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LAND AND WATER RESOURCES MANAGEMENT IN WATERSHEDS

Participatory Action Research Aimed at Integrating Production and Protection

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- Participatory Action Research Aimed at Integrating Production and Protection[1] -

C.M. Wijayaratna[2]

1. INTRODUCTION

The objective of this paper is to submit the conceptual framework and strategies built into a novel Participatory Action Research (PAR) effort, namely the Shared Control of Natural Resources (SCOR) Project. These concepts and strategies are being tested in two pilot watersheds in Sri Lanka by the International Irrigation management Institute, IIMI, in collaboration with the Government of Sri Lanka, Resources User Groups/Organizations (RUG/RUO) and Non-Governmental Organizations (NGO). The project is being funded by the United States Agency for International Development, USAID. SCOR is aimed at integrating environmental and conservation concerns with production goals. In order to achieve this goal the project adopts a novel participatory approach to land and water resources management in a watershed context.

In Sri Lanka, like in many other developing countries, there is an urgent need for more intensive, but environmentally appropriate utilization of its natural resources base, particularly land and water, for profitable and sustainable agricultural and related industrial production. There is an increasing body of evidence from Sri Lanka and other countries in the region that farmers, even those with small holdings make production responses to the economic environment within which they carry out their farming activities. These responses are influenced by the degree of control the users can exercise over their means of production, availability of productive, sustainable & appropriate technology, availability of information about market conditions and opportunities and the necessary supporting services. For example, enhanced group action by the users and participatory management of irrigation have resulted in significant increases in water use efficiency and crop yields in many irrigation systems. Increasing the user's share of control over natural resources through group action and their active participation in making management decisions are, therefore, widely recognized to be vital pre-requisites to improve management of these resources. Interventions aimed at improving natural resources management through local control are known to yield high rates of return.

Moreover, SCOR design team hypothesized that the natural resources base, particularly land and water, can be conserved and their productivity could be sustained if environmental and conservation concerns are incorporated into the production process of the users. SCOR concepts and strategies were developed

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[1] Paper presented to the 10th Internal Program Review of International Irrigation Management Institute, IIMI, 7-11 November 1994, Colombo, Sri Lanka

[2] Head, Sri Lanka Country Program and Project Leader, Shared Control of Natural Resources (SCOR) Project, International Irrigation Management Institute, IIMI

through a unique participatory project design process spearheaded by a core group of experts including senior government officials who are closely associated with the management of land and water resources of Sri Lanka. The process was designed and facilitated by IIMI and financed by the USAID. The three-month design process included a review of past experiences in the management of natural resources in Sri Lanka and elsewhere, a series of consultations and project development workshops with a cross section of resources users, government officials at various levels, development banks and representatives of Non-Governmental Organizations (NGO).

The SCOR design is built on the progress already made in Sri Lanka and elsewhere in participatory irrigation management and social forestry. It applies an organizational approach coupled with appropriate technologies for integrated land and water resources management on a watershed basis. The appropriateness of the approach is being tested and demonstrated in two pilot watersheds of Sri Lanka (namely Huruluwewa in the North Central Province and Nilwala in the Southern Province) chosen for their differing social, agricultural and environmental characteristics. In these pilot areas, appropriate production and conservation techniques and technologies are being used to augment and sustain the resource base and its productivity through participatory processes and novel modes of tenurial arrangements and state-user partnerships.

The paper is organized in eight parts: following this introductory section, part 2 of the paper will outline the constraints (as identified by SCOR design and implementation teams) to sustainable increases in productivity in the watersheds. Part 3 describes project goals, objectives and major activity areas. Part 4 of the paper argues for the rationale in selecting watershed as the basic planning, co-ordinating & implementation unit of this participatory action-research program. Project's organizational structure and implementation strategy/process is discussed in part 5 while the Monitoring and Evaluation approach of SCOR is outlined in part 6. Part 7 of the paper lists some of the additional research studies being conducted to augment the knowledge base. Finally part 8 of the paper will summarize SCOR strategies and approaches and submit a brief account on spread effects of the project.

2. CONSTRAINTS TO SUSTAINABLE INCREASES IN PRODUCTIVITY IN THE WATERSHEDS[3]

A participatory analysis of constraints to and potential for sustainable increases in productivity in the watersheds had paved the way to SCOR design. Four types of major constraints have been identified in relation to the environmentally appropriate increase in production:

a) The lack of a production environment that motivates the resources user to effectively manage the combination of resources essential to optimize economic production while conserving land and water resources;

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[3] An indepth analysis can be found in SCOR project paper, IIMI-Government of Sri Lanka - USAID, 1992.

b) The lack of an effective combination of technology/skills, incentives and (mechanisms to enforce) penalties that encourage internalization of environmental considerations into management decisions;

c) The lack of adequate information about the land and water resources management, at appropriate levels.

d) Institutional constraints including inadequate co-ordination between projects/activities of land and water resources development.

2.1 An Inappropriate Production Environment

Sri Lankan farmers' response to economic incentives and disincentives is clear, as evidenced by the change in farmer cropping practices, in Mahaweli System H and certain other areas taking comparative advantages from dry season rice planting on well-drained red-brown soils to the production of chili, when the Government policy of importing chili to maintain a low consumer price was modified to permit a greater profit to domestic producers. In these soils, the shift to the more suitable other field crops (OFCs), has resulted in a much more efficient use of the valuable irrigation water, as well as an improved fertilizer efficiency. The latter has also undoubtedly, resulted in substantially reduced leaching of nitrates to the groundwater, providing an important environmental benefit. Hence, profitable production and protection of environment can go together. However, it is also clear that in many countries there are disincentives associated with a number of practices designed for environmental protection. In some cases the disincentives are economic while in others they are institutional. For example, when physical works such as terraces and protected waterways, or tree planting are required, the time necessary to recover the costs is too long for the resources user to bear. The customary way to reduce this economic disincentive is to pay some or all of the cost incurred in following this practice.

Another factor essential to sustainable production is sufficient security of tenure for farmers to utilize specific areas of land over an extended period. This reduces the temptation for exploitative land use, and permits recovery of investment in production and environment protection practices that takes relatively long cost-recovery periods. Security of tenure is usually assured by ownership title, but other mechanisms are available to provide effective security. Settlement schemes offer de facto security, as do various types of traditional tenancy. However, the security of tenure alone is not sufficient to ensure that farmers will make economically and environmentally sound decisions.

The size of the operating holding should permit viable and sustainable production. While there is evidence that there are individual small holdings which are or could be made economically viable, very small fragmented holdings are, generally, not conducive to either optimization of agricultural practices or to the application of environmental protection practices. However, the resources of individual holdings could be pooled together to bring about the advantages without changes in tenurial rights. Land consolidation/tenurial changes in small tank systems may be cited as an example.

There must be a supportive production environment. Production inputs, such as credit, seeds, fertilizer and technical information must be available at reasonable effort and cost. The total costs to farmers, particularly small holders, often include a high proportion of "transaction costs", those monetary and non-monetary payments that are associated with obtaining necessary approvals, ensuring timely availability of inputs, etc. Some of these input constraints may be reduced through organized group action. This is important in respect of two aspects, (1) the impact on the ability to organize for group economic activity and (2) the availability of supporting services. Small landholders and other individual resources users experience significant difficulties when they attempt to expand and/or modify their economic activities. Even when they have reasonable security of tenure, they find it difficult to obtain adequate financing, to gain from economies of scale, and to benefit from available professional services. Under such circumstances, organizing into groups with appropriate legal rights provides an effective mechanism for overcoming these difficulties. The SCOR Project is built on past experience of group economic activities - notably of the water user groups in major irrigation schemes - and promote group efforts in water and land use in the watersheds.

2.2 Internalization of Environmental Considerations into management Decisions

Sri Lanka has a long history of cultural sensitivity to the environment. Unfortunately, the combination of increased population pressure, the push for development and modernization, and inappropriate policies has seriously eroded this sensitivity. The impact of this loss, expressed in accelerated environmental degradation, is difficult to address in the agriculture sector, especially in the small-holder subsector. The typical processes used for environmental protection in the industrial sector — establishment of environmental standards, monitoring of impacts, and enforcement of rules — can be effective because most of the environmental-impacting practices can be identified with the individual producer. In the agriculture sector, particularly in farming, adverse impacts are usually the result of the cumulative effects of the actions of many, and difficult to identify with individuals against whom corrective actions can be taken. These problems, typically of a non-point source, cannot be effectively dealt with using the point source control mechanisms. These cumulative effects, such as erosion resulting from inappropriate cultivation practices, pesticide and nitrate contamination of groundwater and nitrate or phosphorous eutrophication of tanks and streams, are the result of decisions made in the normal course of farming. Unless those actors are informed by the knowledge of potential impact, and unless profitable alternatives exist for these cultivation practices and the management of those chemicals, environmentally inappropriate decisions will continue to be made (Levine, 1992).

Other environmental impacts may be the result of failure to use appropriate protection practices because they are technically too difficult or too expensive. Erosion control practices that require physical structures are illustrative. In this case, to reflect and protect public interest, and to encourage its adoption, novel profitable conservation practices, training and new incentive structures may be necessary.

While most agricultural environmental impacts are from non-point sources, some, such as those resulting from inappropriate irrigation or accelerated erosion resulting from inappropriate (or illegal) cutting of trees on fragile lands can be identified with individuals. In these cases, more often than not, penalties are proposed to generate corrective action. However, understanding of alternative use, incentive structures - for example usufructuary rights for protecting stream/irrigation canal reservations - reduction in pressures to utilize environmentally fragile lands through participatory protection of natural resources are usually much more effective in internalizing environmental considerations into agricultural decision making.

Customary economic incentives, such as product prices and market stability must also be such that production of resource appropriate crops can be profitable. Government policies on price fixing, property rights, importation of agricultural products, and other forms of regulation of agriculture and natural resources influence farmer decisions.

2.3 Inadequate Resource Information

To understand environmental cause and effect relationships, and to evaluate their physical, economic, and social impacts, information on the environment as well as on environmentally friendly yet profitable production technologies must be available at a scale that permits appropriate decision making. For this information to be available, data must be collected, processed, analyzed and made accessible in usable form by the decision makers and users. Unfortunately, there is a serious lack of this basic information, particularly at the level of detail necessary for agricultural and resource utilization planning. In addition, even the available data are not conveniently available to those who could best benefit from them.

To assist in the identification of potential opportunities, the information must encompass a wider range. Information on technology, infrastructure, water sources, population centers, marketing, etc., become important when attempting to discover new economic potentials.

Computer-based data handling systems are now available to quickly and efficiently manage spatially defined data, and to permit their combination according to different criteria. The resulting combinations can be displayed readily as maps, charts, tables, or other forms of dissemination. These Geographic Information Systems (GIS) are being adopted rapidly by planning agencies, private firms and others involved with natural resources management and utilization.

2.4 Institutional Constraints

Institutional constraints of special relevance to the objective of balancing production and protection would include:

a) inadequate institutional environment to foster new, sustainable production opportunities;

b) user groups nonexistent or too weak to participate in planning, management and control of natural resources;

c) resource tenure arrangements that inhibit adoption of sustainable production and conservation practices;

d) a lack of coordination among agencies, donors, projects, levels of government and resource users with respect to the use of natural resources;

e) a lack of supporting services for the identification and implementation of sustainable production and protection practices;

f) inadequate environmental consciousness with respect to potential impacts of agricultural and nonagricultural production decisions at various levels.

The SCOR strategies are directly aimed at reducing and/or removing these constraints.

2.4.1 Inadequate Co-ordination Between Projects/Activities

> Many past efforts, with their emphasis on immediate gains and centralized, but poorly co-ordinated, have inadequately addressed the need to manage and utilize the natural resources that are the basis for continued production and development, more efficiently, effectively, and in a sustainable manner. Moreover, the number and variety of projects currently underway to improve the agricultural production sector, to rehabilitate and improve irrigation infrastructure, to enhance the capacity for appropriate planning and implementation of natural resources-based activities, and to increase awareness of environmental problems are such that the potential for overlap, duplication, and conflict, as well as for synergistic benefits exists. Effective communication and cooperation as well as co-ordination and integration of activities involving the management of natural resources are necessary to maximize benefits, to reduce costs and to avoid conflicts. (SCOR Project Paper 1992)

Local or community control of water and land resources in the watersheds should, therefore, enhance the efficiency of monitoring and imposing penalties.

