SHARED CONTROL OF NATURAL RESOURCES (SCOR)

A PARTICIPATORY HOLISTIC APPROACH TO LAND AND WATER MANAGEMENT IN WATERSHEDS

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SCOR seeks to increase the users' share of control of natural resources in selected watersheds through partnerships between
that contribute to greater production while conserving the natural resources base. SCOR will promote
for the use of land and water resources in two pilot watersheds with spread effects to other areas. The
ollaborative effort of the Government of Sri Lanka, the United States Agency for International Development
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1. INTRODUCTION

In Sri Lanka, 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 production in agriculture and related industries. This is true for many other developing countries as well. In these countries, more and more 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 and appropriate technology, availability of information about market conditions and opportunities and the necessary support services.*

Increasing the users' share of control over natural resources through group action and their active participation in making management decisions is widely recognized to be a vital prerequisite to improving management of these resources. Interventions aimed at improving natural resources management through local control are known to yield high rates of return. 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.

This paper briefly examines the concepts and strategies of a *participatory action-research project aimed at developing and testing a holistic interdisciplinary approach to integrating environmental and conservation concerns with production goals in the watershed context.* This project, Shared Control of Natural Resources (SCOR), is being implemented by the International Irrigation Management Institute (IIMI) in close collaboration with the Government of Sri Lanka, resources user groups and organizations, and nongovernmental organizations (NGOs). SCOR is funded by the United States Agency for International Development (USAID).

SCOR is testing a strategy to increase the sustainable productivity of the *land and water resources* base in Sri Lanka in ways that will equitably improve the livelihood of the people now and in the future with due regard to the environment. The focus on the *watershed* as the basic planning, coordinating and implementation unit is a unique feature of the SCOR Project. Ways in which land and water are used in the upper parts of the watershed affect the ways in which these resources can be used downstream. The form of this interdependency is influenced primarily by hydrological and other climatological factors related to land capability, socioeconomic and management factors and various other secondary factors.

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To develop and maintain a *balance between production and protection (conservation)* as a point of departure, the SCOR efforts focus on a proper mix of "Technology, Organization and Resources (TOR)" with changes in the incentive structure (such as profit-oriented conservation), changes in the institutional context (such as user access and rights to resources) and changes in the use of technologies (such as soil and water conservation technologies). Increasing the user share in managing natural resources in watersheds through state-user partnerships is a prime concern of SCOR.

The "protection" strategy of SCOR is different from traditional approaches. SCOR 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 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 to motivate her/him to protect natural resources.

Organizing users into groups and facilitating a process of linking users with institutions such as markets (e.g., through forward contracting), credit and information or extension and providing users or user groups with appropriate legal rights (such as usufructuary) will provide an effective mechanism for overcoming difficulties in "user- and market-oriented conservation". 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 up by ***technology, organization and resources.*** The project activities are aimed at an appropriate mix of TOR.

The SCOR strategy is based on experience in group economic and natural resources management efforts--notably of the water user groups associated with irrigation. At the outset, a participatory assessment of supply and demand characteristics of land and water resources as well as management practices was conducted in selected watersheds. In this exercise, the strengths and weaknesses of existing user organizations and the potential for group action were identified. Next, the project examined the "gap" between existing and "ideal" land and water management patterns within sample contiguous areas or sub-watersheds. Participatory mapping of land use patterns and associated practices formed an integral component of this initial assessment. The existing land use pattern was then compared with an ideal pattern and, through a participatory planning process, a package of activities and management practices is selected to achieve production and protection goals.

The appropriateness of the SCOR approach is being tested and demonstrated in two pilot watersheds of Sri Lanka, namely, Huruluwewa (HW) in the North Central Province and Nilwala (NW) in the Southern Province. These watersheds were 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 arrangement and state-user partnership.

The paper is organized in four parts. Part 1 is this introductory section. Part 2 outlines the evaluation of SCOR concepts, the SCOR Design Process, the constraints (as identified by the SCOR design team) to sustainable increases in the productivity of land and water resources in the watersheds. Part 3 of the paper describes the Participatory Planning and Implementation in the field. For this detailed account of the SCOR implementation process, the author has selected one of the eleven pilot sub-watersheds of SCOR, Huruluwewa Watershed (HW). Part 4 presents a brief outline of the SCOR Management Information System and the Monitoring and Evaluation Process. Finally, Part 5 of the paper summarizes the SCOR strategies and approaches.

2. SCOR CONCEPTS AND STRATEGIES - PARTICIPATORY PROJECT DESIGN AND CONSTRAINT ANALYSIS

SCOR concepts and strategies were developed 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 USAID. The three-month design process included a review of 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 nongovernmental organizations (NGOs).

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

(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 land and water resources management at appropriate levels.

(d) Institutional constraints, including inadequate coordination between projects/activities of land and water resources development.

2.1 An Inappropriate Production Environment

Farmers' responses to economic incentives and disincentives are clear. For example, in Sri Lanka, when the government policy of importing chili to maintain a low consumer price was modified to allow a greater profit to domestic producers, the farmer changed their cropping practice, from dry season rice cultivation on well-drained red-brown soils to the cultivation of chilli. In these soils, the shift to the more suitable other field crop (OFC), resulted in a much more efficient use of the valuable irrigation water as well as an improved fertilizer efficiency. The improved fertilizer efficiency has undoubtedly resulted in reduced leaching of nitrates to the groundwater, providing an important environmental benefit. *Therefore, profitable production and protection of environment can go together.* In many countries, there are also disincentives, economic or institutional, associated with a number of practices designed for environmental protection.

Another factor essential for sustainable production is sufficient security of tenure for farmers to use specific areas of land over an extended period. This reduces the temptation for exploitative land use, and allows 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. Irrigation Settlements in Sri Lanka 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 that are or which 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 these advantages without changes in land ownership. Land consolidation/tenurial changes in small tank systems may be cited as an example.

Production inputs such as credit, seeds, fertilizer and technical information must be available at reasonable effort and cost. The total cost to farmers, particularly small holders, often includes a high proportion of "transaction costs," monetary and non-monetary payments 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 group economic activity and (2) the availability of support 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 experiences of group economic activities--notably of water user groups in major irrigation schemes--and promotes 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 have 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 smallholder 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 practices with environmental impacts 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 are 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 results of decisions made in the normal course of farming. Unless the actors are informed by the knowledge of potential impact, and unless profitable alternatives exist for these cultivation practices and the management of these 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 an example.

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 alternate use, incentive structures (for example, usufructuary rights for users for environmentally sound production in "Government-owned" stream/irrigation canal reservations), and reduction in pressures to use environmentally fragile lands through participatory protection of natural resources are usually much more effective in internalizing environmental considerations into agricultural decision making.*

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

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 help in the identification of potential opportunities, the information must encompass a wider range. Information on technology, infrastructure, water sources, population centers, marketing, etc., becomes 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 allow 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) Institutional environment inadequate 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.

(d) Lack of coordination among agencies, donors, projects, levels of government and resource users with respect to the use of natural resources.

(e) 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 Coordination between Projects/Activities

Many past efforts, with their emphasis on immediate gains and centralized, but poorly coordinated, have inadequately addressed the need to manage and use the natural resources 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, and for synergistic benefits exists. Effective communication and cooperation as well as coordination 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.

2.5 Watershed as the Basic Planning, Coordinating and Implementation Unit

The focus on watersheds as the basic planning, coordinating and implementation unit 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 subdivided 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. For example, 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 in cascades. (Figure 1). In addition, ground water extraction from the weathered rock up to a depth of about 10 m in the dry and intermediate zones of Sri Lanka 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 drawdown of water in the well while pumping from adjoining wells is in progress. This situation has limited the "on-demand" nature of some wells. Moreover, in certain locations, farmers, after excavating to depths exceeding 6-7 m and spending about Rs 40,000 -50,000 (US$800-1,000) per well, have found out that the water yields are not satisfactory. Some of them continued their efforts by driving tubewells from that point up to the underlying deep rock (Fernando 1994). In addition, the negative consequences of the proliferation of agro-wells include the lowering of the water table and associated problems such as moisture deficits in rainfed farming areas, threats to domestic wells, and income disparities. 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. Moreover, recent monitoring of rainfall at several points within the watershed shows a significant "microscale variation". *The 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 the agricultural production system (both spatially and temporally), and to distribute rationally among various users and 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 is clear from the above discussion that different combinations of various sources of water can be used. An in-depth analysis of supply (e.g., water balance) and demand options (e.g., 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.

