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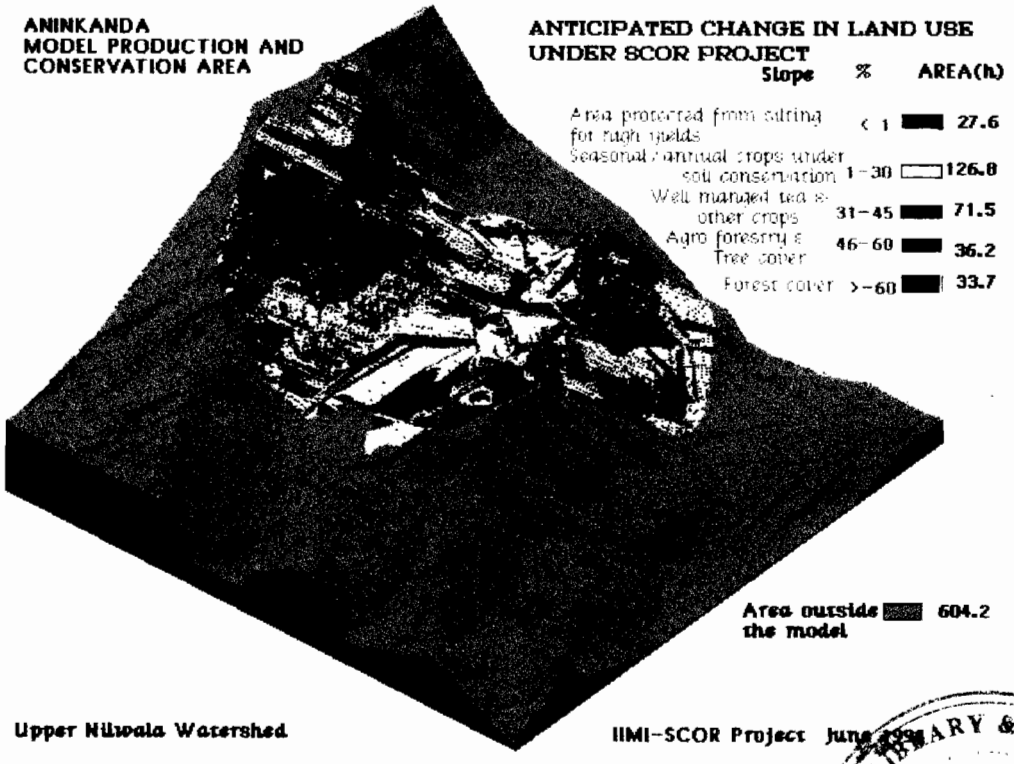
DEVELOPMENT WITH CONSERVATION

- - Action – Research Experiences in Shared Management of Natural Resources in Watersheds - -



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CHAPTER 1

COMMERCIALIZATION, SUSTANABILITY AND THE SMALL FARMER

This book examines an *action-research* effort aimed at catalyzing a process of motivating and organizing small farmers in degraded watersheds to reconcile profit goals with environmental objectives. This learning process while adopting a holistic or integrated approach, introduced a package of interventions in technology, organization/institutions, resources, and policy. This introductory chapter provides a conceptual framework for working with small and resource-poor farmers in resource-poor watersheds, introduces the action-research effort, namely, Shared Control of Natural Resources (SCOR) Project, and finally submits a brief account on the organization of subsequent chapters.

The underlying theme of SCOR action research was to "learn from action." Action research is dedicated to learning through action and explicitly accepts that there is a lack of knowledge about certain implementation issues and this is where this type of action research proves valuable. In "action science or research, one considers increasing the chances of achieving desired possibilities rather than estimating abstract probabilities based on actors' fixed preferences, choices, and means" (Uphoff 1992, p. 396).

The Context

In most parts of the world, there is an urgent need for more intensive but environmentally appropriate utilization of the natural resources base, particularly land and water, for profitable and *sustainable* production in agriculture, industry, and other uses. The concept of *sustainable development* has now become one of the mainstream development paradigms and is popularly defined as "the development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1978). Such a process of development should be environmentally nondegrading, economically viable, and socially acceptable.

It is argued that the rising populations will continue to exert pressure on limited natural resources throughout the globe. In many countries, especially in Asia and Africa, population growth rates are still at higher levels. Even in countries where growth rates have declined, because the base population is already large, substantial numbers are being added to the total population, annually. Ironically, population pressure is typically high in countries where natural resources and economic powers are limited. In most of the agriculture-based economies in the developing world, increasing pressure on limited agricultural, aquacultural, and other related resources including land, water, and forestry

are reported to be degrading and declining due to various reasons. For instance, Abrol (1995) reported that in India, the ongoing degradation of the resource base has adversely affected the supply of food, fuel wood, fodder, and timber. Productivity of most of the rain-fed croplands has declined and soil degradation is identified as a serious constraint in ensuring sustainability of many irrigated production systems.