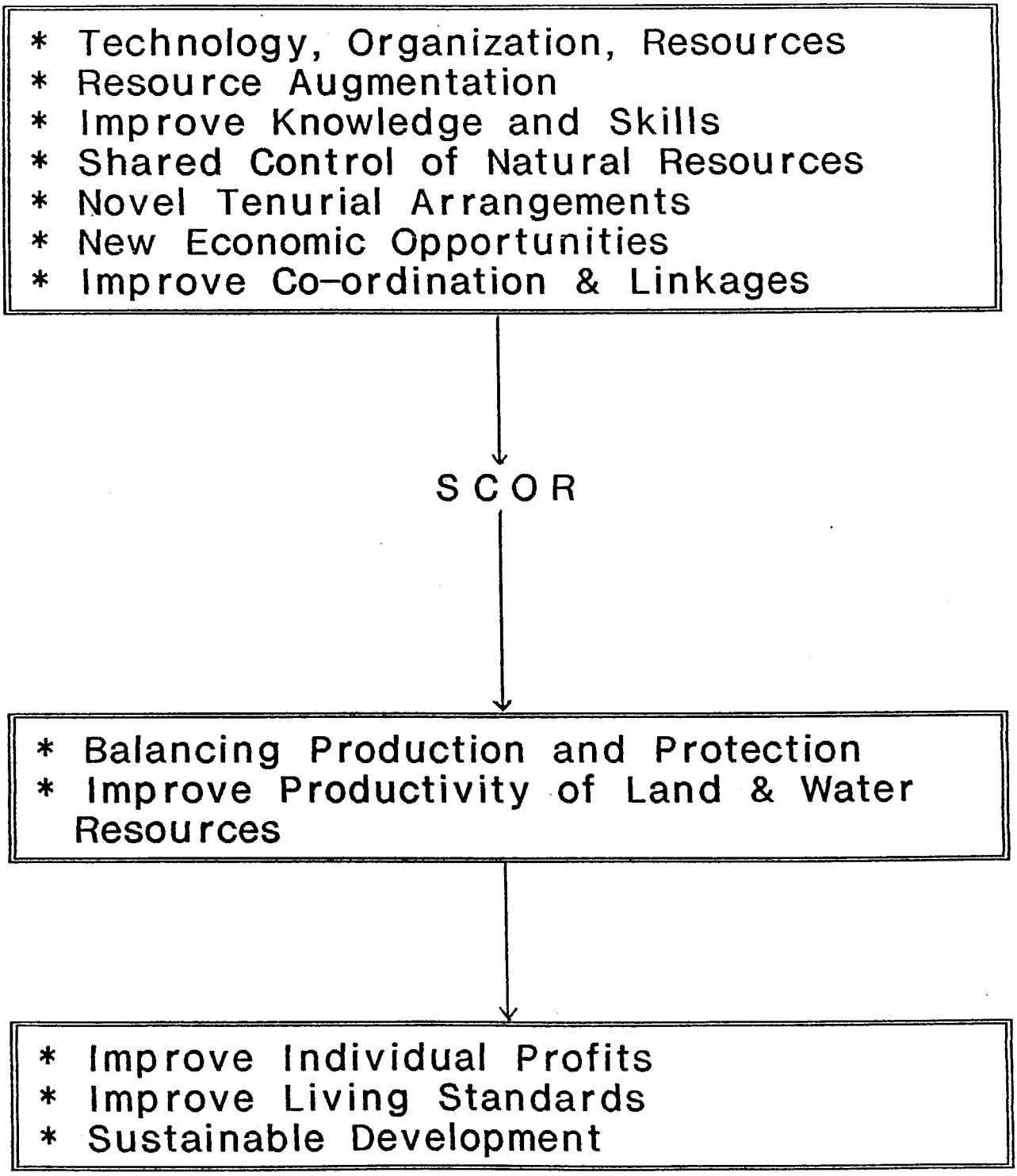
3. PROJECT GOAL, SPECIFIC OBJECTIVES AND ACTIVITIES

The prime goal of this action-research project is to develop and test a strategy to increase the sustainable productivity of the natural resources base in Sri Lanka in ways that will improve people's livelihoods beneficially and equitably now and in the future with due regard to environment.

The specific SCOR objectives are:

a. To improve the incentive and institutional context in which land and water related activities are undertaken in pilot watersheds (Huruluwewa and

Figure 1 : LOGICAL FRAMEWORK OF SCOR



As constraints to group activities are identified, the Project assists in the removal of the constraints. When the constraints are the result of policies, rules, regulations, or actions of a higher level, the Project will work at those levels to achieve the purposes of the Project. Demand-driven changes are likely to be more expeditiously addressed than recommendations for change from above. The Project structure, including Steering Committees in each of the provinces and at the national level will facilitate the process of inducing change. Hence, SCOR project inputs as well as expected outputs and impact cover multiple levels - ranging from micro/farm level to macro or policy levels.

4. WATERSHED AS THE BASIC PLANNING CO-ORDINATING & IMPLEMENTATION UNIT

The focus on watersheds as basic planning, co-ordinating and implementation units is a unique feature of SCOR. The term watershed is defined as the area of land surface that drains water into a common point along a stream or river. (SCOR pilot watersheds are being sub divided into sub watersheds/basins for convenience.) The rationale for using the river basin watershed as the basic unit for integrated planning of (land and water) resources utilization is clear. The watershed is a physical entity geographically defined by an important natural resource, water; the ways in which the water in the upper parts of the watershed are used affect the ways in which it can be used downstream, and they affect the associated land resource. Thus, the various parts of the watershed are physically and operationally linked in important ways, and the potential benefits from integrated use can be large. However, the people in the different components of the watershed having access to different aspects of the natural resources base, may be engaged in different economic activities, and may be of different social and/or cultural backgrounds. For example, people in the upper catchment areas may have very different environmental, economic and social conditions from those in associated irrigated commands and those in downstream areas of the irrigated areas. Thus, the personal and economic interests in the different areas do not necessarily coincide, introducing problems for planning and implementation.

This implies that socio-economic and institutional factors, too, influence the linkages between "upstream and downstream". For example, the inter-relationships between chena (shifting/slash & burn cultivation) in the catchment areas of reservoirs in the watershed (mainly in the upstreams of watersheds) and paddy farming in the irrigated commands and drainage areas (downstream) are influenced by socio-economic factors. Similarly, there exist significant socio-economic relations among tanks systems within a "minor tank cascade"[4]. Such factors as land tenure, power structure, village institutions, community traditions, etc. can influence land and water use patterns within tank systems as well as within river basins/watersheds. As people are the final decision makers in regard to the use of land and water resources, they not only influence those linkages and relationships but also can change the production potential of land and water resources either favorably or adversely.

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[4] The SCOR Huruluwewa watershed contains about 220 small tanks (in addition to the major reservoir). Most of these small tanks are in series of clusters or cascades.

Thus, any development/conservation approach should consider those physical-socio-economic and initial linkages that exist between upstream and downstream of a river basin/watershed, between systems within watersheds (such as the variations within and between micro watersheds/basins like the tank cascade systems). It should also consider the role of users both in "production and protection". In other words, sustainable agricultural development in the broad context of rural development in these areas requires a watershed-based integrated approach which not only optimize the production, but also ensures the protection of the natural resources or production base with active participation of the users concerned. Potential benefits from such an integrated participatory watershed management effort can be large.

Moreover, the physical boundaries of the watershed are rarely congruent with the boundaries of the administrative or constituent political entities. This situation complicates the processes of planning and implementation.

In order to overcome these problems, the Project emphasizes an integrated participatory approach, and makes a substantial effort in linkage and coordination. Experience in the major irrigated commands, in Sri Lanka, has shown that the combination of the use of catalysts, sharing of information, and reasonable administrative and political support can bring divergent groups into successful cooperative activity. While the process will be more difficult in the context of the full watershed, there is a reasonable probability of success, and the potential for major benefit.

4.1 Assessment of Supply and Demand Characteristics of Land and Water Resources in the Watershed

It is evident from the foregoing discussion that analysis of land and water resources, their uses and users, is essential. As indicated earlier, the rationale for using the watershed as the basic unit for integrated planning of resources utilization is mainly based on the supply characteristics of water: the watershed is a physical entity geographically defined by an important natural resources, i.e. water. In this section, the supply and demand characteristics of the Huruluwewa Watershed (SCOR Dry zone pilot site) are briefly examined to illustrate the SCOR approach[5].

Primary sources of water supply to the Huruluwewa watershed can be classified into four categories:

a. Mahaweli Feeder canal,
b. Major (Huruluwewa) and minor tanks,
c. Ground water, and
d. Rainfall

Obviously, the ground water resources have no bearing on the watershed boundary as aquifers underneath can extend beyond.

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[5] An indepth analysis can be found in the paper presented by another SCOR team member, Nihal Fernando to this program review.

a. Mahaweli Feeder Canal

Huruluwewa is a "water deficit" system. Huruluwewa tank is (supposed to be) supplemented by the diversions from Mahaweli System via a feeder canal. However, a high degree of illicit water tapping is reported along the feeder canal from Mahaweli system to Huruluwewa tank. Out of the 60 mile-long feeder canal the first five miles falls within the jurisdiction of the Mahaweli authority. The balance part comes under the control of the Irrigation Department[6]. Some selected issues relevant to SCOR efforts are listed below:

I. The feeder canal was constructed in 1976 cutting across the catchments of several minor tank systems thus depriving some (not all) of the present "illegitimate users" of the water rights they would have enjoyed before the canal was cut.

II. Legal measures to stop illegitimate syphoning of water have proved a failure.

III. Irrigation Management Division of the Ministry of Irrigation had attempted to establish contact with these upstream users. In fact, IMD has formed several farmer organizations in this area.

IV. Land productivity in this "illegal area" is high. However, water is freely syphoned out and therefore, water productivity is low.

V. Hence there are lot of "new comers" - some of them operate on large illegal holdings. This has become a politically sensitive issue at present.

VI. The upper contours of the area are being encroached and soil erosion is substantial.

VII. The soils in this area are generally well-drained and there is potential for increasing water use efficiency if a non-paddy cropping pattern could be introduced; without sacrificing user income.

b. Major (Huruluwewa) and minor tanks

The watershed is spotted with many tanks of which Huruluwewa reservoir (55,000 ac.ft.) is dominant. (Figure 2). There are about 220 small tanks which frequently constitute different "cascade systems" within the watershed. In general, the hydrological (as well as socio-economic) interactions between tanks/people within cascades have not been considered in tank rehabilitation or related development efforts. Moreover, there exist strong inter-dependencies between minor tank systems and between minor tanks and the Huruluwewa major reservoir. Fernando (1994) classifies the minor tanks in the Huruluwewa Watershed into several categories. These include:

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[6] The main canal is a trans-basin canal taking water to several systems, including Huruluwewa. It is about 25 miles long and bifurcates to convey water to Huruluwewa (through a feeder canal - 150 cusecs) and to some other major irrigation systems.