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 socioeconomic and institutional factors too influence the linkages between "upstream and downstream." For example, the interrelationships between ***chena*** (shifting, slash and burn cultivation) in the catchment areas of reservoirs in the watershed (mainly in the upstream of watersheds) and rice farming in the irrigated commands and drainage areas (downstream) are influenced by socioeconomic factors. Similarly, there exist significant socioeconomic relations among tank systems within a "minor tank cascade." 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.

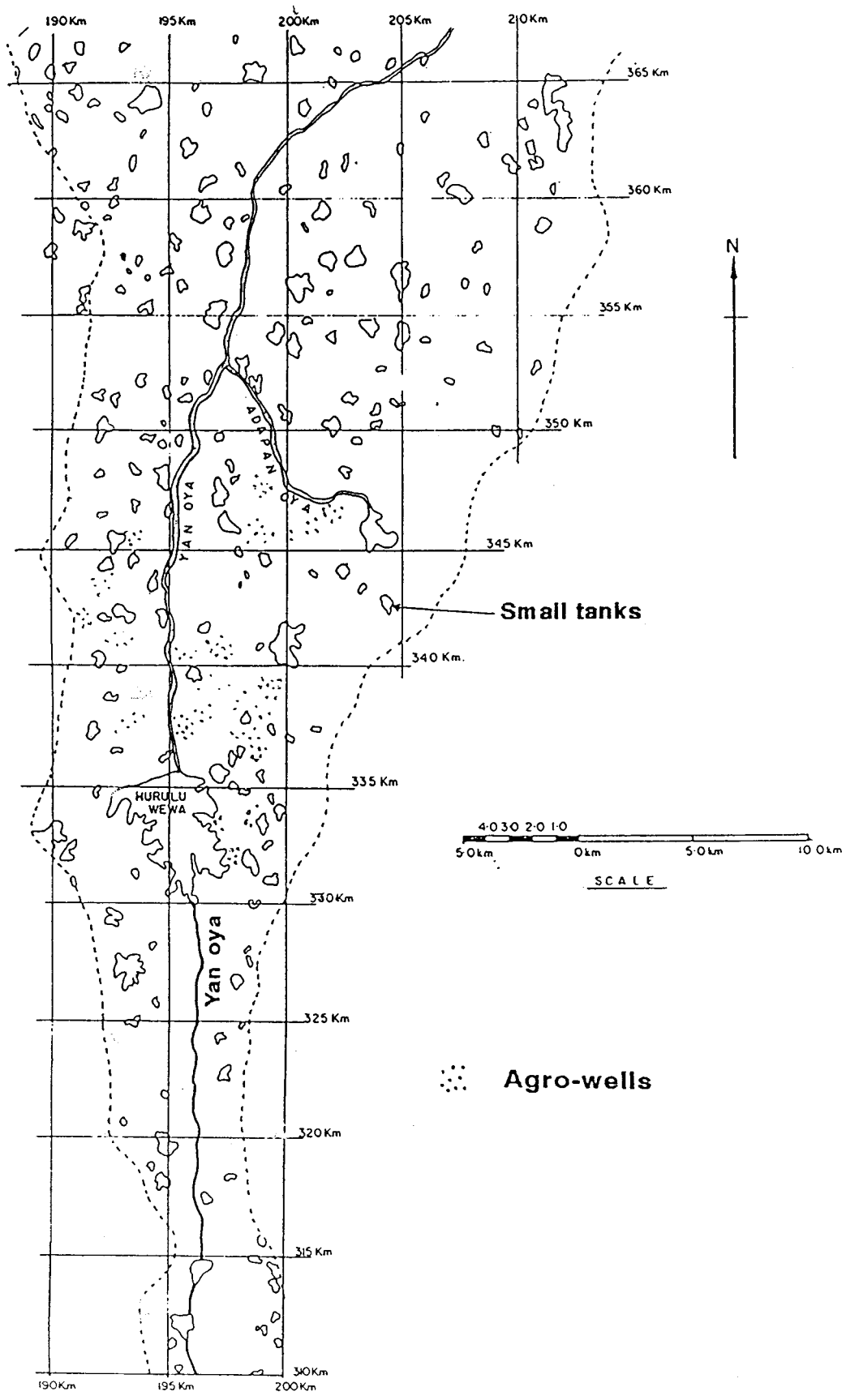


Figure 1

DISTRIBUTION OF WATER RESERVOIRS AND AGRO-WELLS IN HURULUWEWA WATERSHED

As people are the final decision makers regarding the use of land and water resources, they not only influence these linkages and relationships but also can change the production potential of land and water resources either favorably or adversely.

Thus, any development/conservation approach should consider those physical, socioeconomic, and initial linkages that exist between upstream and downstream of a river basin/watershed, and 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.

The integrated participatory approach is useful to overcome these problems and to make 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 benefits.*

It is evident from this discussion that analysis of land and water resources, and 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 resource, i.e., water.*

2.6 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 equitably improve the livelihood of the people now and in the future with due regard to the *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 through appropriate *modes of production and state-user partnerships* to ensure both the productivity and the sustainability of these resources.

(b) To get resources user groups and managers to consider environmental implications of land and water use more explicitly and to *internalize environmental considerations* in decision making and implementation at all levels.

(c) To enhance *information and the understanding* (of the government, groups and individuals) about potentials of and prospects for the natural resources (land and water) base for production and protection.

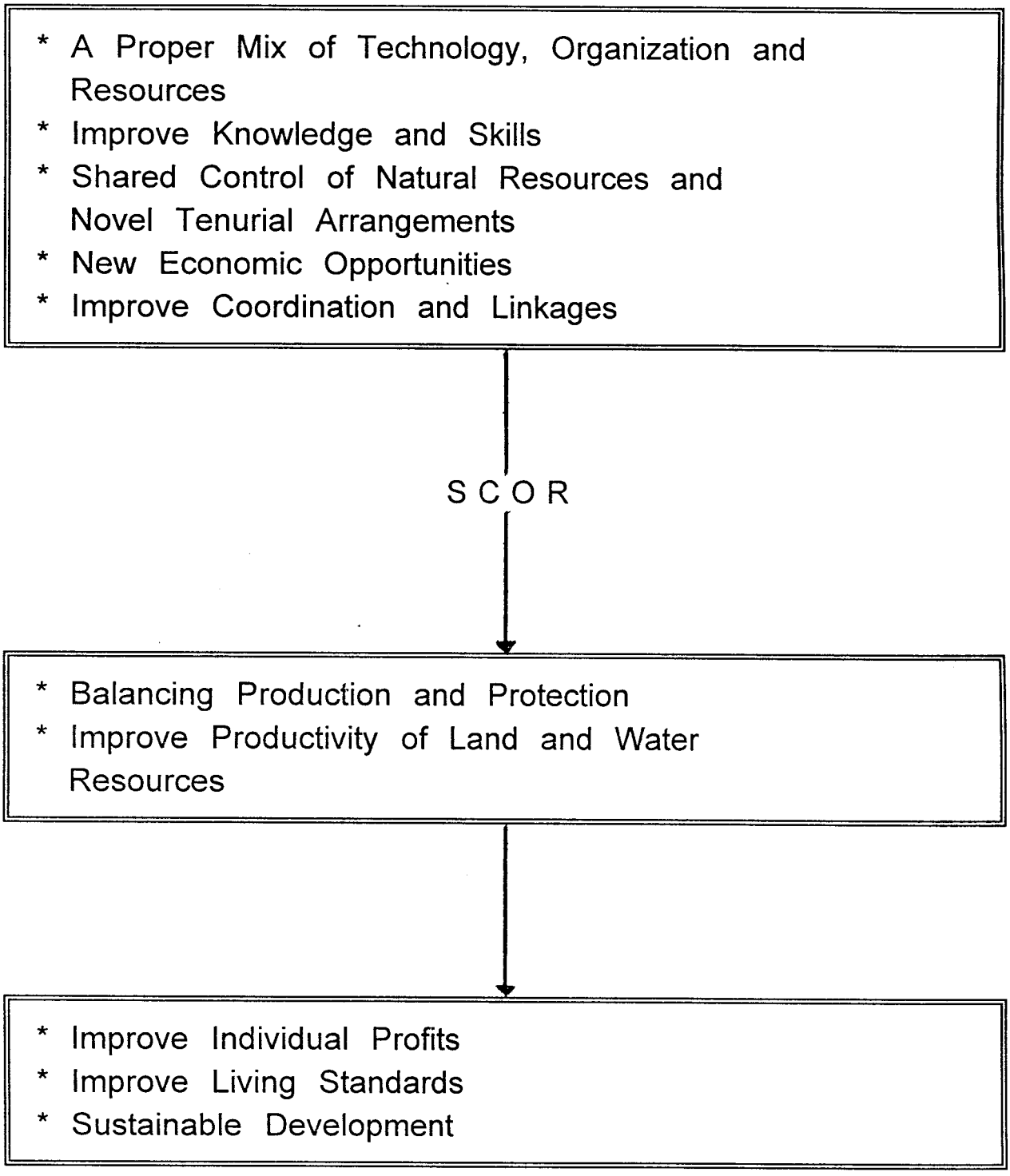
(d) To *strengthen the capacity* of the Provincial/Divisional level government authorities in planning for land and water resources utilization in an integrated manner, gradually transforming the *strategy of development of land and water resources from a "project" mode to a "program mode."*

A logical framework, relating SCOR inputs to expected outputs and impacts, is presented in Figure 2.

