities such as marketing of cash crops, fruits, vegetables and livestock.

The two country studies show that appropriate choices of organizational arrangements for planning and implementing support programs is full of value judgements. There is no uniform model or system and perhaps there can never be one. But the analysis of experience in the two country studies suggests some common issues from which some broad guidelines may be formulated. These are highlighted in the next section.

## **GUIDELINES FOR THE DELIVERY OF SUPPORT SERVICES**

With the growing recognition of the potential contribution FMIS could make to agricultural production, programs to improve their performance are underway in several countries. As the evidence from the two case studies presented in this document suggest, the present facilities and support services for FMIS are inadequate. The purpose of this section is not to prescribe a particular system of providing support services but take note of some general principles which need to be considered in devising effective, efficient and responsive solutions in the light of differing local situations. They are as follows:

### **1. *Coordination of Support Services***

The two case studies demonstrated the fragmented nature in the delivery of support services. A multiplicity of organizations provide various services which are administered in several different ways. These efforts need to be coordinated both in terms of program content and timing in order to provide a better fit between farmers' needs and the array of services available. This would require the consensus

and cooperation of the various providers. Furthermore, coordination will eliminate duplication and also minimize transaction costs.

## *2. Decentralization*

Support services must be easily accessible to the farming community. Decentralization of the provision of services to village-level state institutions or non-governmental organizations could facilitate accessibility of services to a larger population.

## *3. Service Integration*

As modern agriculture requires a variety of inputs and services, support programs which focus solely on the physical improvement of irrigation facilities is inadequate. Support services should be organized as a "package" including the supply of production inputs, credit, extension and post-harvest operations such as storage, processing and marketing.

## *4. Farmer Participation in Planning and Delivering Support Services*

Evidence from the case studies demonstrate that the involvement of beneficiaries enhances the effectiveness of support programs. Farmer organizations could play an effective role in deciding priorities and in the design and delivery of support services.

## *5. Private Sector Provision of Commercial Services*

Private sector has been effective to the commercial needs of the farmers and should be encouraged to play a greater role in such areas as supplying production inputs, farm machinery and equipment and marketing.

## *6. Legal and Institutional Support*

In countries in which FMIS are of ancient origin, production conditions in the schemes are generally governed by customary rules and procedures which are obsolete in the present day context. There is a need for new institutions where farmers' rights to land and water are clearly defined and also, provide legal status to farmer organizations.

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## Annex

*Table. Agricultural performance of FMIS and AMIS in different terrains of Nepal.*

Variable	Hills		Hills-river valley		Terai and Terai-river valley		All terrain		(n)
	FMIS	AMIS	FMIS	AMIS	FMIS	AMIS	FMIS	AMIS	TOTAL
mt/ha: How many metric tonnes of agricultural product are produced per year per hectare ?									
mt/ha	5.4	4.5	6.8	5.4	6.2	4.8	6	5	108
[sd]	[1.31]	[1.92]	[2.7]	[2.4]	[2.3]	[2]	[2.1]	[2.1]	
(n)	(35)	(6)	(14)	(9)	(37)	(37)	(86)	(22)	
Headint: What is the cropping intensity for the head end ?									
Headint	249.5	212.6	225	198.7	251.8	218.2	246.2	208.3	118
[sd]	[44.4]	[39.4]	[41.9]	[73.9]	[45.9]	[69.5]	[45.2]	[62.1]	
(n)	(40)	(6)	(17)	(9)	(40)	(6)	(97)	(21)	

Source: Ostrom, E; P. Benjamin and G. Shivakoti. 1992. Institutions, Incentives and Irrigation in Nepal. Vol. 1. p. 127.