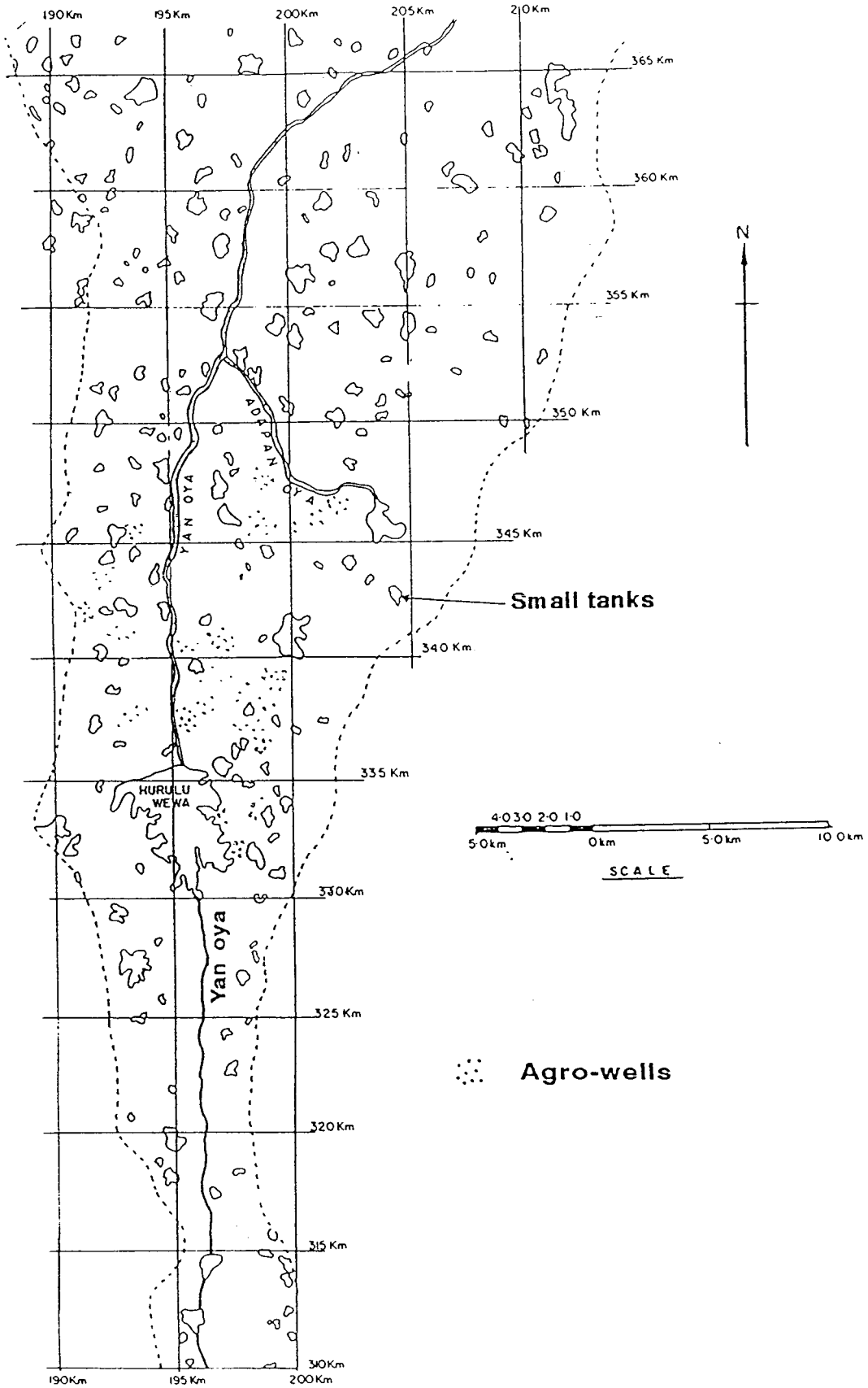


Figure 2 :

DISTRIBUTION OF WATER RESERVOIRS AND AGRO-WELLS IN HURULUWEWA WATERSHED

I. tanks located above the command where drainage return flow enters the Huruluwewa major reservoir system, both the reservoir and the irrigation distribution system;

II. tanks located below the main reservoir and within the command which are directly augmented by the canal system;

III. tanks located within the command which are not augmented directly by the canals but are augmented by the return flows of the command;

IV. tanks with own catchments augmenting the supply to lands in the Huruluwewa command area.

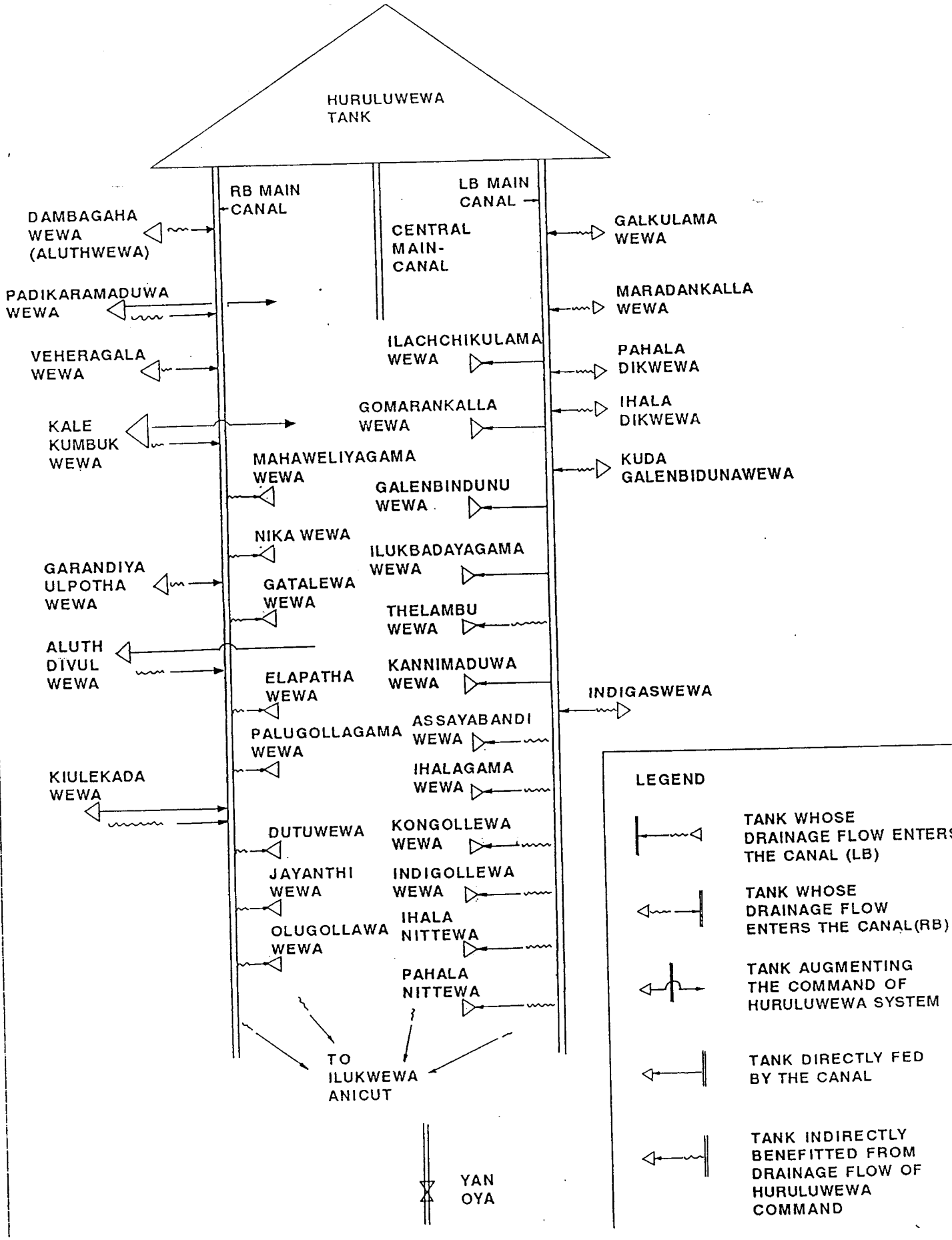
Some of these hydrological "interactions" are illustrated in Figure 3. It is evident that "supply exchanges" among minor tanks and between minor tank and the major tank take place without much planning and co-ordination.

The minor tanks are managed by the farmers. Most of these systems have farmer organizations established under the Agrarian Services Department. And, the farmer organizations of Huruluwewa have been established by the Irrigation Management Division. The drainage return flows of Huruluwewa and associated tank systems are being tapped by Agro-wells for lift irrigation. On the whole, there is an urgent need to strengthen co-ordination between Mahaweli Authority, Department of Agrarian Services, Provincial and National Departments of Irrigation and various forms of users. SCOR project is "catalyzing" such a process to achieve its objective of integrated management of land and water resources in the watershed.

c. Ground Water and Re-Cycling of Drainage Water

It has been generally believed that the dry zone, with the exception of Jaffna peninsula and immediate surroundings, do not offer a great potential for ground water explorations on large scale. However, ground water extraction from the weathered rock up to a depth of about 10m in the dry and intermediate zones is taking place at an increasing rate. No regulations or accepted norms have been adopted with regard to well density, spacing between wells, pumping durations, etc. In certain locations, it is reported that pumping operations of one or more wells interfere with adjoining wells. This is evident from the sudden draw-down of water in the well, while pumping of adjoining wells are in progress. This situation has limited the "on-demand" nature of some wells. Moreover, in certain locations farmers, after excavating to depths exceeding 6-7m and spending about Rs.40,000 - 50,000 (US$800-1000) per well, have found out that the water yields are not satisfactory. Some of them continued their efforts by driving tube wells from that point up to underlying deep rock. (Fernando, 1994). In addition, the negative consequences of the proliferation of Agro-wells include: lowering water table and associated problems such as moisture deficits in rain-fed farming areas, threats domestic wells, income disparities (i.e. due to inefficiencies in the subsidy scheme of the government, usually the Agro-wells are owned by well-do-do farmers. This however, need to be studied further.)

Figure 3 : SCHEMATIC LAYOUT OF THE MINOR TANKS INTERLINKED TO THE HURULUWEWA SYSTEM



Water level fluctuation at three sample sites are illustrated in figure 4. These samples represent the following:

(a) Water level fluctuations in irrigation wells located in the command area of the major reservoir
(b) Water level fluctuations in irrigation wells located highlands
(c) Water level fluctuations in the domestic wells.

It is evident from these figures the : fluctuation variation over time is more in wells used for irrigation and the variation is influenced by rainfall, canal water levels and pumping. A comprehensive research/monitoring activity is being conducted and the analysis will be extended to several other areas including : economics of ground water usage, potential for using ground water in conjunction with tank water, feasibility of group wells, effects on water quality, potential for legal and regulatory mechanisms, etc.

However, SCOR project investigations show some important benefits deriving from agro-wells - increased incomes and profits, better re-use patterns of water, diversification of agriculture, improvements in nutrition standards, etc.

According to SCOR project's participatory resource mapping, there are 721 agro-wells within the Huruluwewa watershed. Most of these have been constructed over the past 2-4 years. The number of agro-wells within different sectors of the watershed is shown in Table I.

Table I. Distribution of Agro-Wells within Huruluwewa Watershed

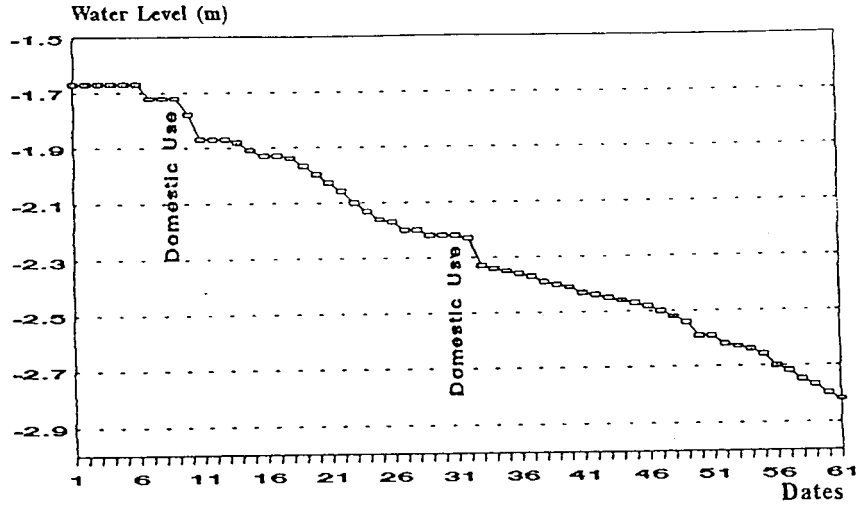
Sector of watershed	- Number of Wells -		
	Lined	Unlined	Total
Catchment	10	46	56
Irrigation Command	65	434	499
Highlands (RB)	20	106	126
Highlands (LB)	12	28	40
Total	107	614	721

Source : SCOR Agro-wells Survey (1994)
Notes : RB = Right Bank, LB = Left Bank

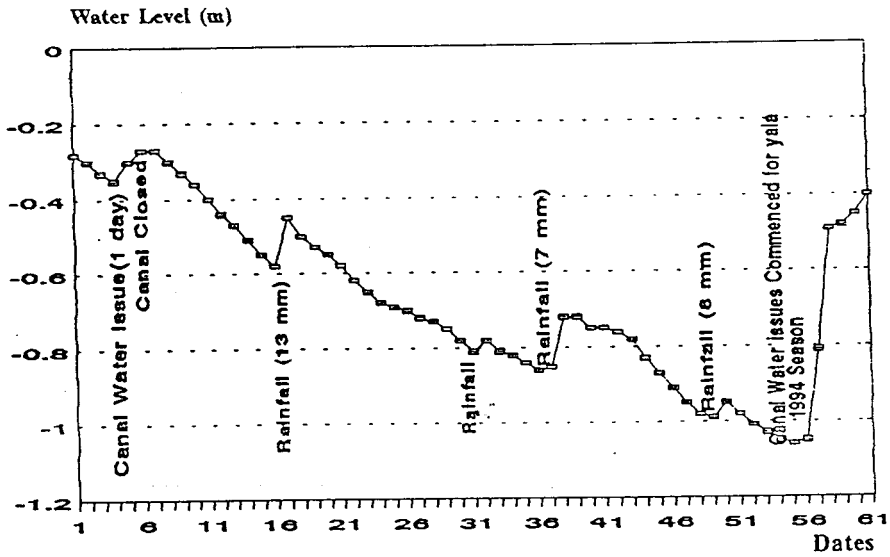
The SCOR project conducted a participatory mapping exercise to gain more knowledge (for SCOR staff, government officials and the users) on the spatial distribution of agro-wells. Locations of these wells appear on Figure 2.