As explained earlier, the SCOR strategy is designed to be user-oriented and participatory. This means that much of the emphasis and activity of the Project are at the field level in the selected watershed. The approach is to increase the *share of control of the natural resources of the watershed by the users and to support them as they attempt to intensify, expand or move into new economic activities. To achieve economies of scale, and to use group solidarity to promote responsible behavior, the Project is based upon group action as a primary vehicle for project implementation.*

SCOR makes a different interpretation of the property rights defining it in the context of individual and communal ownership of resources based on culture, local values and local market conditions. For example, instead of exclusive individual property rights (in this case, a complete transfer of ownership of state land to individuals), the concepts of *shared control*, usufructuary rights, longer-term lease arrangements, and *state-user partnerships* are being tested in pilot watersheds. It is hypothesized that such alternatives to exclusive individual property rights may provide the Sri Lankan natural resources user a *sense of ownership.*

Figure 2 - Logical framework of SCOR



As constraints to shared control and "production - protection" activities are identified, the Project helps in the removal of the constraints. When the constraints are the result of policies, rules, regulations, or actions of a higher level, the Project has operated 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 province and at the national level, has facilitated the process of inducing change. Hence, SCOR project inputs and expected outputs and impacts cover multiple levels--ranging from micro/farm level to macro or policy levels.

2.7 Organizational Structure

The Organizational Structure of SCOR is illustrated in Figure 3. The project is being implemented primarily by user groups with the help of catalysts/institutional organizers (IOs), a multidisciplinary 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, reservoirs, command and drainage areas. A tank cascade system is also considered as a sub-watershed and includes village settlements, paddy areas, highlands and chena (shifting cultivation). The project activities at field level are coordinated by the catalyst. A small task force composed of the catalyst (coordinator), farmer representatives and concerned government officials (e.g., Agriculture Instructor, *Grama Niladhari* or village-level government officer, Technical Assistants, etc.) is responsible for planning and day-to-day implementation, monitoring and evaluation (M&E). A highly qualified locally recruited multidisciplinary team of IIMI professionals stationed within the watershed provides technical assistance, and facilitates implementation.

The IIMI Professional team at watershed level includes: Institutional Development Specialists, a Resource Management Specialist (preferably a water resources engineer), an Agronomist/Conservation Farming Specialist and an Enterprise/Marketing Specialist.

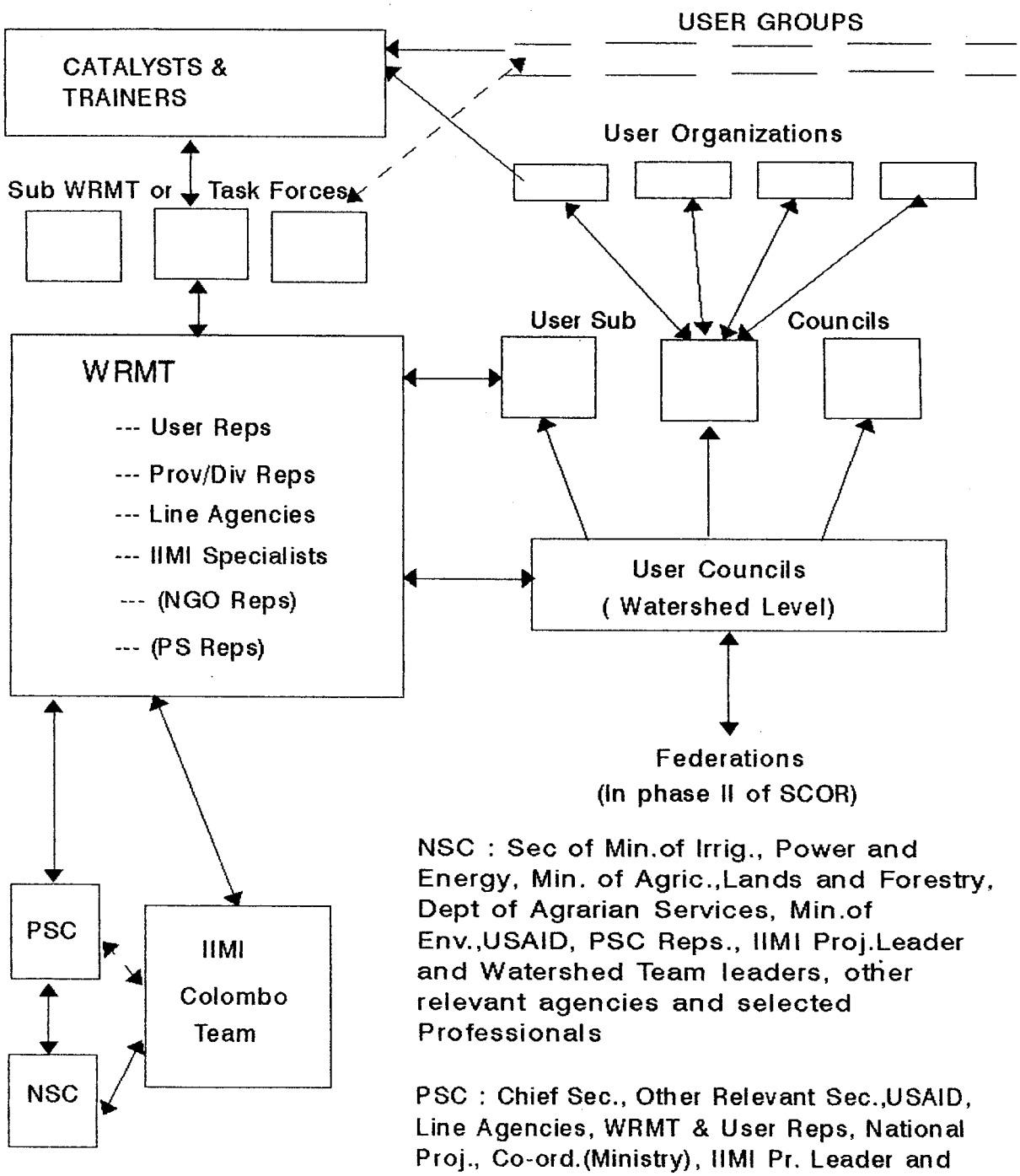
One member acts as the coordinator and oversees overall project implementation activities on a day-to-day basis.

At the watershed level, there is a Task Force/Coordinating 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 IIMI 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 the 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 (NSC) at the national level, chaired by the Secretary of the Ministry of Irrigation, Power and Energy. Other relevant ministries, such as the Ministry of Agriculture, Lands and Forestry, Departments and the IIMI Representatives, Provincial Chief Secretary, Provincial Coordinators are included in this committee.

Figure 3 - SCOR Project Participatory 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. THE PARTICIPATORY PROCESS OF INTEGRATED LAND AND WATER MANAGEMENT IN SUB-WATERSHEDS

The SCOR Project promotes participatory and 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 "program" mode. 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, SCOR conducted a Participatory Assessment of the present land and water use patterns, capabilities of resources user groups and support services, socioeconomic status, status of resource degradation and potential for development. Based on this assessment, SCOR 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 the 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 of organizing beneficiaries for integrated land and water resources use and related industrial development (in a holistic manner) are very much limited. Therefore, there was a need for SCOR to organize user groups, provide appropriate technological packages, and check and coordinate 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 level, the SCOR Project experience is summarized below.