Greater use of high-yielding crop varieties and fertilizer, investments in irrigation, together with management inputs had contributed to significant increases in agricultural production in the recent past. However, increased scarcities of inputs and poor performance in their utilization have already caused problems in food production. For example, in many parts of Asia, most of the economically promising sources of irrigation appear to be already fully developed. At the same time, the performance of many irrigation systems has fallen short of expectations and low intensity/efficiency of land and water use and stagnating productivity are evident. Late in the 1970s, scientists believed that there is a substantial amount of "untapped yield potential" in irrigated production systems, especially in Asia. They believed that much of this could be realized through improvements in crop management in general, and in water management in particular.

However, many scientists have observed that, by the end of the 1980s, there was a stagnating or declining trend in productivity of major food grains grown mainly under irrigation. Stagnating or declining trends in productivity (and consequently the profitability) in irrigated areas are a great concern in many countries in the region where most of the farmers are operating in small farm holdings. This condition is further aggravated because they have limited "roots" in off-farm income sources. The opportunities for conventional alternatives such as slash-and-burn (or shifting) cultivation are fast disappearing and many countries lack a strong sector of agriculture-based rural industries, which can act as the interface between the peasant farmer and the industrial world (Wijayaratna and Hemakeerthi 1992).

In Sri Lanka, irrigated agriculture, which is mainly devoted to rice production, is now faced with serious constraints: the rice growing area has increased only marginally in recent years and the major determinants of production, namely, yield and cropping intensity have also been stagnating since the mid-1980s (Wijayaratna and Hemakeerthi 1992). "There is uncertainty about the future directions for agriculture and irrigation development, an uncertainty intensified by the growing scarcity and competition for water. The issue is not one faced by Sri Lanka alone but by many other Asian countries that experienced rapid agricultural growth from the mid-1960s to the mid-1980s" (Barker and Samad 1998, p.12). While recognizing the importance of further improvements in irrigated areas, it can be argued that a great deal of intensification and commercialization is required in rain-fed highlands in many of these countries. Today, nearly two thirds of the cultivated area in the world is rain-fed.

Obviously, soil and water conservation play a critical role in rain-fed upland farming. Soil degradation, both in quantity and quality, is one of the major factors that attributed to low productivity levels in upland agriculture. The high degree of soil erosion reduces the long-term productivity of the lands since the top soil is eroded. Soil erosion could also have adverse effects downstream. The eroded sediments may settle in the downstream. The sediments may also settle in irrigation canals and reservoirs,

reducing their capacity. It is clear that the irrigated commands and their catchments are interdependent. The form of this interdependency is influenced primarily by hydrological and other climatological factors, socioeconomic and management factors, and various other secondary factors. Therefore, benefits to integrated natural resources (mainly land and water) management in a watershed could be large. However, it should be noted that water is only one input in the agricultural production process and this resource should be judiciously matched with other non-water factors—mainly crops and cropping patterns, soil conservation measures, management of other complementary inputs, and, above all , markets and prices. Such a process should also take into account the relevant social and environmental considerations. Based on this, different land and water use options can be evaluated.

Watershed Management

In the watershed literature there is some confusion about the usage of terms such as "watershed," "river basin," "catchment area," or "drainage basin" (Pereira 1989). Such definitions can broadly be classified into two groups. In one group the area that drains water into a river is described as a "watershed" and the boundary line between adjacent "watersheds" is called the "divide." The other group defines the area drained by a river as "catchment area" or "river basin." Brooks et al. (1991) made a distinction between a watershed and a river basin, based on scale. The line between adjacent areas is called the "watershed." The river basin is larger than a watershed and covers the total area that drains through the river and its tributary system. However, for SCOR, the term "watershed" is defined as "the area of land surface that drains water into a common point along a stream or river. Hence, the river basin is considered as the highest order watershed. Areas that generate separate streams/tributaries within a larger watershed (or a river basin) can be conveniently defined as "sub-watersheds" and "micro-watersheds."

Based on the characteristics of the drainage flow, many authors had defined "watershed" as a hydrological unit. For example, Easter et al. (1985) and Brooks (1991) defined a watershed as a topographically delineated area that is drained by a stream. A slightly different definition has been given by Magarth (1990). While acknowledging the hydrological concept, he interprets the dividing line between two catchments as the "watershed." Accordingly, areas that drain into a specific point along a stream is a watershed. He classifies the land area above 30 percent slope as an "upper watershed" and that between 8 percent and 30 percent as a "lower watershed." Many others have defined the area included within the divide line of a catchment of a stream as a watershed. Koshoo (1986) used such a definition and suggested that the watershed is a useful unit, because the rainfall to this area will flow through a particular point and one could assess the quantity and plan for its optimum utilization.

ADVERSE EFFECTS OF WATERSHED DEGRADATION

"Watershed degradation is the loss of value over time, including the protective potential of land and water, accompanied by marked changes in the hydrological behavior of a river system resulting in inferior quality, quantity, and timing of water flow. Watershed degradation usually results from the interaction of physiographic features, climate, and poor land use, e.g., indiscriminate deforestation, inappropriate cultivation, disturbance of slopes by mining, the movement of animals, road construction and badly controlled diversion, and storage, transportation and use of water" (FAO 1994, p. 3-6). The improper cultivation of hilltops and steep slopes, non-adoption of conservation practices and bad land management and crop husbandry would cause soil erosion.