The area cultivated per well is in the range of 0.1 - 0.2 ha. The major crops irrigated by wells are chillies, onion and vegetables.

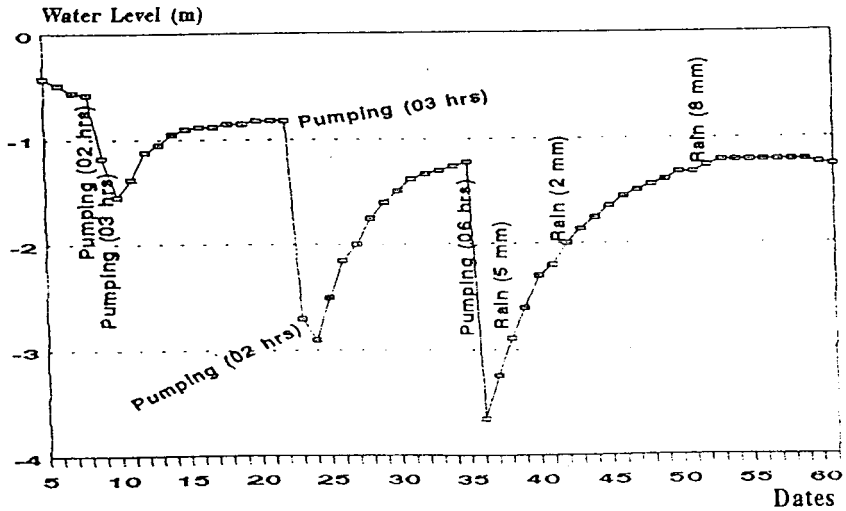
Figure 4 : WATER LEVEL FLUCTUATION IN A TYPICAL DOMESTIC-WELL IN HURULUWEWA HIGHLAND AREA(March-April)
(Well No. 17B- Mainly Used for Domestic Purpose)



WATER LEVEL FLUCTUATION IN A TYPICAL AGRO-WELL IN HURULUWEWA COMMAND AREA(March-April)
(Well No. 02-Mainly Used for Irrigation; Recharged by canal and rainfall)



WATER LEVEL FLUCTUATION IN A TYPICAL AGRO-WELL IN HURULUWEWA HIGHLAND AREA(March-April)
(Well No. 16A-Mainly Used for Irrigation; Recharged by rainfall only)



In addition to this form of "re-use", some farmers have resorted to recycling of drainage water through other methods. For example, farmers practice lift irrigation especially near two pick-up anicuts which have been constructed across Yan Oya at Nikawewa and Illukwewa, reusing drainage return flows of command area of Huruluwewa tank system. Several others have started pumping from Yan Oya (Natural stream, which also conveys water from Mahaweli feeder canal to Hurulu reservoir) in the Huruluwewa catchment area.

It has become increasingly evident from the analysis of current trends in ground water and drainage re-use patterns that the interactions (namely hydrological, user and institutional) between different sources of water for irrigation should be considered in any development effort focused on land and water resources.

d. Rain fall

In regard to climatic factors such as rainfall, temperature, solar radiation, and wind patterns, Huruluwewa watershed represents the characteristics of a typical dry zone regime. Seasonal distribution of rainfall than the total amount plays a major role in influencing agricultural activities in the watershed. The watershed receives an average rainfall about 1,000 mm per annum. On the average, more than 75 percent of precipitation is received during the period from November to January from the North-east monsoon. Periods from May to September is virtually "dry".

Moreover, recent monitoring of rainfall at several points within the watershed shows a significant "microscale variation". (Figure 5). The real challenge to SCOR is to study the spatial and temporal variations in Rainfall at different probability levels and try to combine various sources of water available to this agricultural production system (both spatially and temporally), equitably among various users and rationally between different uses.

The present major problem in both major and minor tank commands (within the watershed) is the inadequacy of water for agricultural production, especially in the dry season. However, it was clear from the above discussion that different combinations of various sources of water can be used. An indepth analysis of supply (eg: water balance) and demand options (eg: conjunctive use, diversified cropping, water conservation measures) is being conducted for this purpose. Temporal and spatial dimensions will also be considered in such an analysis.

It is clear from this discussion that IIMI, through a participatory action research mode (or through a learning process), is now testing a new approach to irrigation management - instead of focussing on the irrigated command area of a single source of supply, integrated water resource management is being attempted in a watershed context. In this particular case the watershed comprised of degraded catchments and drainage areas, a major reservoir and a large number of minor tanks, mostly in cascade system, scattered over the catchment and drainage areas of the major reservoir. The research tasks undertaken so far includes:

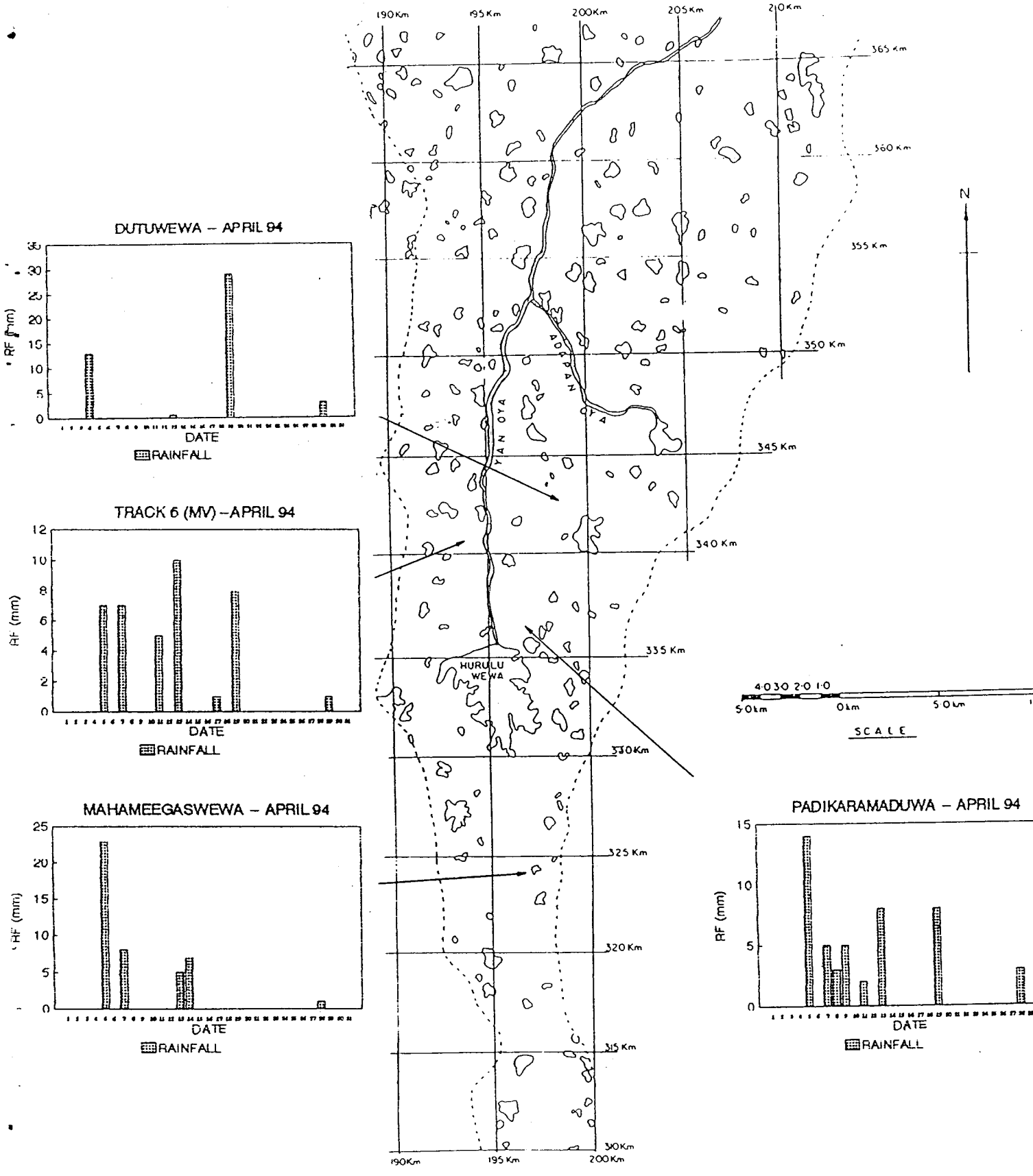


FIGURE 5 : Micro-scale Rainfall variation in the Huruluwewa Watershed

I. predict, at different levels of probability, the quality and quantity of supply available from different sources (feeder canal, rainfall, reservoirs, ground water including natural re-use) over TIME and SPACE.

II. Understand the hydrological linkages among these different sources and explore the possibility of combining them at different production sites at various times/crop seasons. eg: Seasonal planning for optimum allocation, conjunctive use etc.

III. Explore/test various means available for adjusting:

- technologies including crops and cropping patterns, timing of cultivation, water saving techniques including rotational distribution, mulching, "water harvesting" through contour bunding etc. and

- organizational approaches including the decision making at watershed user councils representing the interests of different user categories and different segments of the watershed.

5. ORGANIZATIONAL STRUCTURE AND IMPLEMENTATION OF INTEGRATED LAND AND WATER MANAGEMENT AT SUB WATERSHED/TANK CASCADE LEVEL

5.1 Organizational Structure

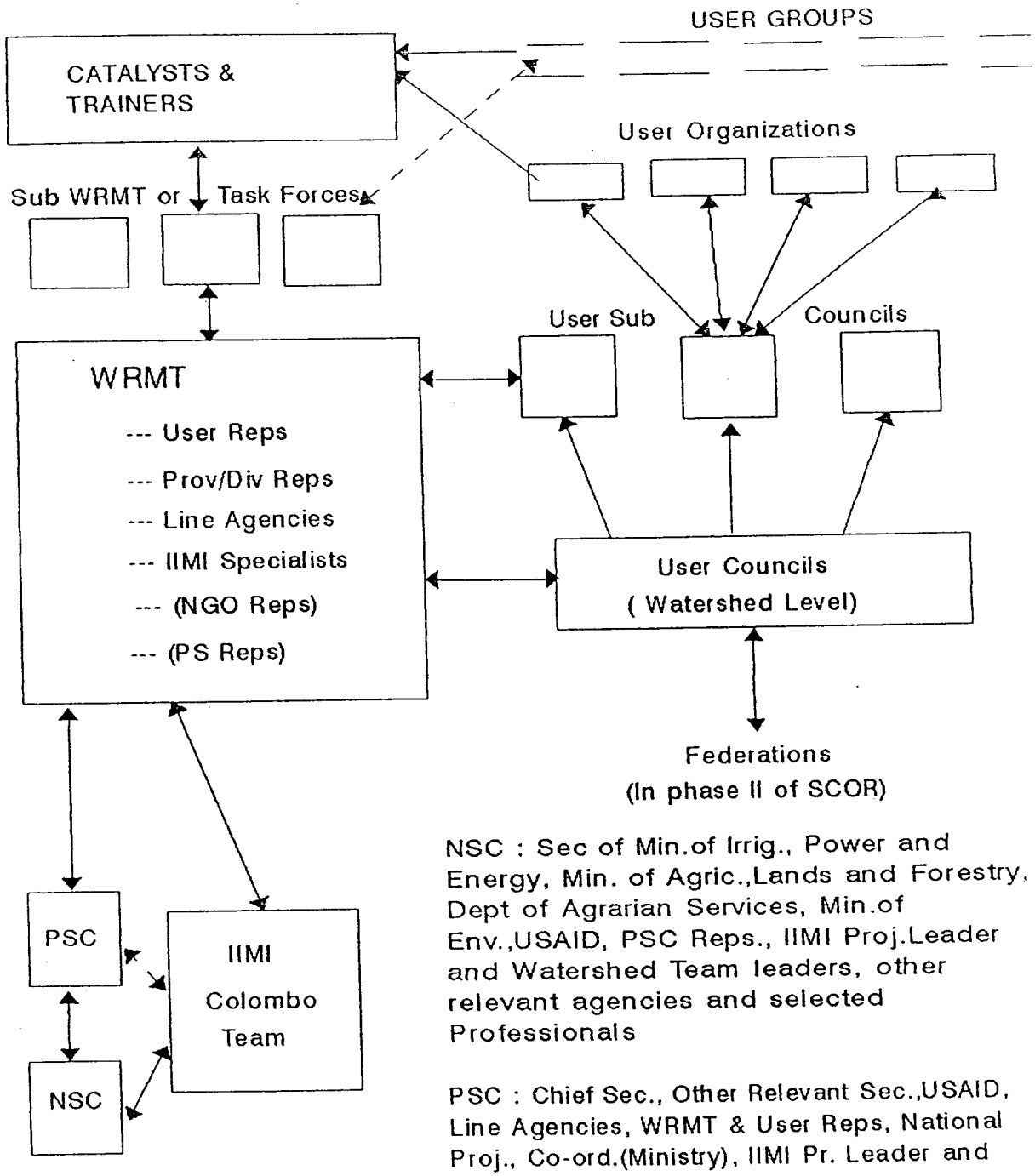
The Organizational Structure of SCOR is illustrated in Figure 6. The project is being implemented primarily by the user groups with the help of Catalysts/Institutional Organizers (IO), a multi-disciplinary team of professionals and line agencies. The base activity unit is the Sub Watershed or Tank Cascade System. In the dry zone SCOR site, for example, a typical sub Watershed includes catchment, reservoir/s, command and drainage areas. Tank-cascade system is also considered as a sub watershed and includes: village settlements, paddy areas, highlands and chena. The project activities at field level will be coordinated by the catalyst. A small task force composed of the catalyst (co-ordinator), farmer representatives and concerned government officials (eg: Agric. Instructor, Grama Niladhari, Technical Assistants, etc.) is responsible for planning and day-to-day implementation and M&E. A highly qualified locally recruited multi-disciplinary team of IIMI professionals stationed within the watershed provides technical assistance, and facilitate implementation.