The selected sub-watersheds for SCOR implementation are contiguous areas of manageable size within the main watersheds, each having characteristic profiles of ecological, socioeconomic and environmental features similar to that of the respective main watershed. The size of the selected sub-watersheds ranges from 75 hectares (ha) to 600 ha. Action is being taken to demonstrate an "ideal" land use pattern with due emphasis on production and 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 to produce a sustainable land and water resources base.

In the selected sub-watersheds, participatory appraisal of the characteristics of resource uses and users as well as *current* resources 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 government officer, Colonization Officers, Agriculture Instructor) and farmer/user representatives. The catalysts took the lead role in preparing the "map" and recording information. Other group members and the users helped the catalysts in the identification of land holdings, consultations with users and providing 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. The general objectives of a typical participatory appraisal 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.

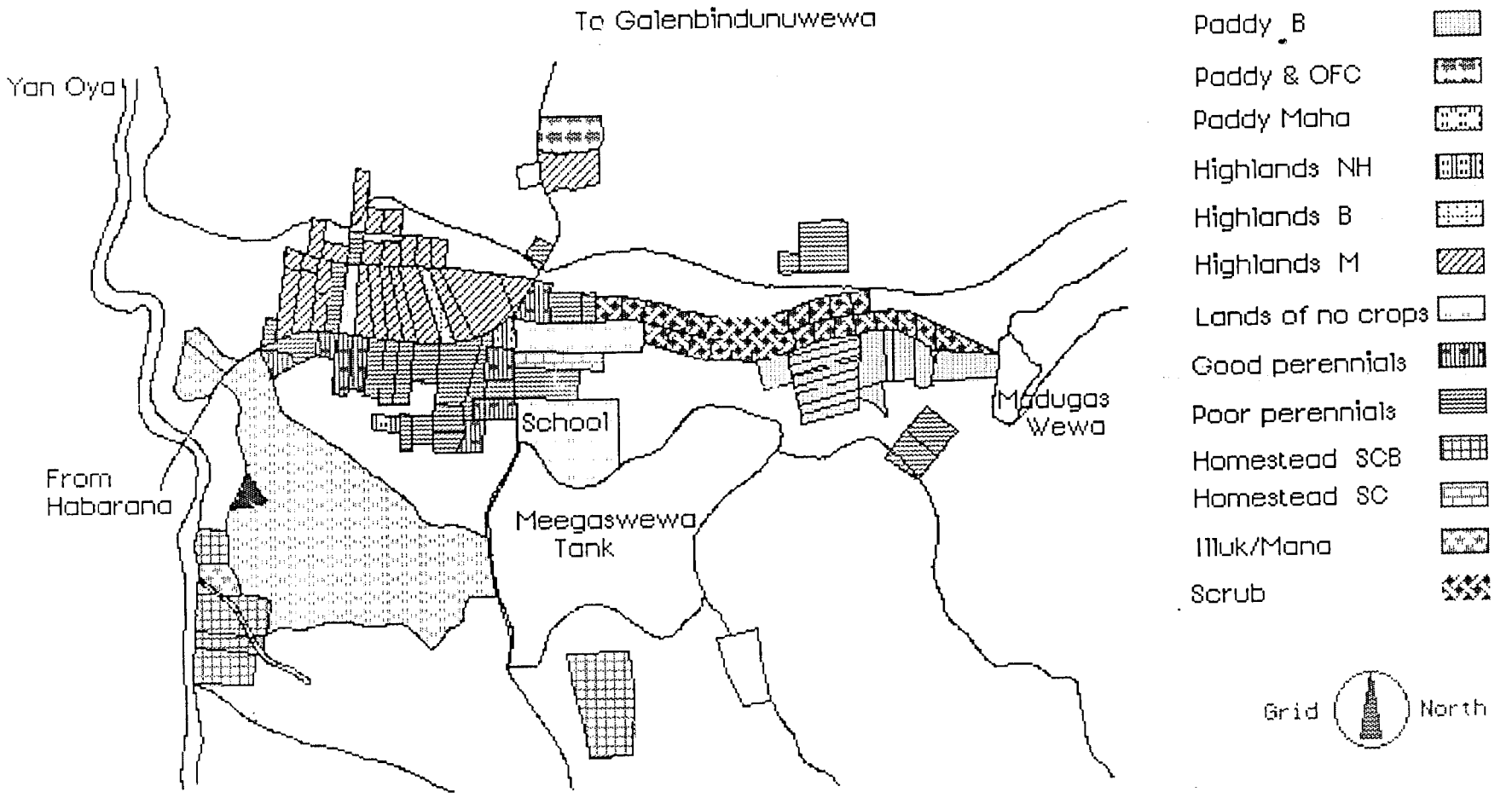
(b) Develop a database, including basic data such as: type and membership of user organizations, ownership and tenurial patterns, cropping patterns and intensities, slope category, apparent degree of soil erosion, conservation practices, production and productivity, and constraints to production and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

(c) Help establish a baseline for the resource use pattern using (a) and (b).

(d) Sensitize the officials of relevant government agencies/NGOs, and resource users on the importance and need for this exercise and 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 groups collected data and mapped each land plot of a village. Refining of the map to maintain accuracy to scale was done subsequently by the draftsman 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 have been incorporated into the SCOR spatial database using a Geographic Information System (GIS). This was repeated for each village in selected sub-watershed system. For example, Figure 4 shows the pre-project land use (as of January 1994) by individual plot of one such sub-watershed, in this case a tank cascade system namely Maha Meegaswewa, MM. For this village, a participatory resources management "mini project" was formulated with an investment of Rs 1.2 million (US$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.* New commercial enterprises and conservation practices in a typical sub-watershed in the 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 bunds to cover the entire area,* water harvesting techniques, etc.

Figure 4 **MAHAMEEGASWEWA LAND USE - JANUARY 1994**



Huruluwewa watershed IIMI SCOR

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

This means that the villagers in such pilot sub-watersheds have "action plans" that guide them along a path to the planned future from the current status of resources use. The planned future land use pattern is illustrated in Figure 5 while the current status (as of February 1995) is illustrated in Figure 6. Contour bunds and drains are being established to cover the entire extent shown in this map as well as in several other pilot areas. Other activities include the planting of Gliricidia Sepium as hedge, growing seasonal cash crops and perennials between bunds in the uplands, increasing soil moisture retention using mulch (both in uplands and rice fields), home garden 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).[3] The banks have agreed to provide a loan four 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 most of the expected produce under the "mini-project."

Several mini projects of this nature are being implemented in the two pilot watersheds. In the wet zone watershed (Nilwala), it has been observed that deforestation and inappropriate hillside cultivation in the upper Nilwala has resulted in reduced water availability in the dry season, erosion, sedimentation, distorted runoff patterns and decline in water quality. It is proposed that hilltops and high slopes should be under the land cover category of dense forests. Most 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 reforestation patterns at hillside, help raise nurseries and facilitate replanting.

In areas within the range of 46-60 percent slope, a production oriented intervention will be launched. Agro-forestry practices with woody perennial and agricultural crops, and 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.