Water Quality. Water quality, including groundwater contamination and salinization, too is reported as a serious environmental concern. Groundwater contamination is rapidly becoming a serious environmental concern (Anderson et al. 1985). Bradley et al. (1987) state that agriculture's contribution to groundwater contamination is primarily from pesticides and nitrates. Nitrates are common in groundwater mainly because of the widespread use of commercial fertilizers providing nitrogen to crops. Bradley et al.. (1987) argue that the erosion and sediment control measures may not be helpful in reducing nutrient pollution. Soil conservation practices may reduce surface runoff and thereby increase nitrogen leaching as a result of increased percolation to groundwater aquifers. Such contamination of wells and aquifers is generally difficult and costly to correct, and it may be easier to control the application of those chemicals at farm-level.

As such, the availability of profitable and acceptable alternatives as well as user participation in soil conservation and watershed management is highly important. The socioeconomic and ecological consequences of soil degradation has been acute affecting many areas of a country, especially the rural poor, tribal, and landless people who are relying heavily on the communal and public lands in the uplands. This situation leads to overexploitation of natural resources. For instance, overgrazing by livestock, commercial and industrial exploitation of timber, gathering of fuelwood, agricultural use of land without proper conservation practices, etc., aggravate degradation (Abrol 1995).

Changed Water Flow Regimes, Soil Erosion, and Loss of Productivity. Different segments of a watershed are in a continuum and linked physically and, therefore, changes in one area would affect other areas. For example, changes in forest cover in the upstream may result in changes in hydrological regimes that, in turn, could lead to soil erosion. A good forest/vegetation has the capacity of converting heavy rainfall into a favorable steady flow of water. If this is lost, especially in sloppy areas, droughts can occur during dry spells due to low river flows and lowering of the water table. In addition, micro-climatic changes such as fluctuations in temperature on the exposed top soil, convection, and turbulence close to soil, variations in relative humidity, wind effects, etc., may also occur.

A study conducted by Elkaduwa and Sakthivadivel (1998) in the Nilwala basin revealed that there has been no significant long-term trend in the annual rainfall during the period connected to the study. Also, no appreciable long-term trend in the total annual water yield (or runoff) with changing land use practices in the catchment during the 50- year period, 1940-1990. The authors argue that, if a time period of one year is considered, no significant interannual variation in the groundwater storage can be expected under natural conditions. In the absence of any significant change in the annual total water yield with conversion of forests, indicates a similar abstraction loss of rainfall by the subsequent land use. In light of these, the authors suggest that the rate of evapotranspiration, ET, under natural forest condition seems to be the same as that of perennial crops, mainly tea and mixed trees in home gardens. However, it was clear that even though the total water yield of the basin has remained almost constant, the flow regimes have changed substantially. This implies a change in infiltration rates with the conversion of forests into other land uses.

Increased rainfall to runoff ratio and total runoff, consequent to the change in land cover, during the high rainfall months, show that even with the perennial crops the infiltration of the soils has declined compared to that with the natural forest cover. With conversion of forests into other plantations (mainly tea), high runoff due to low infiltration has resulted in more surface runoff during high rainfall months and thereby reduced recharging of groundwater aquifers rendering release of groundwater less during the low rainfall months. The analysis revealed that more than half of the forestlands has been converted into other land uses during the reference period, mainly for perennial crops. Tea is the major crop that replaced forests in this process.

Soil Erosion and Land Productivity. The high degree of soil erosion reduces the long-term productivity of the lands since the top soil is eroded. Some studies have shown that crop yields have declined 3-7.5 percent after 1 mm of soil loss due to natural erosion and 10-25 percent after 8 mm of soil loss (Marsh 1971). Experiments on Alfisols in Africa showed that removal of 3 cm., 10 cm, and 22.5 cm of top soil resulted in yield declines of 30.5 percent, 73 percent, and 93.5 percent, respectively (Lal 1987). A similar experiment conducted in India showed that the removal of 5cm, 15 cm, and 30 cm of top soil had reduced crop yield by 12.5 percent, 33.3 percent, and 45.0 percent, respectively (Hegde 1988).

El-Swaify et al. (1984) working on Alfisols on relatively mild topographies at ICRISAT (Hydrabad, India) had estimated a mean annual erosion rate exceeding 40 tons per hectare or approximately 5 mm.

Erosion takes place if a soil particle is disturbed and soil loss takes place if the particle is moved (Doolittle John B. et al. 1990). Soil erosion and sediment transport from upland agricultural watersheds are mainly caused by rainfall impact and overland flow. (Meyer and Wischmeier 1969). Interil and rill flow components of overland flow act differently in detaching, transporting, and depositing soil particles due to their hydraulic characteristics of flow concentration. The detached soil particles (individually or after aggregation) are transported downslope by the overland flow when its transport capacity exceeds the sediment load. When the sediment load in the overland flow exceeds

the transport capacity, sediment will be deposited (Yoo, Kyung H., and Myron Molnau 1987). More often than not, erosion by water is the major factor resulting in loss of top soil and terrain deformation, causing loss of productivity. Erosion by wind is significant in the arid and semiarid areas. The degree of degradation may vary with inherent soil properties, which is also related to the degree of soil maturity, slope, topography, intensity and volume of rain fall, wind speed, and other factors.