The IIMI Professional team at watershed level includes:

(1) Institutional Development Specialists with experience in organizing farmers, training and skill development, co-ordination and with strong interpersonal and training skills.

(2) A Resource Management Specialist - preferably a hydrologist with experience in irrigation design, agro-well design and operation, irrigation and drainage (O&M), farmer organizations, rainfed agriculture OR an agriculturist with experience in agricultural extension, farm management, irrigation and land-use.

Figure 6 - SCOR Project Organizational Structure



NSC : Sec of Min.of Irrig., Power and Energy, Min. of Agric.,Lands and Forestry, Dept of Agrarian Services, Min.of Env.,USAID, PSC Reps., IIMI Proj.Leader and Watershed Team leaders, other relevant agencies and selected Professionals

PSC : Chief Sec., Other Relevant Sec.,USAID, Line Agencies, WRMT & User Reps, National Proj., Co-ord.(Ministry), IIMI Pr. Leader and Watershed Team Leader

Legend :

WRMT - Watershed Resources Management Team
PSC - Provincial Streeing Committee
NSC - National Streeing Committee
PROV - Provincial
Div - Divisional
REPS - Representation
PS - Private Sector

(3) An Agronomist/Conservation Farming Specialist with a good knowledge in conservation farming, water saving techniques, crop husbandry, rainfed agriculture. In the wetzone watershed an agro-forestry expert is employed.

(4) An Enterprise/Marketing Specialist with diverse experience in enterprise development, linking farmer groups with appropriate markets/private sector, co-operative business ventures, etc.

One member acts as the co-ordinator and oversees overall project implementation activities on a day-to-day basis.

At the Watershed level, there is a Task Force/Co-ordinating Committee namely the Watershed Resources Management Team, WRMT, chaired by the Divisional Secretary. The Committee is composed of user representatives, concerned line agency representatives, relevant NGOs, and TA team representatives.

At the provincial level, there is a Steering Committee chaired by the Provincial Chief Secretary. The Provincial Land Commissioner or Provincial Secretary for Agriculture acts as the Secretary/Convener and the committee is represented by TA team, farmer organization federation/council, concerned line agencies such as Department of Irrigation, Agrarian Services and Agriculture Department, etc.

There is a National Steering Committee at the National level, chaired by the Secretary of the Ministry of Irrigation, Power & Energy. Other relevant Ministries, such as Ministry of Agriculture, Lands & Forestry, Departments and the IIMI Representatives, Provincial Chief Secretary, Provincial Co-ordinator are included in this committee. Its specific responsibilities will include:

- review project progress. Examine any discrepancies between planned and actual achievements and make recommendations for accelerating progress in the upcoming quarter;
- reviewing and approving the quarterly and annual workplans, recommend changes, if necessary;
- facilitate progress by adding to the efforts of PSC, watershed resources management team and other implementors;
- discuss and resolve specific policy/and or procedural impediments.

The Provincial Steering Committee performs a similar role at the Provincial level.

Authorities related to project implementation decisions are decentralized to a greater extent. And, a senior official of the host ministry (Ministry of Irrigation, Power & Energy) as the National Level Facilitator/Co-ordinator. His responsibilities include:

- Planning and convening meetings of the NSC in consultation with Project Leader;

- Recording and communicating the decisions of the NSC to the parties concerned;

- Make independent visits to project sites as necessary;

- Help resolve policy/procedural impediments, if any, through discussions with the staff of relevant agencies, provincial and divisional authorities and provincial professional team of project;

- Facilitating and ensuring the harmonious functioning of SCOR management by promoting the effective participation of all concerned agencies, and

- Representing the host Ministry in the Provincial Steering Committee.

At the provincial level, Secretary to the PSC, i.e. Provincial Land Commissioner or Secretary - Provincial Ministry of Agriculture assumes similar responsibilities to facilitate the smooth functioning of SCOR.

While the Steering Committees review and facilitate the project implementation, the responsibilities of the Provincial Professional Team (i.e. TA team) include:

- **Catalyzing all aspects of project implementation;**

- Providing professional expertise for project implementation;

- Prepare workplans and budgets, in consultation with user groups & line agencies at sub-watershed and Provincial levels;

- Conduct regular reviews and analyses;

- Arrange for specialized assistance when necessary; including preparation of terms of reference, work supervision and evaluation;

- Providing guidance and technical advice to the NSC, Co-ordinating Committees or task forces at lower level and catalysts;

- Developing close links and working relationships with relevant GOSL or other donor funded projects operating in the area; and

- **Co-ordinate and Monitor all project activities.**

- Sub-contracting project activities, if necessary.

- Aggregating project reporting at sub watershed and provincial levels;

- Attending to other functions that may be decided upon by the NSC or PSC.

5.2 The Process of Integrated Land and Water Management in Sub-Watersheds/Cascade Systems:

Project promotes integrated planning for land and water resources utilization in these basic units, gradually transforming the strategy of development of the resources from a "project" mode to a "programme" mode. In order to facilitate this process of internalization, the project strengthens the capacity of the provincial administration, divisional secretaries, line agencies and user groups at different levels.

In each sub watershed/cascade system, SCOR conducted a Participatory Assessment (PRA) of the present land and water use patterns, capabilities of resources user groups and support services, socio-economic status, status of resource degradation and potential for development. Based on this assessment, developed an integrated plan to improve land and water resources management, again, through a participatory approach. Planning was focussed on efforts to intensify the utilization of resources through known technologies, and also to augment the resources base.

These analyses assessed potential status and uses of resources in the area and identified economic, technical, informational, institutional, and legal factors that prevent resource users from managing and utilizing land and water resources (as well as labor and capital) to best advantage while conserving the physical, biological and social environments. Other than the experiences with institutional organizers in major irrigation systems and with "social mobilizers" in some areas/villages (for specific purposes), information and proven strategies on incentives and means for organizing beneficiaries for integrated land and water resources use and related industrial development (in a holistic manner) is very much limited. Hence, there was a need for SCOR to : organize user groups, provide appropriate technological packages, check and co-ordinate forward and backward linkages to promote and internalize environmentally sound novel productive enterprises. To illustrate the participatory planning of production and protection processes at sub-watershed/cascade level, SCOR project experience is summarized below:

The selected sub watersheds for SCOR implementation are contiguous areas of manageable size within the main watersheds, having characteristic profiles of ecological, socio-economic and environmental features similar to that of the respective main watersheds. Several cascade systems, too, were selected as contiguous areas. Size of selected sub watersheds ranges from 75 ha to 600 ha. Action is being taken to demonstrate an "ideal" land use pattern with due emphasis on production & protection. This "contiguous area" or "model watershed" approach of implementation would illustrate the various production - protection elements along with their intimate relationships, that will have to be incorporated in watershed management in order to produce a sustainable land and water resources base. As stated by a specialist in regional planning who had evaluated the progress of SCOR-"another interesting addition to the regional planning and implementation character of SCOR is its micro concentration on contiguous areas within which "every inch of surface" is carefully planned and monitored for the impacts of intervention" (Gerald Karaska 1994).

In the selected sub-watersheds, participatory appraisal of the characteristics of resource uses and users as well as current resource use mapping were done by a 'group' comprising of : IIMI-SCOR professionals/catalysts, relevant local officials *(such as Grama Niladhari or the village level generalist/govt. officer, Colonization Officers, Agric. Instructor)* and farmer/user representatives. The catalysts took the lead role in preparing the "map" and recording of information. Other group members as well as the users helped the catalysts in the identification of land holdings, consultations with users and provide information. The groups were guided and supported by senior IIMI-SCOR professionals, Divisional Secretaries, Irrigation Engineers and technical officers, Divisional Officers of Agrarian Services, Senior Officials of Forest and Agriculture Departments, etc. General objectives of a typical participatory appraisals were to:

a. prepare a map of the sub watershed indicating individual land holdings, land use patterns, type and quality of vegetation, water use, drainage lines, irrigation methods etc.;

b. develop a data base including some basic data such as : type and membership of user organizations, ownership and tenurial patterns, cropping patterns and intensities, slope category apparent degree of soil erosion, conservation practices, production and productivity, constraints to production and protection;

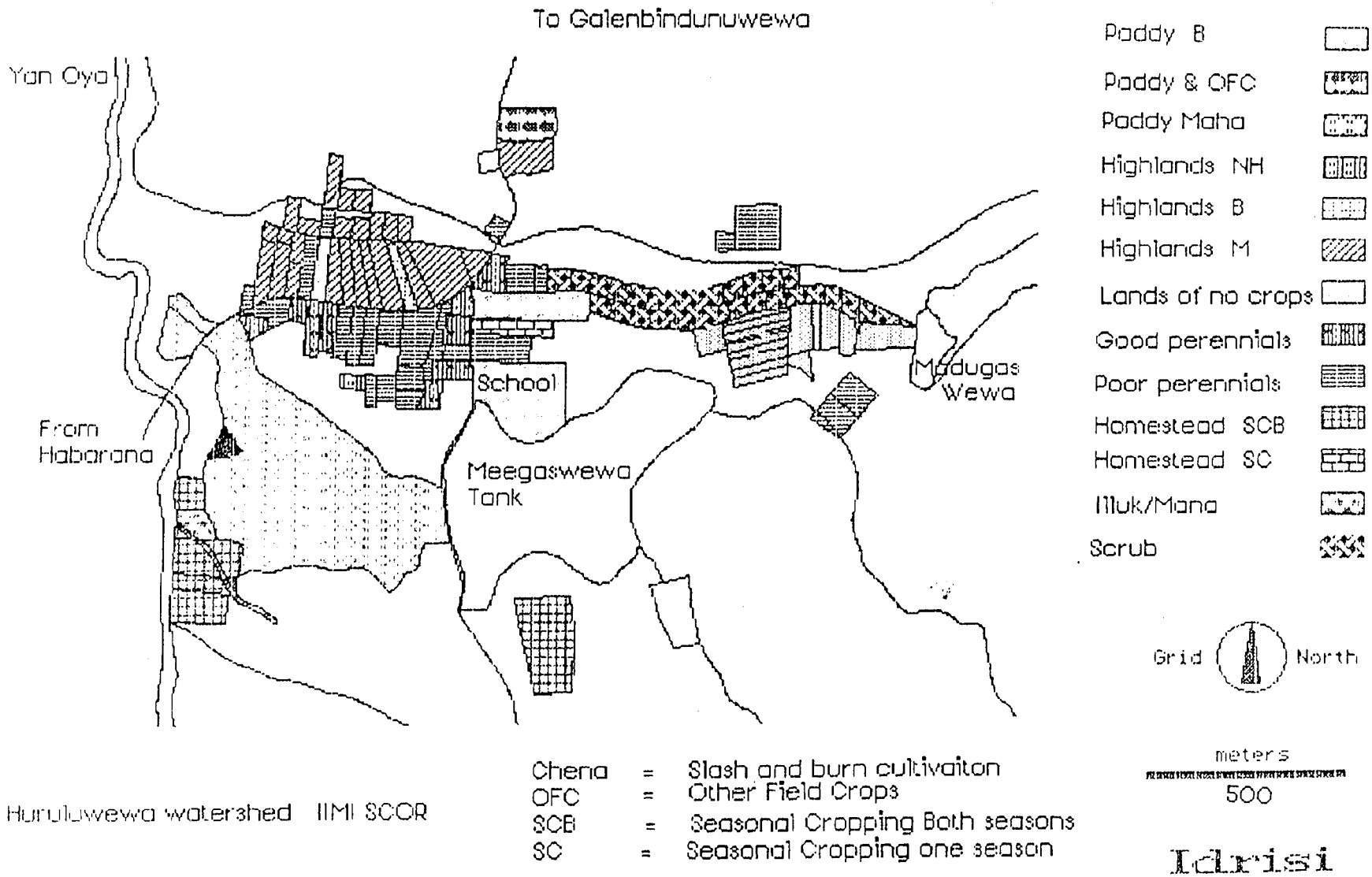
c. help establish a baseline for the resource use pattern using (a) & (b);and

d. sensitize the officials of relevant government agencies/NGOs, and resource users on the importance and need for this exercise and to obtain their active participation in future work.