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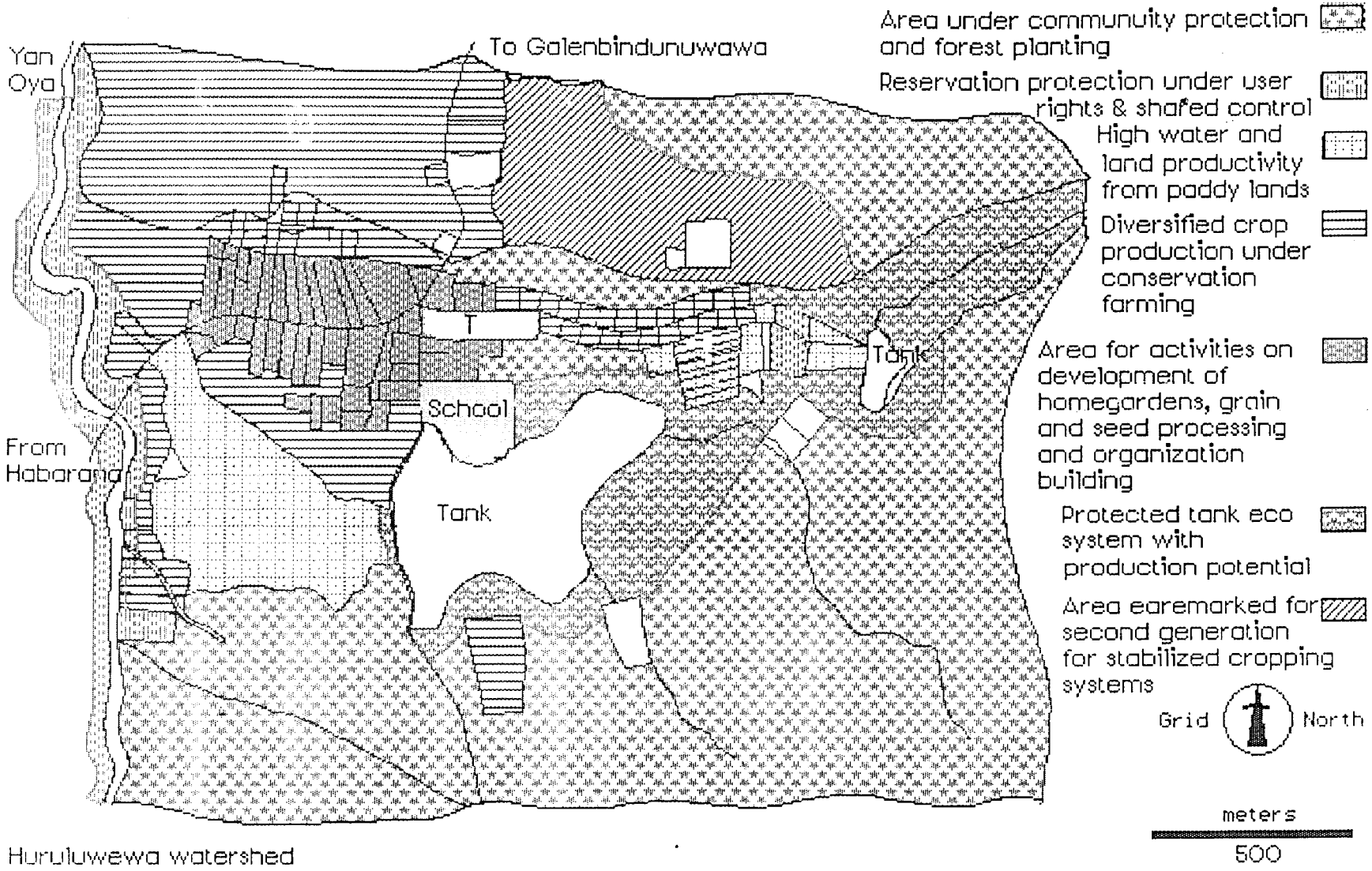
[3]Providing small grants to the existing and new user groups is considered to be crucial. Such grants, among other things, will enable the group to:

* 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.
* Obtain legal, financial and other services associated with establishing user rights, small enterprises and productive ventures.

Most of such "grants" will be transferred to new organizations after the completion of mini-projects. Hence, grants are used as revolving funds.

Figure 5 **PLANNED FUTURE LANDUSE FOR MAHAMEEGASWEWA**



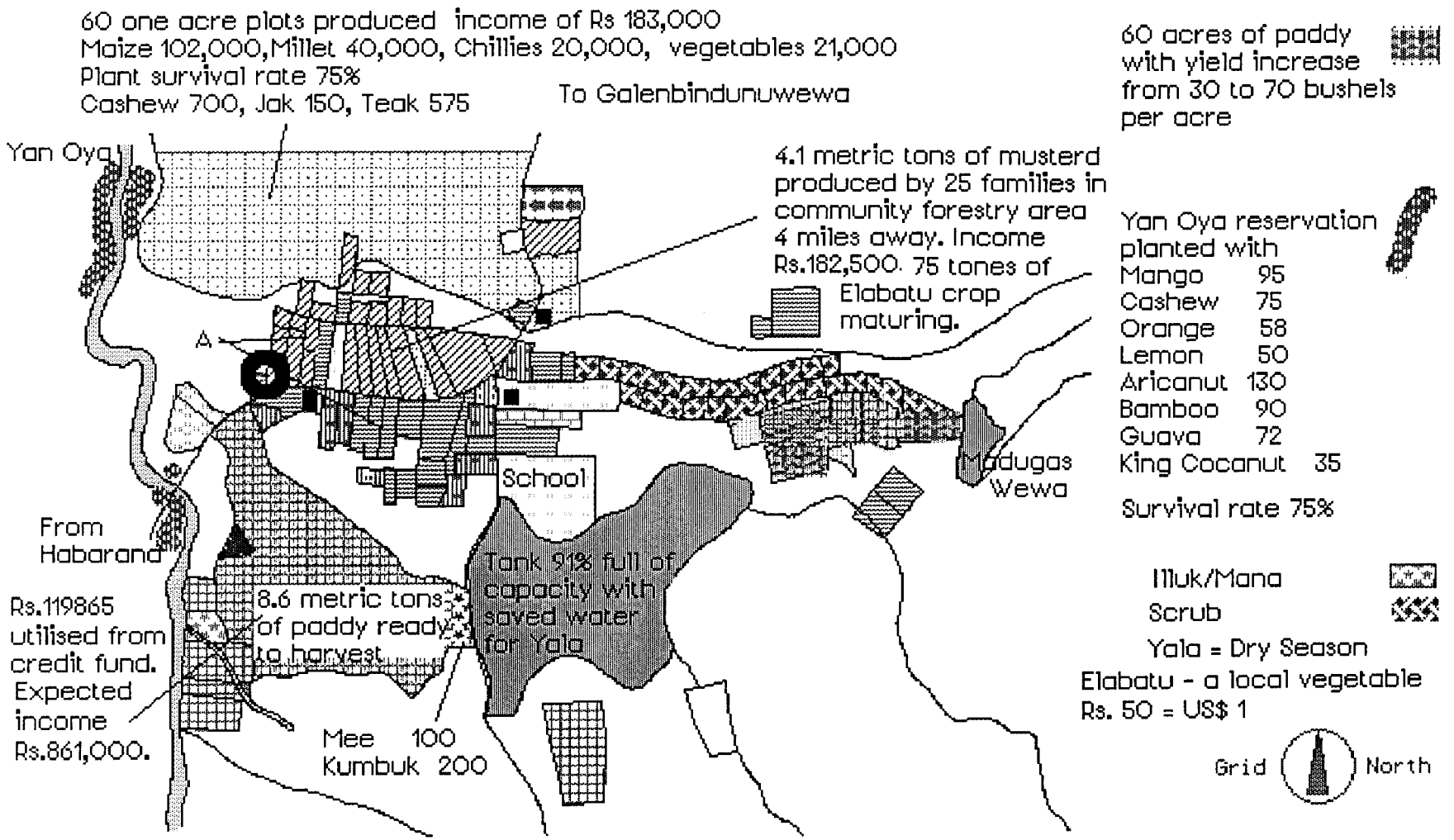
Huruluwewa watershed

SOOR Project - IIMI August 1994

Idrisi

Figure 6

MAHAMEEGASWEWA LAND USE - FEBRUARY 1995



The main features of the sub-watershed production-protection plan or the "mini-project" that illustrate the elements of the proposed strategy are:

(a) The action plan covers the entire geographic area of the sub-watershed (typically ranging from 200-500 ha).

(b) It recognizes the function of each major segment of land use in the landscape, in the watershed context.

(c) It recognizes the need for resource use change in each of these land segments for improving the livelihoods of all the people. Example: It involves all the families in the village in sharing the effort to change the present land use to a high-income and resource-conserving land use.

(d) It has identified major zones for production, facilitating production planning and scheduling so that production activity can be organized enabling the organization to predict production, enter forward agreements, mobilize resources and exercise joint control over production, processing and marketing process with the membership.

(e) It has a path for new technology to flow into the community to improve and balance protection and production. Example: For the first time the MM (Maha Meegaswewa) villagers were exposed to new knowledge from the SCOR teams on conservation farming. They shifted *chena* (shifting cultivation) farming from the catchment of their tank to a highland area and established organic bunds followed by earth bunds on contours with protective and productive plants and crops for a stabilized farming system that ensures a family food supply with maize, pulses and vegetables. In addition, valuable timber trees planted on boundaries provide security for the future. They tried mulch farming using straw in the rice fields raising a crop in *yala* season for the first time in their village.

(f) It facilitates balanced disposal of economic activity in the village providing work opportunities to everyone. Example: The families have the opportunity to choose the economic activity based on the comparative advantages they have, stemming from the economic assets, including labor, skills that each family possesses, and family confidence in a particular activity such as rice farming, vegetable farming, livestock farming, trading, etc., or confidence (risk taking) in new ventures.

(g) It facilitates organization and leadership, provides mechanisms of self-assessment and conflict resolution, increases the ability to analyze and predict, strengthens the bargaining capacity, and encourages risk taking in viable economic ventures.