Soil erosion could have adverse effects in the downstream. The eroded sediments may settle in the downstream. The sediments may also settle in irrigation canals and reservoirs, reducing their capacity. For example, in Asia, it is reported that certain reservoirs built within the last 20 years have, on average, 4 times the sediment load anticipated by their designers. As a result, dams and irrigation schemes with a projected life span of 100 years became inoperable after about 25 years. For example, the Shihmen multipurpose reservoir on the Ta-han river in Taiwan has filled up 39 million cubic meters of sediments yielding from the watershed in 30 years. This is well over 10 per cent of its storage capacity. In a feasibility study, the soil erosion rate of the catchment of the Magat reservoir in the Philippines was estimated as 20 t/ha. A survey carried out after 2 years of impounding the reservoir showed the gross erosion rate to be 38 t/ha, which is almost double the predicted value. However, research has shown that soil loss is less than 1 t/ha in the well-protected and reforested catchment where there are no roads and no agricultural land use (Bingham 1989).

Positive influence of forests in arresting erosion would depend on reduced soil pore water pressure caused by the forest evapotranspiration, accumulation of an organic forest "floor layer," and mechanical reinforcement of the soil by tree roots (O' Loughlin and Ziemer 1982). However, vegetative canopies may not necessarily protect the soil surface from raindrop impacts. Instead canopies may influence the natural raindrop size by amalgamating the smaller drops and consequently large drops may drop on the soil. Depending upon the height of the vegetation (which in turn would influence the amount of kinetic energy acquired by the raindrops) impact could be higher than that of natural raindrops. Nevertheless, multi-strata canopies and the ground cover (such as grass or deep litter) could reduce this negative impact.

Ian et al. (1992) state there is greater awareness that not only water quantity but also water quality has implications of afforestation. For this, SCOR believed that the availability of profitable and acceptable alternatives as well as user participation in watershed management is important.

Small Farmer and Watershed Dgradation: It has been observed that watersheds in many countries are being "used" (mostly "illegally") by small farmers. This is partly due to the lack of alternative employment opportunities. *As most of the watersheds are degraded mainly because they are "being used," and because watershed resources can be used profitably if due consideration is given to conservation concerns, it is argued that watershed management be considered as a process of participatory planning/formulating, implementing, and monitoring/adjusting and evaluating a course of action involving natural, human, and other resources.* An integrated/holistic soil conservation and watershed management approach should consider those physical, socioeconomic, political, and institutional linkages that exist between upstream and

downstream of a river basin/watershed, and between systems within a watershed. For land and water, it should be aimed at maximizing efficiencies of resource (land and water) use watershed-wide.

Watershed as the Basic Planning, Coordinating, and Implementation Unit

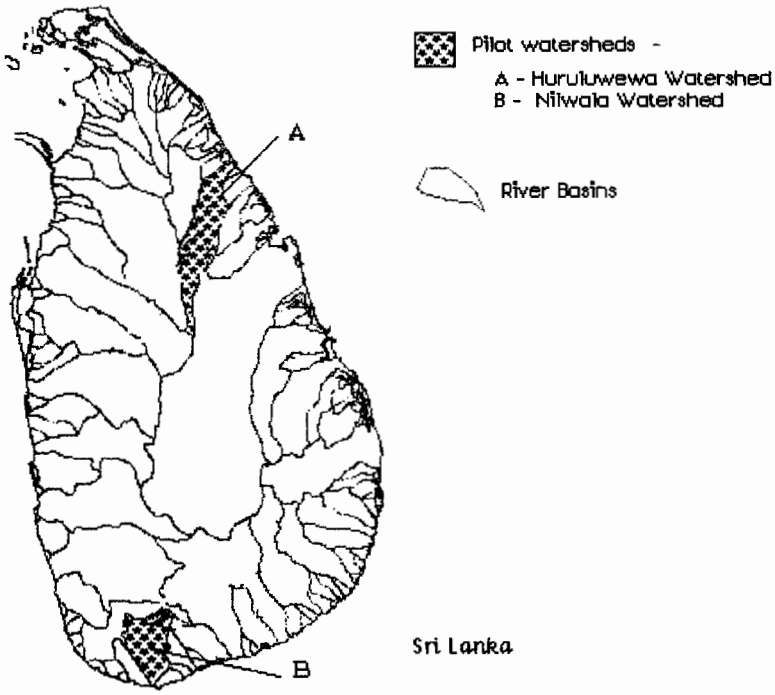
Watershed management is not a new concept. For example, as early as 1600 BC, the Chinese Emperor Yu implemented a major forestry program to "control erosion and floods" under the slogan "to protect the river, protect the forest" (Brown and Beschta 1985 quoted by UNDP/FAO 1986).