For this purpose, each group was provided with a line diagram/sketch map of 1:3000 scale with land marks indicating roads and streams for guidance. The group collected data and mapped each land plot of villages. Refining of the map to maintain accuracy to scale was done subsequently by the draughtsman supporting the group and the map was used for participatory planning of resources management of that village.

Land and water use as well as other information collected through the participatory mapping exercise are incorporated into SCOR spatial data base using Geographic Information System (GIS). This was repeated for each village in selected sub water basins/cascade system. For example, Figure 7 shows the current land use (as of January 1994) by individual plot of one such sub-watershed, in this case a tank cascade system. For this particular village, a participatory resources management "mini project" was formulated with an investment of Rs.1.2 million ($24,000). The project aims to change the present land and water use pattern to a more profitable and diversified resource use combining production and conservation using appropriate technologies/techniques, novel shared control arrangements and resource augmentation. Novel approaches and new commercial enterprises in a typical sub-watershed in Huruluwewa Watershed include: cultivation of medicinal plants, fruits and vegetables in Chena (shifting cultivation areas) processing industry for medicinal plants, stabilized cropping patterns for chena and highlands, contour bunding to cover the entire area, water harvesting techniques, etc.

Figure 7 : MAHAMEEGASWEWA LAND USE - JANUARY 1994



Hurulawewa watershed IIMI SCOR

Chena = Slash and burn cultivaiton
OFC = Other Field Crops
SCB = Seasonal Cropping Both seasons
SC = Seasonal Cropping one season

The planned future land use pattern is illustrated in Figure 8. Contour bunds and drains are being established covering the entire extent shown in this map as well as in several other pilot areas. Other activities include: planting Gliricidia sepium as hedgerows and growing seasonal cash crops and perennials between bunds in the uplands, increase soil moisture retention using mulch (both in uplands and paddy fields), homegarden development - especially by farm women, integrated pest management, organic farming etc. Novel modes of state-user partnerships in land and water resources use have been arranged. This mini project is backed up by SCOR with a sub-grant of approximately Rs.400,000/= (US$8000)[1]. The Banks have agreed to provide a loan 4 times larger than the SCOR grant for the user organization using the grant deposit as collateral. A Colombo based company offered a forward contract to the user organization to purchase a major portion of the expected produce under the "mini project".

Current and projected status of a pilot sub watershed in the wetzone watershed are illustrated in Figures 9 & 10. In the wetzone watershed (Nilwala) it has been observed that deforestation and inappropriate hillside cultivation in the upper Nilwala watershed has resulted in reduced water availability in the dry season erosion, sedimentation, distorted runoff patterns and decline in water quality. For instance in one of the pilot sub watersheds, namely Aninkanda, users - especially those who live in the downstream - have begun to realize the ill effects of deforestation and hillside cultivation. Consequently, it was reported that there were few ad-hoc yet organized efforts by villagers to "re-plant" at hillside. The SCOR project helps strengthen such efforts so that the users would direct them in a planned manner. To facilitate such efforts it is important to reach a consensus on anticipated or targeted changes in land use. For respective pilot contiguous areas, this is being done through a participatory planning process.

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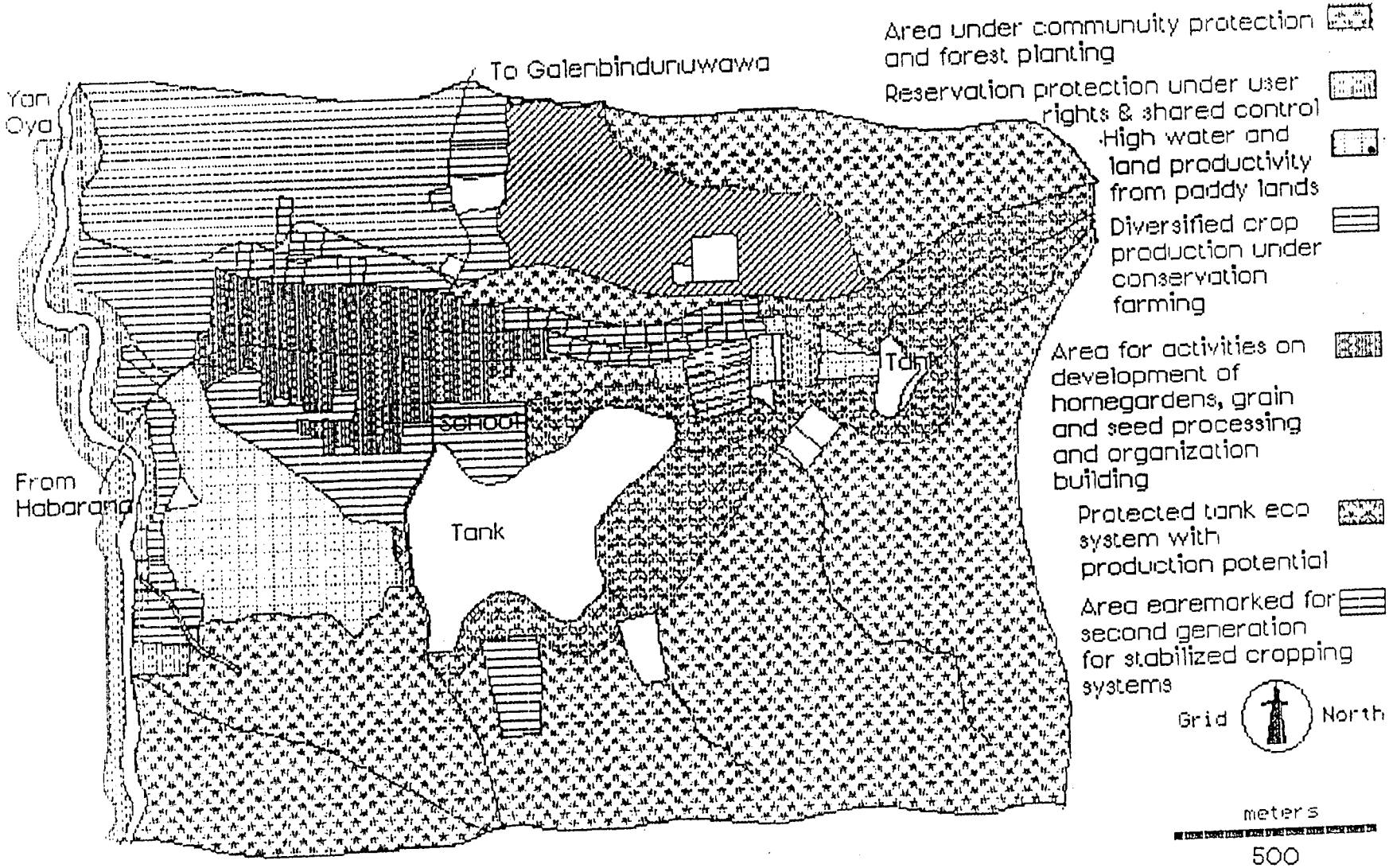
[1] Providing of small grants to the existing and new user groups is considered to be crucial. Such grants among other things, will enable the group to:

- Show collateral when seeking additional loans through private financial institutions;
- Develop and promote insurance schemes for new crops, conservation schemes and investments;
- Construct storage facilities, markets, terraces, nurseries or other small physical infrastructure;
- Purchase equipment needed to initiate or upgrade joint enterprises to gain economies of scale and value added to their production.
- Join with other user groups to establish revolving funds for investments and/or the purchase of agricultural inputs; and
- Obtain legal, financial and other services associated with establishing user rights, small enterprises and productive ventures.