A leadership emerged from the community with volunteer catalysts representing each production zone in the village, which is the correct basis for selecting mobilizers without considerations of party politics. These *Samurdhi Niyamakayo* (Mobilizers of Prosperity) in the Maha Meegaswewa Settlement can catalyze development, harmony and contentment. They have access to information from outside and knowledge gained from their own experiments in their own farms with the support

of the government officers and others who extend such support to them. They can mobilize resources to carry out their plans and finally become shareholders of their own company with control over the production process, which is the only way for small farmers to gain and share prosperity equally among themselves.

(h) It produces credit worthiness for the resources users so that they can mobilize capital for their economic ventures from sources of credit. The accessibility they have to sources of expert knowledge and information, extension, local administration, sources of funds, and markets through forward contracts and shares of business ventures increase the credit rating of each individual resources user family. Each of these factors can be considered in assessing the credit worthiness of the farm family, the recognition of which would further help resources users to increase their rating in each factor.

(i) It guides the identification of complementary economic and social infrastructure (health, education, transport, energy), the provision of which has legitimacy based on the increased productive capacity generated by the community with the production and conservation effects.

The above illustration shows how the SCOR concepts are being translated into practice with local communities, the government functionaries at subdivisional, divisional, provincial and national level, NGOs and the private sector. There are many such locations where this model is being used, in the two pilot watersheds in the dry zone and the wet zone of the country.

3.1 Organized Group Action for Production and Protection

SCOR group formation and the anticipated organizational structure are illustrated in Figure 7. To maximize the 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/home gardens.* As most of the holdings are small (ranging from about 0.2 ha to about 1 ha),[4] most productive conservation practices such as integrated water management, building contour bunds and water harvesting/saving techniques, biological measures (e.g., planting along contour)s, integrated pest management, reducing water pollution, etc., demand group action. For instance, contour bunds will cut across individual holdings.

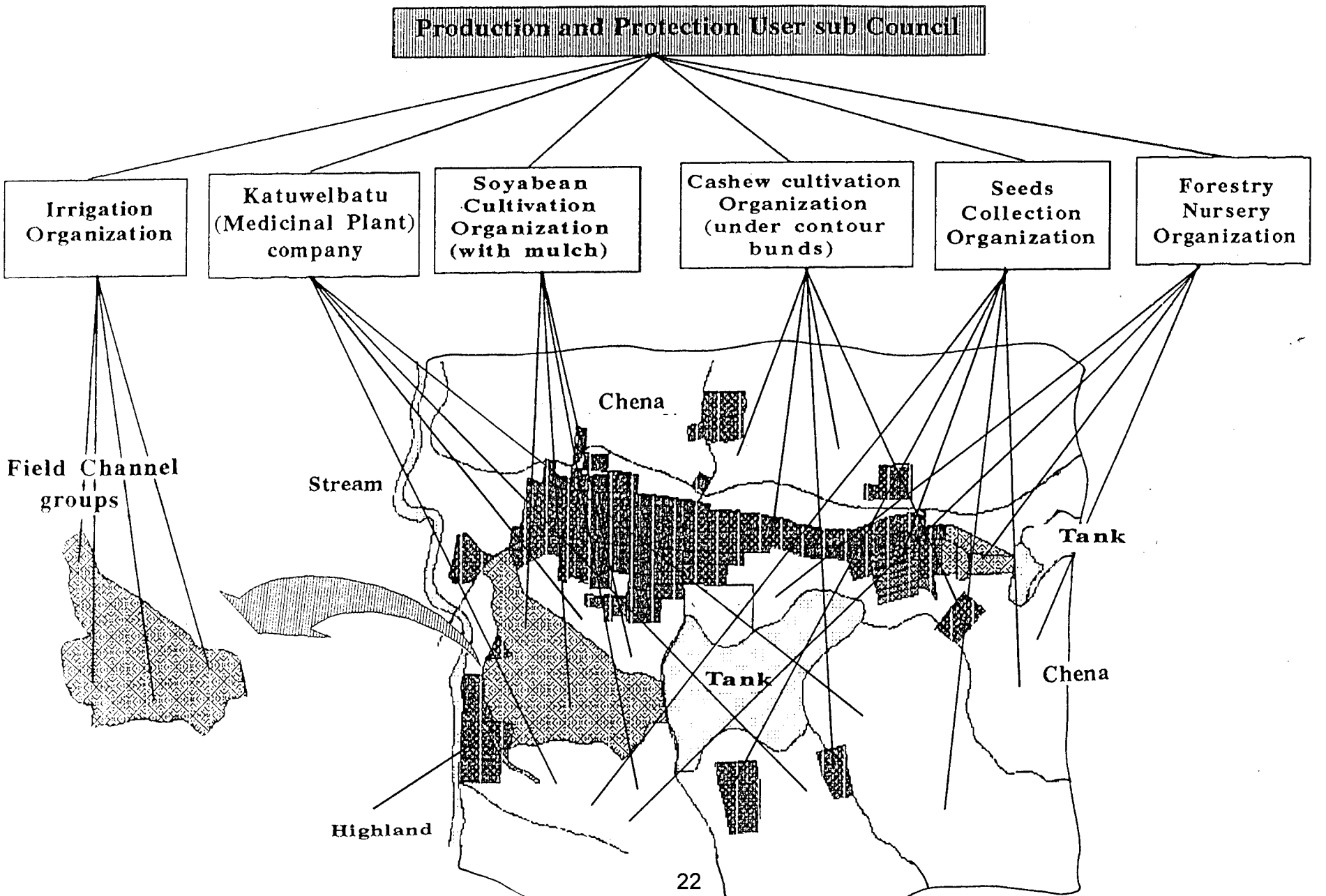
Moreover, group action will enhance individual profits through various means: benefits accrued to pooled resources and scale economies, increased bargaining, exchange of expertise in a complementary way, etc. Users are being grouped and united for various purposes, ranging from groups for multiplication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

[4]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 7

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

From Groups to Organization/Company to Sub Council/Council



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. The 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 services such as marketing, input supply, etc.) *will not be* discouraged because the composition of different activities in the contiguous area will ensure that the objective of balancing production and protection will be achieved when they are put together. 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.[5] When all the activities in a contiguous area are assembled, it will take the form of an integrated production and protection plan for that sub-watershed/contiguous area.

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 comprise of a collection of mini-budgets for individual activities. There will be three sources of inputs/funding: (a) User inputs including labor, materials, and money, (b) Seed money/grant from SCOR project (often, this will be used as a revolving fund and will not exceed 20 percent of the total budget) and (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 into one body for production and protection purposes. Such a trend can be seen in certain irrigation districts, for example, Polonnaruwa and Anuradhapura.

IV. ***Legal Arrangements***

Though the smaller groups may remain at "informal status," the organizations, more often than not, would like legal recognition. Certain farmer organizations may not like to register under the existing legislature. 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. In addition to such legal recognition, the groups, organizations and councils may

[5]Even though a typical process of formation of organizations may follow this pattern, there may be exceptions as desired by the users.

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.

4. SCOR MANAGEMENT INFORMATION SYSTEM, AND MONITORING AND EVALUATION

A continuous flow of information is required to enrich the SCOR participatory process facilitating interaction, debate and resolution. The prudent use of information technology (IT) in the generation, process and analysis of the volumes of information needed is crucial to support the planning, implementation and evaluation processes (Batuwitage 1994). For this, SCOR has launched a Management Information System (MIS)and a rigorous monitoring and evaluation (M&E) activity through a participatory procedure involving user groups, government and other project participants. It reviews the progress and employs 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 relevance, efficiencies, effectiveness (and impact) of project activities.

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

Figure 8 lists the basic data requirements to gain knowledge on the watershed.