The focus on the watershed as the basic planning, coordinating, and implementation unit as an important feature of SCOR. The pilot watersheds selected under SCOR were 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 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 the downstream can be used, and they affect the land resource associated with it. 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 Huruluwewa[1] SCOR watershed contains about 200 small tanks and these are in series of clusters/cascades. Figure 1.1 shows the distribution of watersheds in Sri Lanka and figure 1.2 shows the distribution of reservoirs and rivers/streams in a "dry zone" district of Sri Lanka. According to the SCOR Project participatory resource mapping, there are about 721 large diameter wells (locally called as "agro-wells") within the Huruluwewa watershed for groundwater extraction. Moreover, recent monitoring of rainfall at several points within the watershed showed a significant "micro-scale" variation.

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 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.

[1] *Huruluwewa is one of the two pilot watersheds included in SCOR experimentation.*

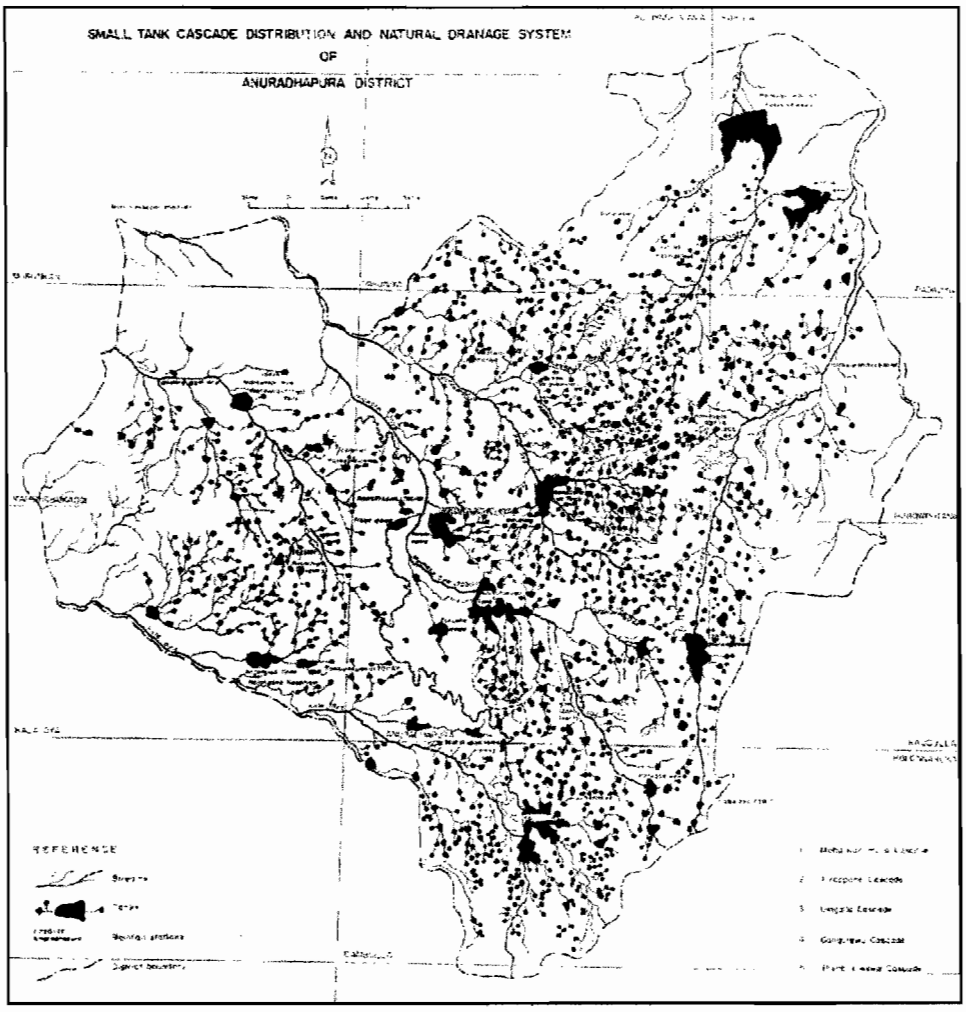
Figure 1.1. Watersheds in Sri Lanka.



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.

This implies that socioeconomic and institutional factors too influence the linkages between "upstream and downstream." For example, the interrelationships between *chena* (shifting or 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 strong 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. 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.

Figure 1.2. Reservoirs, rivers, and streams in the Anuradhapura District of Sri Lanka.



The Need for a Holistic and Integrated Approach

It is clear from the above discussion that any development/conservation approach should consider those physical, socioeconomic, and institutional 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 terms of "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 that not only optimizes the production, but also ensures the protection of the natural resource base with the active participation of the users concerned..*

An integrated participatory approach is useful to overcome these problems. The SCOR Project emphasizes an integrated participatory approach, and made a substantial effort in establishing linkages 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.*

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. One major problem in a watershed/basin approach, however, is that the subsurface flow and aquifer boundaries do not necessarily fall in line with watershed boundaries.* It is evident from this discussion that analysis of land and water resources, and their uses and users, in a watershed context is essential

More often than not, watershed research and watershed management projects/programs do not follow a holistic approach. Instead, such efforts focus only on one or two components such as reforestation, reducing soil movement, improving water available to plant growth and fertility, improving infiltration (at the same time reducing surface runoff and soil erosion), improving surface storage and water quality, etc., However, when watersheds are occupied by people and when watershed management has to deal with human-induced degradation, it involves changes in attitudes and behavior. Physical outcomes may be achieved only through socioeconomic and organizational action. In other words, one cannot ignore institutional, policy, and socioeconomic, and market factors. In watershed management these different components are complementary to one another.