Figure 8 : PLANNED FUTURE LANDUSE FOR MAHAMEEGASWEWA



Hurulluwewa watershed

SOOR Project - IIMI August 1994

Idrisi

Figure 9

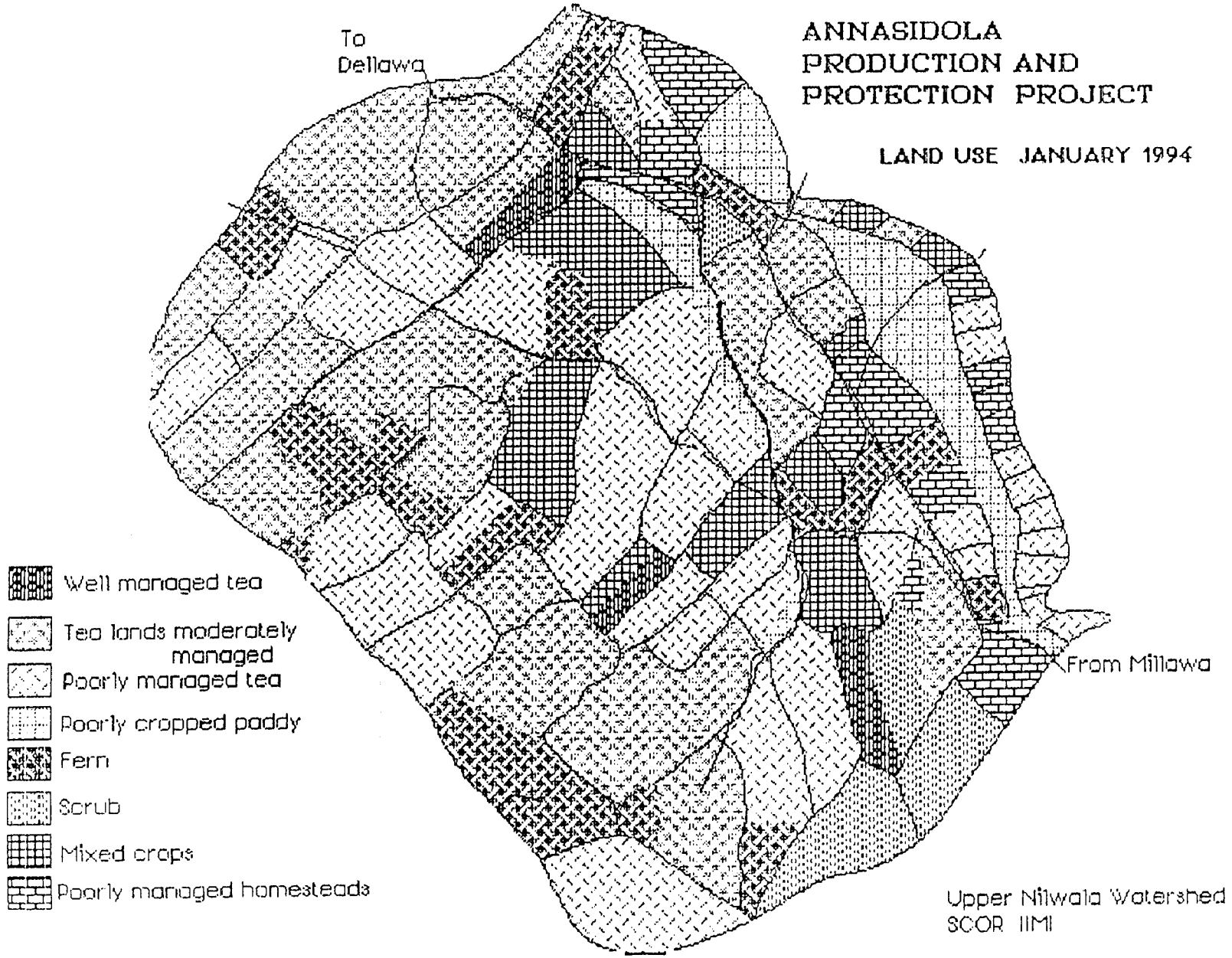
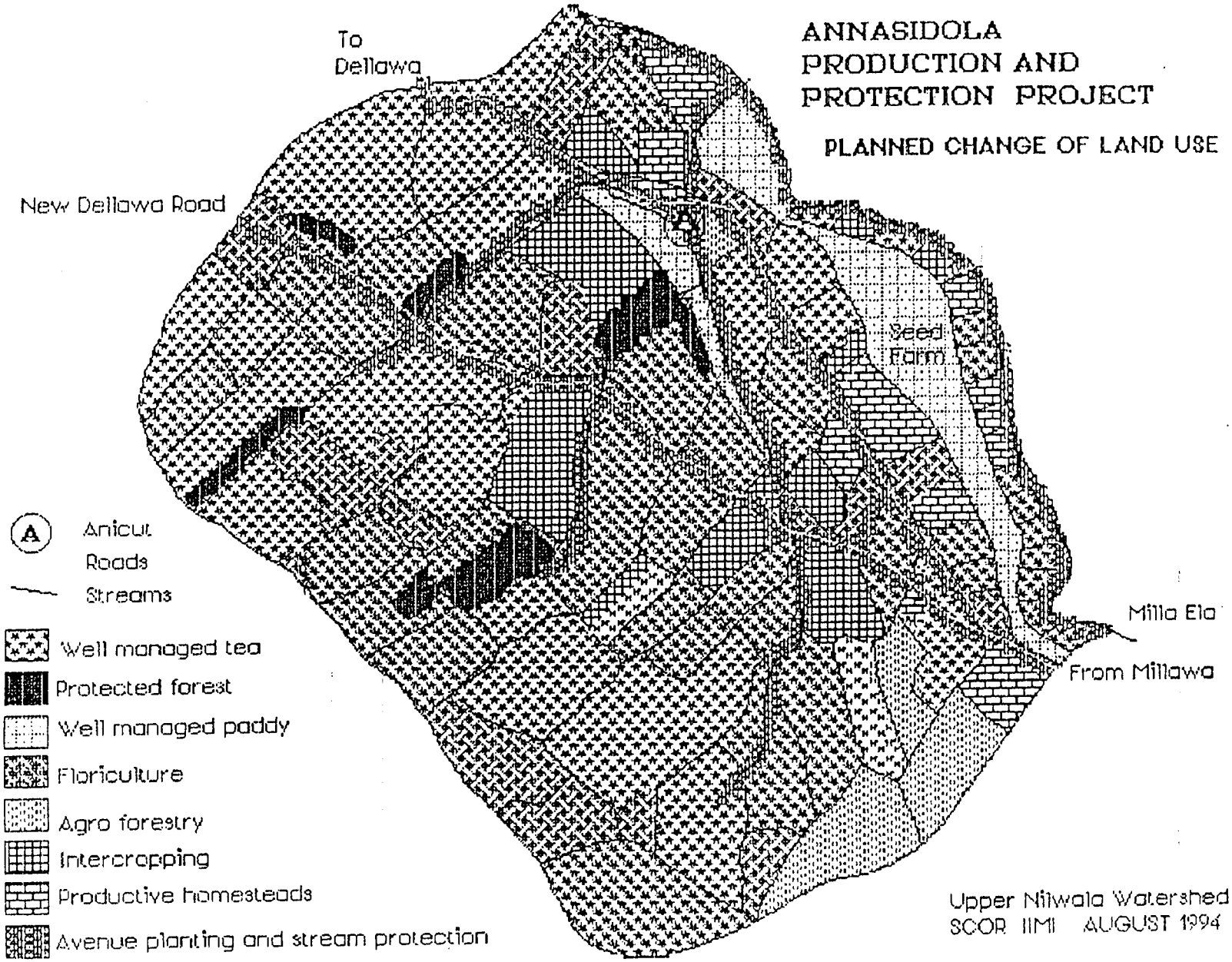

To
Dellawa
ANNASIDOLA
PRODUCTION AND
PROTECTION PROJECT
LAND USE JANUARY 1994
From Millawa
Well managed tea
Tea lands moderately managed
Poorly managed tea
Poorly cropped paddy
Fern
Scrub
Mixed crops
Poorly managed homesteads
Upper Nilwala Watershed
SCOR IIMI

Figure 10


ANNASIDOLA
PRODUCTION AND
PROTECTION PROJECT
PLANNED CHANGE OF LAND USE
To
Dellawa
New Dellawa Road
Seed
Farm
Milla Ela
From Millawa
A Anicut
Roads
Streams
Well managed tea
Protected forest
Well managed paddy
Floriculture
Agro forestry
Intercropping
Productive homesteads
Avenue planting and stream protection
Upper Nilwala Watershed
SCOR IIMI AUGUST 1994

It is proposed that hill tops and high slopes should be under the land cover category of dense forests. Most of such areas come under the control of the Forest Department. The department officials, SCOR project catalysts and other relevant agencies have already joined the user groups to plan re-forestation patterns at hillside, helped raise nurseries and facilitated re-planting.

In areas within the range of 46-60% slopes a production oriented interventions will be launched. Agro-forestry practices with woody perennial and agricultural crops, tapping of available resources through proper user-state partnerships and acceptable usufructuary rights will be adopted for this region. The emphasis will be on conservation farming aimed at balancing production and protection.

It is evident from planned interventions that the protection strategy of SCOR is different from conventional approaches. For example, when physical works such as terraces and protected water ways or tree planting are required, the time necessary to recover the costs usually is too long for the resource user to bear. The customary way to reduce this economic disincentive is to pay some or all of the cost incurred. On the contrary, SCOR efforts are focused on:

a) changes in the incentive structure by combining production and protection activities in one package,
b) changes in the institutional context, and
c) changes in the information base and in the use of technologies

For example, users are motivated to adopt protection measures because this package of measures will also enhance their profits, maintain cash flow at desired levels and provide security for future. Moreover, organizing users into groups and linking users with institutions such as markets (eg. through forward contracting) credit and extension, and providing users/groups with appropriate legal rights (such as usufructuary) will provide an effective mechanism for overcoming such difficulties as scale constraints. The SCOR strategy is built on past experience of group economic activities - notably of the water user groups in major irrigation schemes.

5.3 Organized Group Action for Production and Protection

SCOR group formation and anticipated organizational structure is illustrated in Figure 11. In order to maximize environmental impact, efforts/activities aimed at balancing production and protection must cover the entire area of the selected contiguous block; and should not be limited to sample plots or selected farms/homegardens. As most of the holdings are small (ranging from about 0.2ha to about 1ha.)[8], most productive conservation practices such as: integrated water management, contour bunding and water harvesting/saving techniques, biological measures (such as planting) along contours, integrated pest management, reducing water pollution etc., demand group action. For instance, contour bunds will cut across individual holdings.

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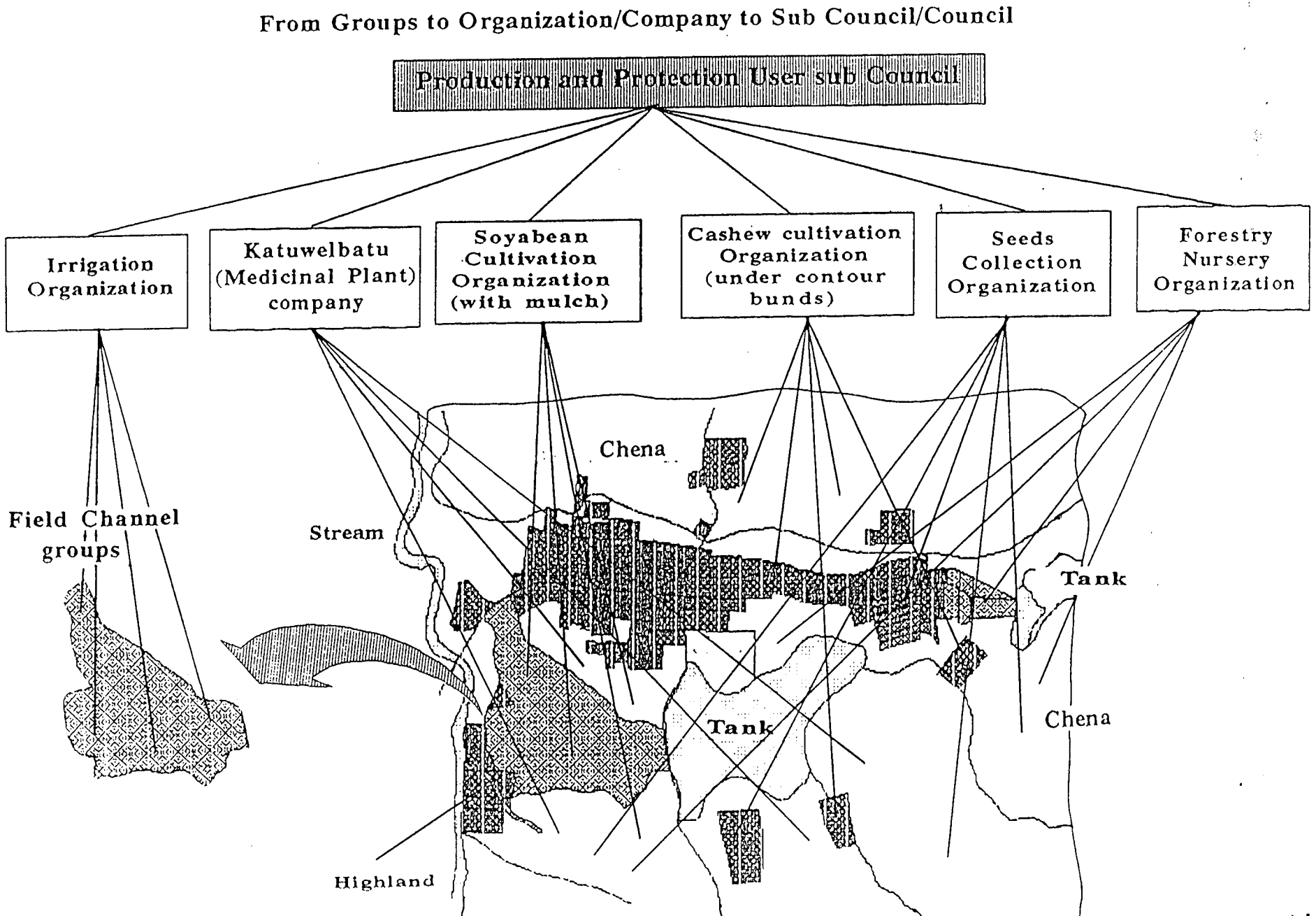
8 Privately owned large holdings as well as company estates can be found in the Upper Nilwala watershed. However, a vast majority of farmers are small holders.

Figure: 11 A SCHEMATIC PRESENTATION TO ILLUSTRATE GROUP, ORGANIZATIONS AND (SUB) COUNCIL FORMATION IN A SUB WATERSHED



Moreover, group action will enhance individual profits through various means: benefits accrued to pooled resources and scale economies, increased bargaining, exchange expertise in a complementary way etc. Users are being grouped and united for various purposes - ranging from groups for multiplication of seeds through groups for mini hydropower plants (coupled with conservation of the corresponding "catchment") to production companies or NGOs.

Group formation in a given contiguous area may be guided by certain principles:

I. Groups (10-20 users)

- Groups may be formed for the realization of various service functions, production purposes, protection purposes or for combined action of production and protection. Most common mode is the latter, that is most groups are aimed at balancing production and protection. Single purpose group formation (either production or protection or even for specific service such as marketing/input supply etc) will not be discouraged because the composition of different activities in the contiguous area will ensure that when they put together the objective of balancing production and protection will be achieved. And, the total area will be covered by the interventions.

II. Organization (5-20 groups)

- Usually, various groups in a particular contiguous area may get together and form an organization[9]. When all the activities in a contiguous area are assembled together, it will take the form of an integrated production and protection plan for that sub-watershed/contiguous area. In most cases, the SCOR professionals/catalysts have consulted existing organizations and/or users as well as the relevant officials etc at the beginning, analyzed the existing situation collaboratively and identified the potential for various interventions. In other words, an indicative plan for the entire area and activities for various groups/locations have been developed.