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

(a) ***Land and water conservation for production and protection purposes***

* Sediment concentration and sediment load
* Land cover
* Soil fertility: photometric plants, changes in weed composition, earthworm casts
* Soil loss
* Biomass: leaf litter, weed trash, other organic matter
* Water quality
* Rainfall: runoff ratio
* Infiltration

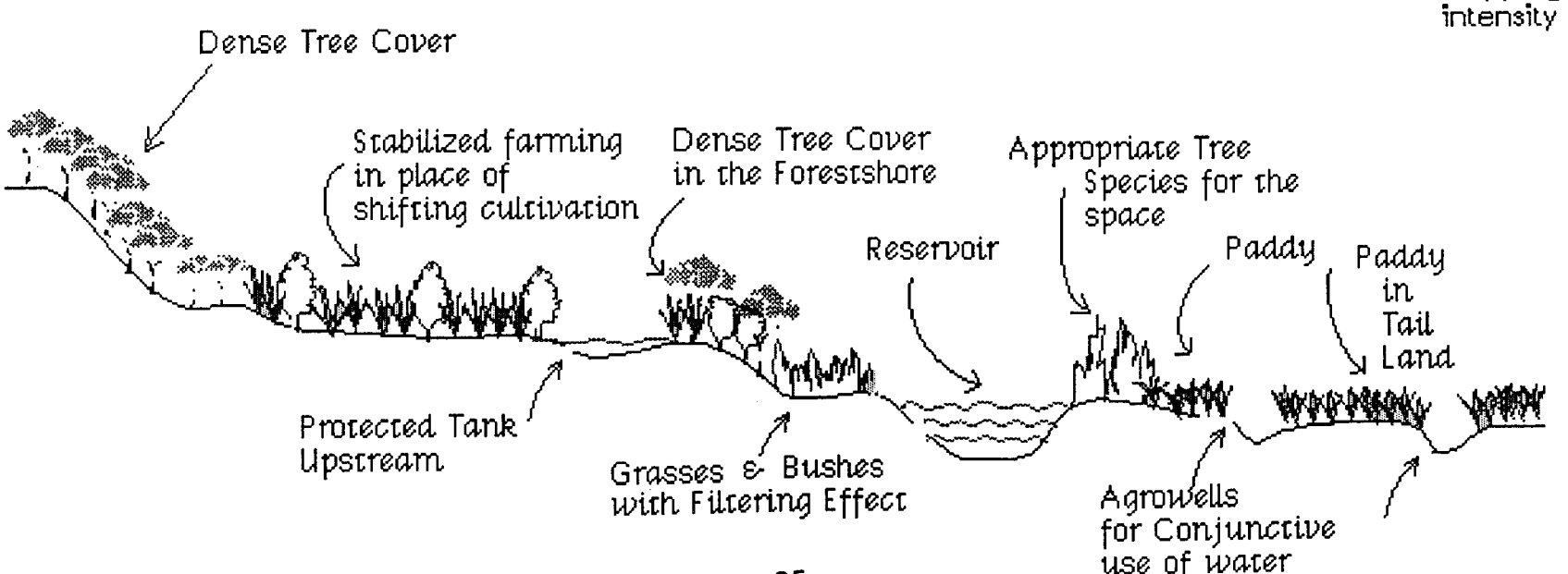
Figure 8. **INDICATORS FOR MONITORING AND EVALUATION SCOR PROJECT**

Number, Level of maturity, investments, turnover,
Survival ratio of capital works of user groups,
Organizations and councils

Awareness level
Commercial activities, User grants

Ground water potential

- Usufructuary rights
- Trees
- Land cover
- Soil loss
- Infiltration
- Runoff
- Use rights
- Conservation practices
- Trees
- Land cover
- Tank storage
- Sedimentation
- Water quality
- Surface and Ground
- Water use efficiency
- Income Cost of production, profits
- Plants Value
- Yield
- Cropping intensity



(b) ***Land and Water Productivity, Incremental Production and Profits***

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

(c) ***Shared Control, and Institutional and 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 9.

* Value of investments (capital/operational) made by user groups.

• Expenditure	)		Production modes	)
• Income	)	by		) by group/person
• Profits	)		Protection modes	)
• Assets	)			

* Returns to Shared Control of Land and Water Resources; e.g., incremental crop yields due to shared management.

* Number and type of commercial activities undertaken by groups.

* Formal agreements entered into by: • State and users • Private sector/nongovernmental organizers and users

* Number of policy/procedure changes.

* Number and value of user grants/loans.

Figure 10 illustrates the Management Information Systems and the operation of the Monitoring and Evaluation System of SCOR[6].

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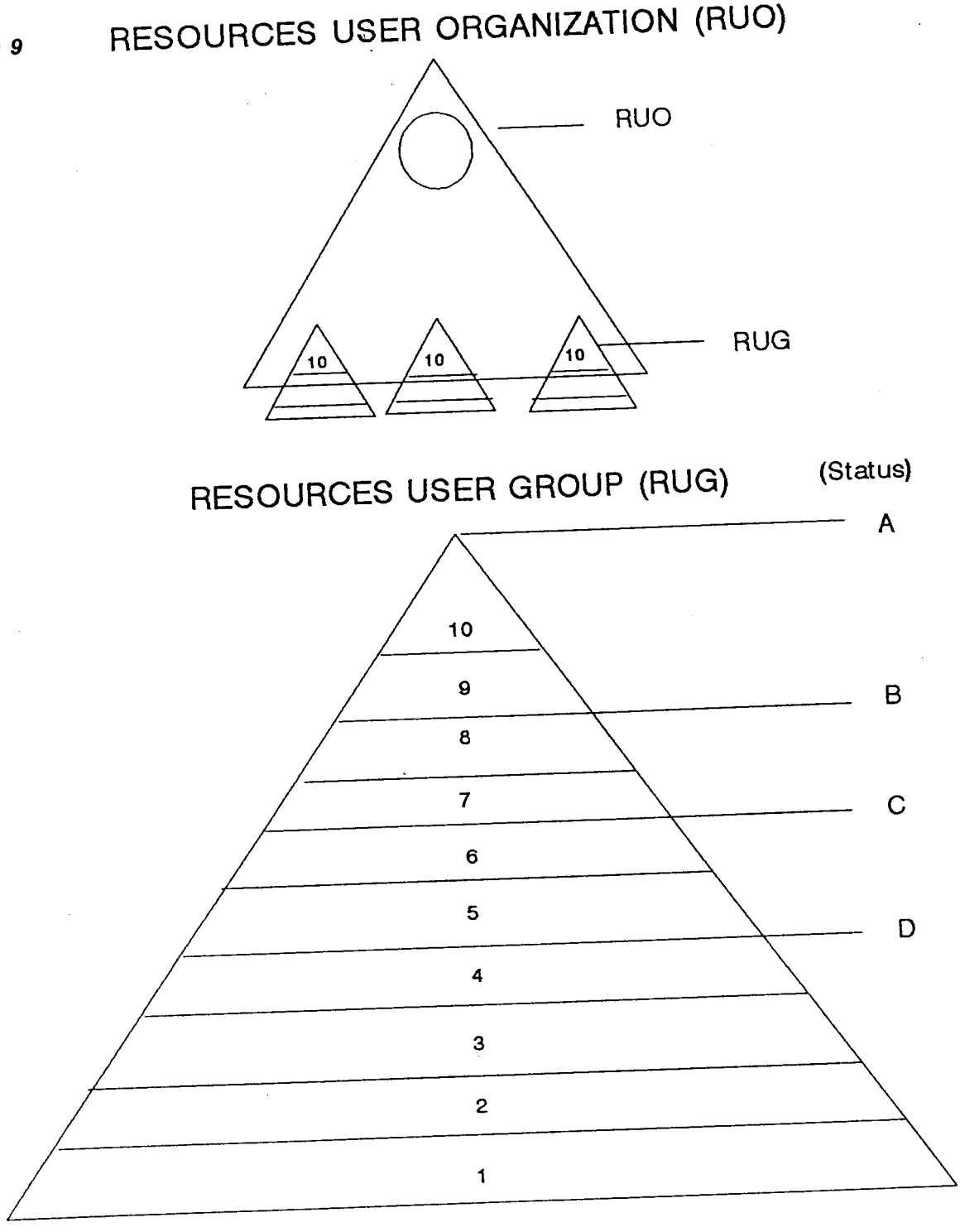
6 Prepared by G. Batuwitage,SCOR M&E Specialist.