Easter (1985) proposed that integrated watershed management effort should consider linkages between upstream and downstream of a particular watershed and not only the physical, but socioeconomic, institutional, and organizational aspects also should be included. He interprets integrated watershed management as a process of formulating and implementing a course of action involving natural, agricultural, and human resources management. Brooks et al. (1991) too, advocate to recognize the interrelationships among land use, soil, and water and the links between the upstream and downstream. Certain others (such as Biswas 1990) treat watershed management in a narrow sense and consider only water development. Botttral (1993) is of the opinion that watershed management could include (or exclude) a wide range of factors in varying degrees. For example, the physical area can vary from a small micro watershed (of about 500 ha) to a large river basin. It may include only the upstream or downstream or both. And, the scope of planning and implementation could also vary in terms of the type of activities included, for example from "water only" to comprehensive management of water, land, and other resources. Bottral (1993) states that a powerful case can be made for using the watershed, including its highest order namely, the river basin, to provide the basic framework for development planning within a region; and for establishing institutions

that would satisfy the interests of both upstream and downstream resource users. He argues that when the interactions of land, water, climate, and people are the focus of development, such interactions are mostly expressed in a watershed. Nevertheless, according to Bottral, water seems increasingly to be the key physical resource limiting or triggering economic development in rural areas. SCOR follows a holistic approach and considers that to achieve the desired goals of production and conservation, water must be combined judiciously with relevant non-water factors, including soil and associated components related to production and conservation.

The sectoral approach through the involvement of several development agencies (in many developing countries mainly government departments) did not bring desired results because the efforts were not well-coordinated and integrated. The SCOR participatory action-research program attempted an integrated approach addressing these different dimensions, and considered the total utilization and management of water resources and associated land in a watershed. The project aimed at optimizing watershed-wide water use efficiency. For example, in figure 1.3, a unit of water in the upstream (w_1) may be characterized by a quantity/volume of v_1 and a quality level of q_1. The potential productivity of that unit will depend (in addition to type and method of utilization) on v_1 & q_1. As illustrated in figure 1.3, at the initial point, a portion of v_1 may be "lost" due to evapotranspiration, percolation, etc. However, part of this "loss" may reappear several times later in the watershed (v_2, v_3, v_4, ... v_n)[2]. Depending on upstream (agricultural and nonagricultural) land and water use, the quality of water may also change (q_2, q_3 ...).

It is clear that, various parts of the watershed are physically and operationally linked in important ways. For example, one of the pilot watersheds selected for SCOR experimentation contains about 220 small tanks or reservoirs and a large reservoir. Most of these small tanks are in series of clusters or in cascades. In addition, ground water extraction, using large diameter wells, from the weathered rock up to a depth of about 10-m is taking place at an increasing rate.[3] No regulations or accepted norms have been adopted with regard to well density, spacing between wells, pumping duration, 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 drop of water in the well while pumping from adjoining wells is in progress.[4] In certain locations, farmers, after excavating to depths exceeding 6-7 m and spending about Rs 50,000 (US$750) per well, it was found that the water yields are not satisfactory. In addition, the negative consequences of the proliferation of these wells include the lowering of the water table and associated problems such as moisture deficits in rain-fed farming areas, threats to domestic wells, and income disparities. Moreover, monitoring of rainfall at several points within the watershed shows a significant "micro-scale variation."