  As stated earlier, in most cases, the integrated plans (of respective contiguous areas) are being developed into PROJECTS. A typical budget of such a project will comprised of collection of mini budgets for individual activities. There will be three sources of inputs/funding:

  a. Users inputs including labor, materials, money,
  b. Seed money/grant from SCOR project. (in most cases this will be used as a revolving fund, and will not exceed 20% of total budget)

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9 Even though a typical process of formation of organizations may follow this pattern, there may be exceptions as desired by the users. For example, several groups in different contiguous areas/micro watersheds may decide to get together as an registered organization if they share a common goal. This is essentially vertical integration of groups.

c. a bank loan (according to present arrangements this will be 4-5 times more than the SCOR project contribution.)

III. Councils/Sub Councils

It is expected that the users will like to federate up small groups into area councils or sub-councils. (through organizations). For example, all the organizations in the Huruluwewa watershed may decide to federate up to one single body for production and protection purposes. Such a trend can be seen in certain irrigation districts. eg: Polonnaruwa and Anuradhapura.

IV. Legal Arrangements

Even though the smaller groups may remain at "informal status" the organizations, more often than not, would like legal recognition. Farmer Organizations may register under the Agrarian Services Act. In the future, certain organizations may wish to have more independence. They may not like that a government department is vested with the powers of dissolving user organizations. Moreover, certain complex organizations such as small farmer production companies may seek recognition under (modified?) company act. In addition to such legal recognition, the groups, organizations and councils may need to enter into contracts with their partners. These may include: state: user contracts for usufructuary rights, producer-buyer contracts such as forward contracting, user group-bank contracts, service contracts, etc.

6. MONITORING & EVALUATION

IIMI assumes the responsibility for implementing a rigorous M&E activity through a participatory procedure involving user groups, government and other project participants. It reviews the progress and employs as a feedback/correcting mechanism to ensure that project inputs, work schedules, targeted outputs and other related actions are proceeding according to plan. This mechanism also provides data for continuous and periodic evaluations to determine systematically and objectively the relevances, efficiencies, effectiveness (and impact) of project activities.

M&E of SCOR monitor and evaluate project activities or inputs as well as the project's achievement of its specific objectives. These two are related to each other and will eventually lead to project's impacts, in the second phase of SCOR. The effects and impact of certain SCOR inputs could be measured even at this initial phase of SCOR implementation. The criteria employed in assessing the accomplishments of SCOR project are:

- increases in information available to User groups, Government and other groups about the natural resources base, and enhanced knowledge on "balancing production and protection" and integrated approaches of the resources use by all concerned;

- changes in current land and water use practices in the Sri Lankan pilot sites;

- effectiveness of the institutional arrangements for the management of land and water resources introduced by the project in the pilot watersheds.

  - number, strength and user rights of resources user groups, resources user organizations etc.

  - enhanced capacity of government, NGOs, and private sector agencies to better support user groups.

- Economically viable and environmentally sound production processes.

SCOR uses a specific set of indicators to monitor and assess the effects and impact. These include:

a. Land and water conservation for production and protection purposes:

- Sediment concentration and sediment load;
- Land cover
- Soil fertility : Phytometric plants, changes in weed composition, earthworm casts,
- Soil loss
- Bio-mass : leaf liter, weed trash, other organic matter
- Water quality
- Rainfall : Run-off ratio
- Infiltration

b. Land and Water Productivity, Incremental Production and Profits

- water duty, relative water supply, delivery : Performance Ratio, Water Availability Index, WAI
- Factor productivity and profitability
- Cropping intensity
- Cost reduction
- Value-added

c. Shared Control, Institutional & Organizational Changes

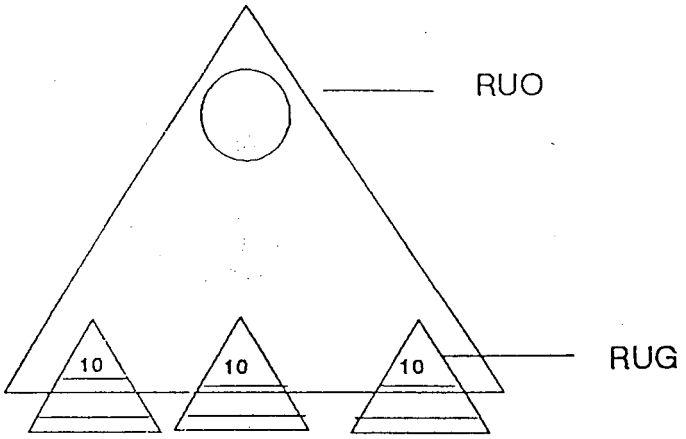
- Effects of land (including common property) covered by group activities.

  - Production
  - Protection

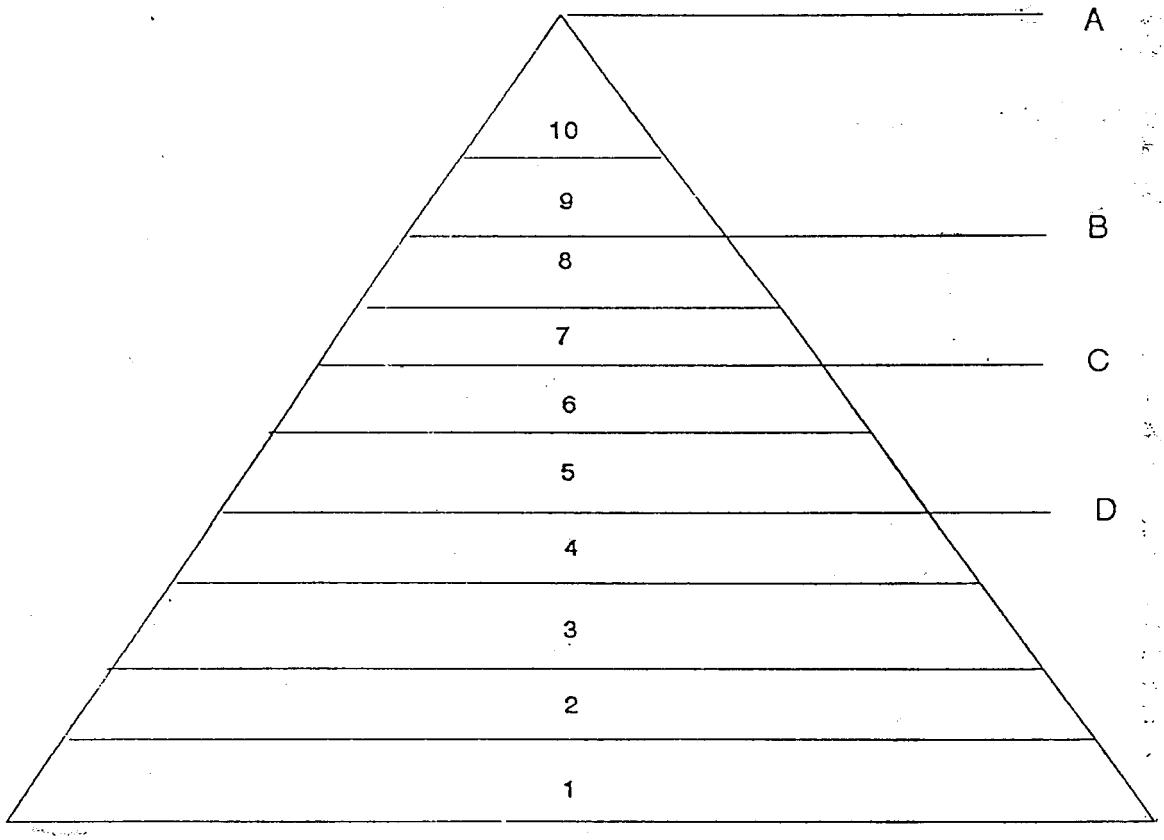
- Number of resource users in groups/councils/federations, classification of organizations by ten levels of "maturity/strength, as indicated in Figure 12.

Figure 1

RESOURCES USER ORGANIZATION (RUO)



RESOURCES USER GROUP (RUG)



The RUG,

1. Forms the group for better resource use
2. Has a recognized form of leadership/core
3. Meets regularly with participation rate greater than 60%
4. Records minutes of meetings and status of group action.
5. Has a group fund
6. Has agreed targets to achieve
7. Invests money, labour and time on activities for production and protection of land and water resources
8. Monitor own activities through self monitoring and assessment
9. Has institutional/legal recognition
10. Has affiliation with other organizations

The "protection" strategy of SCOR is different from traditional approaches. SCOR project believes that a package of measures (type of vegetation, water saving and conservation practices, novel land and water management practices and related user rights) should be selected in consultation with or jointly with the users and both production and protection should be incorporated into the package. This means that the package provides adequate incentives - such as profits, desired cash flow and desired non-monetary benefits - to the user in order to motivate her/him to protect natural resources.

Organizing users in to groups and linking users with institutions such as markets (eg. through forward contracting) credit and information/extension and providing users/groups with appropriate legal rights (such as usufructuary) will provide an effective mechanism for overcoming such difficulties as scale constraints. The SCOR strategy is based on past experience in group economic and natural resources management efforts - notably of the water user groups associated with irrigation.

SCOR assumes that the "sense of ownership" is a necessary condition but not a sufficient condition for motivation to undertake sustainable practices. Therefore, the sense of ownership should be backed by technology, organization and resources. The project activities, classified under four themes, aimed at an appropriate mix of TOR:

i. **Strengthening the capabilities of Resources User Groups:**

Survey of Existing Local Organizations and Constraints Analysis, User Group Creation, Legal Status and Powers for User Groups including formal agreements between user groups and state, Skill Development and Training for User Groups and Trainers, Environmentally sound Economic Opportunities for User Groups, Appropriate technologies and techniques aimed at balancing production and protection: eg: conservation farming, water saving techniques, conjunctive use of water, Supporting Services and Facilities for User Groups and Establish Production Companies (for advanced user groups).

ii. **Improving land and Other Resources Tenure Arrangements:**

Regulatory and Legal Mechanisms, Resources Access and Tenurial Arrangements, Policy and Process Reform (long term), Land Titling and Consolidation.

iii. **Strengthening Government, NGO and Private Sector Capacities to Support User Groups through Participatory Land and Water Management, Training and Skill Development, Information Systems.**

iv. **Improving Coordination and Linkage for Land and Water Resource Management**

Coordination among Projects, Programs and Activities, Coordinate and Improve Provincial and Divisional Planning and Implementation, Coordinate the activities of different Government Agencies and Donors, Administrative and Coordination Mechanisms for Watersheds (in pilot areas), Multi-Level Planning (in pilot areas), User Group Federations in Watersheds (in pilot areas) and

Establishment of Information System.

While the Project focuses the majority of its activities at the local level, with the watershed as the basic unit, other activities take place at the divisional, district, provincial and national levels. The specific activities at the intermediate levels are being determined in the process of dealing with the problems and constraints identified in the selected watershed. These activities strengthen the ability of the government and others to more adequately provide supporting services to the user groups, and to assist in the reorientation of the government agencies to a client-centered mode.

8.1 Spread Effects of SCOR

The SCOR Programme envisaged that its effects will be spread beyond the areas covered by its operations. As SCOR activities gather momentum, these planned spread effect are being realized. In addition, owing to the nature of relationships and activities which the SCOR has established from field, through divisional, provincial and national levels, there is now evidence of certain unplanned spread effects being realized.

As the initial phase of SCOR is only of two years duration, only certain specially selected areas of the two watersheds (contiguous areas) were taken up for immediate SCOR interventions. However, as planned, the effects of the activities have spread to adjoining areas within the watershed and its immediate vicinity. Although SCOR activities does not cover the entire province in which the watershed is located, the message of the effectiveness of the programme is conveyed to other areas through the interaction with the Provincial Steering Committee. The Steering Committee members have established frequent contact with the SCOR's field activity and there is evidence that the same SCOR approach is adopted in other areas within the province. There is also evidence of increased cooperation, coordination and intensity of activity among the governmental agencies involved in SCOR activity resulting in more effective efforts towards utilizing limited resources in an integrated manner.

The government officials show an increasing realization that a high levels of awareness creation among resource users on the need to use and protect their resources in a judicious manner and strengthening/promoting user groups/organizations are vital pre-requisites for the successful implementation of departmental programmes. The lesson of their experience with SCOR is adopted in their approach to other areas under their purview.

Unplanned SCOR spread effects are realized in the readiness with which governmental agencies at national/provincial levels involved in the land and water resources sector, seek to adopt SCOR concepts and approaches in the formulation of new policies including new institutional approaches and projects. SCOR assistance has also been sought by donor agencies in the formulation of related projects. SCOR, for instance, is now contributing to the formulation of the Proposed Area Development Project of the NCP to be funded by the ABD and IFAD. The land and water resources component of this project is expected to be modelled on the SCOR concepts and approaches.

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