Figure 9

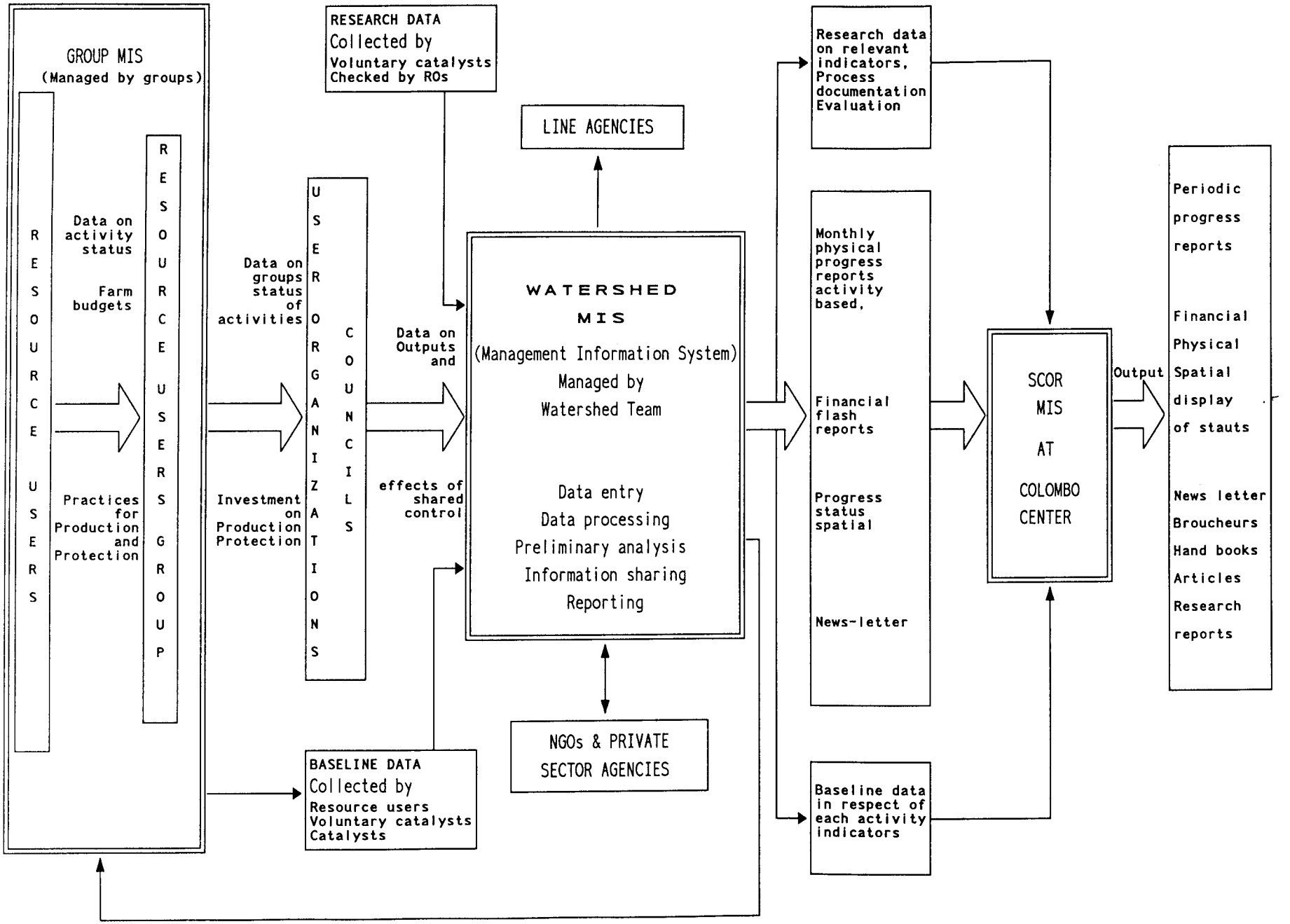


The RUG,

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

Figure 10

OPERATION OF M&E SYSTEM OF SCOR PROJECT



The correct choice of information technology is crucial in this effort that could produce the required information in the required formats in a usable way, for replication and effecting necessary policy and process changes. To achieve these goals, SCOR adopts, among others, the following mechanisms:

I. Involvement of local officials of relevant agencies, resource users, NGOs, etc., in participatory resources use survey and mapping (ref. previous section).

II. Computerization of data.

III. Use of GIS to undertake overlay operations to examine critical features for site selection for interventions. The elevation data were used to create digital elevation models and slope maps (in Nilwala watershed). Land cover images were superimposed on the terrain images. It was possible to view the form in which land and water resources are available with terrain and drainage in focus in a three-dimensional view. Such a view helps in understanding the particular functions of the land in various locations and facilitates the articulation of a possible future vision for the area. It also helps in understanding the spatial aspects of the interventions, and correctly interpreting resources and their functions.

IV. Computerization of the participatory resources use survey and map data and using them with elevation data to obtain detailed plot level information. The map is linked to a database that carries all the collected information in respect of each plot. This facilitates detailed planning with the resources users whose investment behavior will have to be changed if there should be a change in the land use. The ability to mass produce such information and their timely availability would be a requirement that could complement such a resource management effort in a participatory mode.

V. Use of a computerized database that covers an entire village, for a village where a mini-project has been designed, to help manage the external resources to be mobilized for the project. Database management has become an essential function and contribution by the facilitators to help the farmer organization to manage the business venture developed by this project.

VI. Operation studies, such as irrigation and crop scheduling, to provide information to the farmers. Example: an operations study carried out on the main reservoir of the dry zone watershed generated information helping the working out of different crop combinations under different scenarios to provide information to the farmers for decision making at the seasonal cultivation planing meetings. A study has already been undertaken to gain better knowledge of the whole system and its water resources and the functioning of the subsystems, and the relationships for planning water efficiency and its sustainable use.

4.1 Additional Research Studies

To augment the knowledge base and to provide additional information to the testing process of integrated land and water resources management in the pilot watersheds, SCOR conducts several additional research studies. These include:

(a) Land use studies and preparation of maps for the Huruluwewa and Nilwala watersheds.

(b) Rainfall trends, surface water balance, agro-well and groundwater studies, and vegetation change in the Huruluwewa watershed.

(c) Baseline and M&E studies

(d) Evaluation of profitability and productivity of crops under different irrigation and technology regimes.

(e) Impacts of land tenure and land ownership on productivity and related factors:

(f) Evaluation of SCOR interventions on resources management and profitability.

(g) Feasibility study on productivity and processing of medicinal plants--a component of land and water conservation effects in the dry zone.

(h) A study on adoption of technology in the tea sector in the Upper Nilwala watershed.

(i) Process Documentation research of SCOR.

(j) Policy research related to organizational and business modes for production and protection, ranging from informal groups to production/ processing/ service companies, including state-user partnership.

(k) Land consolidation in small tanks.

(l) Integrated soil and water conservation package for Nilwala tea lands.

5. SUMMARY

The Shared Control of Natural Resources (SCOR) Project aims at developing and testing a strategy to increase the sustainable productivity of the land and water resources base in Sri Lanka. The focus on "watersheds" as the basic planning, coordinating and implementation units is a unique feature of the SCOR Project. To develop and maintain a *balance between production and protection* as a point of departure,

the SCOR efforts focus on changes in the incentive structure, changes in the institutional context and changes in the use of technologies.

At the outset, a participatory assessment of supply and demand characteristics of land and water resources as well as management practices was conducted in selected watersheds. In this exercise, the strengths and weaknesses of existing user organizations and the potential for group action were also identified. Apparently ways in which the land and water are used in the upper parts of the watershed affect the ways in which these resources can be used downstream. The hydrological and socioeconomic management factors and various other factors influence the form of this interdependency.

Next, the project examined the "gap" between existing and "ideal" land and water management patterns within sample contiguous areas or sub-watersheds.

Participatory mapping of land use patterns and associated practices formed an integral component of this initial assessment. The existing land use pattern was then compared with an ideal pattern and, through a participatory planning process, a package of activities and management practices was selected to achieve production and protection goals.

The "protection" strategy of SCOR is different from traditional approaches. SCOR 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 to motivate her/him to protect natural resources.

Organizing users into groups and linking users with institutions such as markets, credit and information/extension and providing users/groups with appropriate legal rights will provide an effective mechanism for overcoming such difficulties as scale constraints. The SCOR strategy is based on 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 (TOR)*. The project activities aimed at an appropriate mix of TOR includes:

1. **Strengthening the Capabilities of Resources User Groups**

   * Survey of existing local organizations and analysis of constraints.

   * Creation of user groups.

   * Legal status and powers for user groups, including formal agreements between user groups and the 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.

* Support services and facilities for user groups.

* Establishment of production companies (for advanced user groups).

2. **Improving Land (and Other Resources) Tenure Arrangements**

* Regulatory and legal mechanisms.

* Resources access and tenurial arrangements.

* Policy and process reforms (long term).

* Land titling and consolidation.

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

4. **Improving Coordination and Linkage for Land and Water Resources 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).

* Establishment of information systems.

While the Project focuses most 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 support services to the user groups, and to help in the reorientation of the government agencies to a client-centered mode.

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