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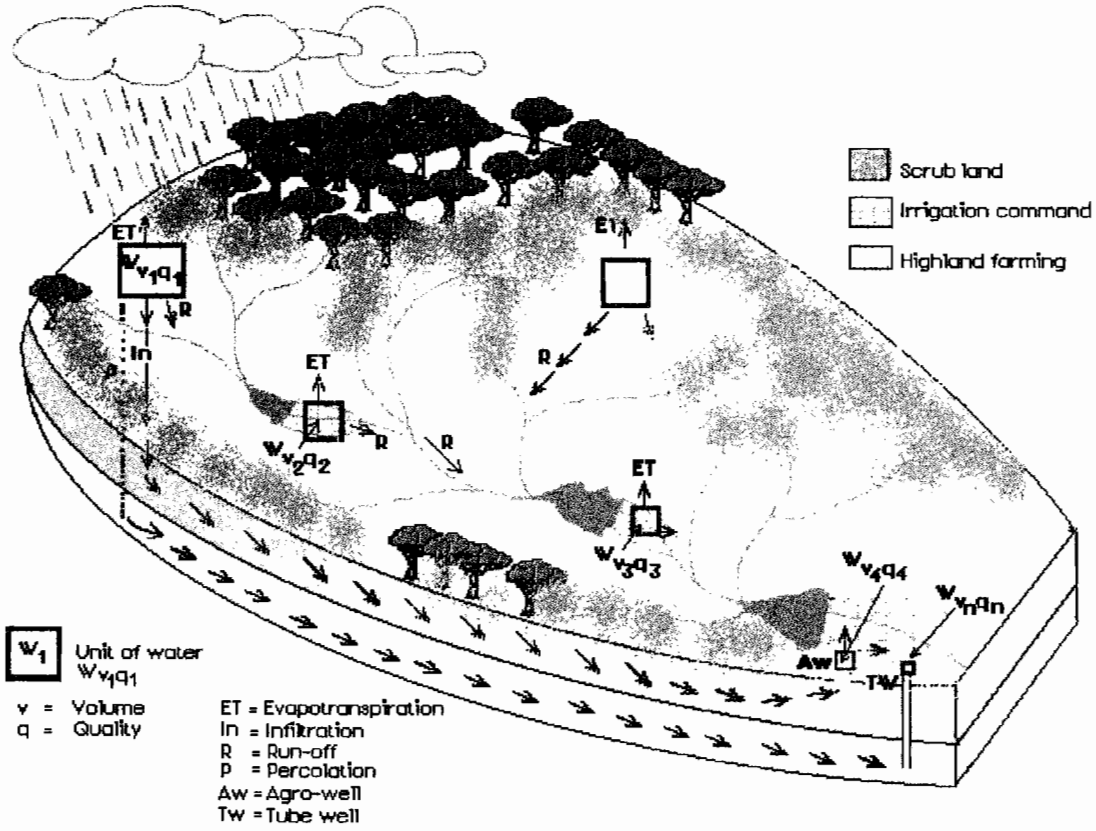
[2] Therefore, computations of water use efficiencies, using only the volumes applied to irrigation commands need to be adjusted considering the reuse patterns.

[3] This is a recent development and is common in the dry and intermediate zones of Sri Lanka.

[4] This situation affects the "on demand" nature of the well concerned, because the water may not be readily available at the time it is needed.

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 and the challenge to a watershed management program is to examine the spatial and temporal variations of rainfall and other "sources of supply" available to the agricultural production system and to assist users in managing those supplies in an optimal manner, among various users and uses. The potential use at a given point will depend on the qualitative and quantitative aspects of water use in the upstream, terrain and soil characteristics, vegetation cover, methods employed in recapturing, etc. Hence, the characterization of the geographic space of the landscape systematically by appropriate unit of analysis (sub/micro watershed, farm plot, etc.) based on supply characteristics of water (quality and quantity over time) and land (capability and fertility levels, drainage quality, depth, etc.) is useful in a watershed management effort. It should, however, be noted that water is only one input in the agricultural production process and this resource should be judiciously matched with other non-water factors, mainly crops and cropping patterns, soil and water conservation measures, and other complementary inputs. Based on this, and socioeconomic (including market potential) and environmental considerations, different land and water use options can be evaluated. This calls for a user-oriented and participatory approach.

Figure 1.3. Total utilization and management of water resources in a watershed.



Integrating Environmental Concerns with Production Goals through Internalization of Environment Considerations into Agricultural Decision Making

This book is focused on a participatory *watershed management* strategy aimed at *integrating environmental and conservation concerns with production goals.* It is primarily based on firsthand experience in working with watershed resource users, mainly small farmers, government and nongovernmental organizations, researchers and the international donor community. More specifically, the book examines the experience of the Shared Control of Natural Resources (SCOR) Project, Sri Lanka, funded by the United States Agency for International Development (USAID) and implemented by the International Irrigation Management Institute (IIMI) in collaboration with the Government of Sri Lanka, resource users, and NGOs.

SCOR Concepts[5]

The project concepts and strategies were developed through a unique participatory project developing and testing a holistic interdisciplinary approach to watershed management. A participatory analysis of constraints to the potential for sustainable increases in productivity in the watersheds (identified throughout the consultation process) paved the way for SCOR. Four types of major constraints have been identified in relation to environmentally appropriate increases in production:

- The lack of a *production environment* that motivates the resource user to effectively manage the combination of resources essential to optimize economic production while conserving land and water resources.

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

- The lack of adequate information about land and water resources management at appropriate levels.

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

An Inappropriate Production Environment

An important 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

[5] This section is based on the SCOR project design paper (See IIMI SCOR 1993).

for exploitative land use, and allows recovery of investment in production and environment protection practices that have 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 to show that there are individual small holdings that 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 these advantages without changes in tenurial rights. Land consolidation/tenurial changes in small tank systems may be cited as an example.

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 sub-sector. 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. *However, understanding of alternative 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.*

Inadequate Resource Information

To understand environmental cause-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. 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 as other forms of information dissemination. These Geographic Information Systems (GIS) are being adopted rapidly by planning agencies, private firms, and others involved with natural resources management and utilization. Hence, the establishment and utilization of appropriate information systems was an integral component of SCOR.

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 on the "market–oriented conservation" were primarily based on these constraints.

Market-Oriented Conservation

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.* 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 (Levine, (IIMI, SCOR Project paper, 1993).

While most agricultural environmental impacts are from non-point sources, some, such as those resulting from inappropriate irrigation or accelerated erosion due to 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 (Levine, IIMI, SCOR Project paper 1993).

However, understanding of alternate use, incentive structures 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 . Unless the actors are informed of the potential impact, and unless the profitable alternatives exist then the environmentally inappropriate decisions will continue to be made. Major factors that should be considered to ensure the integration of environmental concerns into the production process are discussed in the next few sections of this chapter.

Incentives to Promote the Adoption of Sustainable Practices: More often than not, it is argued that it is essential to provide incentives to motivate the resources users, especially the small farmers, to adopt resource conservation measures or sustainable crop husbandry. Gibbs (1985) argues that in order to make watershed management effective, incentives should be provided: individually to watershed resource users to adopt practices that are both productive and sustainable, for groups and organizations of resource users to undertake collective action and make profits. As the benefits to conservation would come in the long run and because of the fact that it is the downstream users who would benefit from the conservation practices adopted by the upstream inhabitants, there is a need for providing incentives.

However, small farmers' response to economic incentives and disincentives is clear. For example, this was evidenced by the change in farmer cropping practices, in many irrigated agricultural systems in Sri Lanka. Taking comparative advantage for chili and other field crops, as compared to the cultivation of rice in the dry season on well-drained reddish-brown soils, farmers made higher profits. At the same time, 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. Nevertheless, it is argued that there exist technologies (such as crops, cropping systems and other enterprises), which have the potential yield conservation benefits as well as profits to users, if those technologies are judiciously combined with other resources, appropriate organization and policy.

The Need to Consider User Profits: Increased income generation of arable lands through increased quality and quantity of agricultural products, processing and value addition through organized action by the watershed resource users, and diversification of production would stop the expansion of the arable frontier to the detriment of natural and fragile ecosystems including to their bio-diversity. Such a pragmatic and market-oriented approach to natural resource conservation in a watershed context would include, as its major components: development of agricultural production systems integrating production goals and conservation concerns as well as incorporation of attractive non-agricultural uses such as participatory micro hydropower generation coupled with participatory hydro catchment management (for users to capture agroforestry benefits as well as to ensure the sustainability of the hydropower generation) and relevant policy and institutional arrangements. This strategy recognizes the major constraints to sustainable production, including the population pressure on limited natural resource base-especially land and water, low rural income, inadequate employment opportunities, inadequacies in the information systems- such as the information on profitable yet conservation based technologies, market conditions etc.

Conservation Farming

The concept of conservation-oriented, yet profitable, farming in the uplands in which farming systems and individual (agricultural practices) combine to conserve soil and water and improve total production and net benefits has been a pivotal strategy of SCOR. Such a strategy will help conserve natural resources, mainly land and water, and enhance the sustainability of the system. As revealed from a discussion earlier in this chapter, it is widely accepted that erosion lowers agricultural productivity and that soil conservation raises and preserves it. Magrath et al. (1990) stated that erosion involves changes in soil structure that influence root growth and water availability and relative concentration of plant nutrients. Soil conservation practices minimizes the occurrence of these changes and often induce other reactions that directly improve conditions for crop growth, such as improved response to fertilizer or lowering wilting point.

Magrath et al. (1990) submitted two complementary strategies for the development of conservation-oriented upland farming. The first is the adoption of a problem solving approach aimed at identifying, the key constraints to and opportunities

for expanding output on site-specific basis. The second, is the promotion of *vetiveria zinznioides* (popularly known as vetiver grass) *as a contour hedgerow.* However, SCOR experience as well as experiences elsewhere suggest that, vetiver grass, which can be used as an excellent soil conservation measure under certain conditions, does not thrive well under all conditions. (conservation techniques and conservation farming approaches adopted in SCOR will be discussed later in chapter 6). Moreover, there exist a variety of conservation farming measures, that could be used profitably by resource poor small farmers. These would include: selection of crops and other agricultural, aquacultural and other enterprises or cropping systems which are environment friendly and at the same time earn profits to the farmer, agroforestry systems,[6] organic farming techniques, soil and water conservation measures, water harvesting methods etc.

Agroforestry Systems

Agroforestry systems can maintain the productivity of land and water resources in watersheds, especially the upstream sub watersheds, through reducing the export of plant nutrients, minimizing erosion and runoff losses, increasing the rate of natural nutrient inputs through the use of nitrogen-fixing plants, trees and food crops, and the judicious use of fertilizer to add nutrients from outside to the system (Vergara, Napolean T. 1985). Also agroforestry systems provide higher total biomass per unit area besides yielding different products such as fodder, fuel, fibre, fertilizer, fruits, fence materials etc. These systems use off-season rainfall and also utilize the moisture available in the zones below the root zones of other (ordinary) crops. Under rainfed conditions, deep percolation losses may vary from 20 to 25% of total rainfall, depending on the soil and climate conditions (Singh R.P. 1988). Agroforestry systems help in soil and water conservation. Moreover, agroforestry systems are capable of providing additional employment opportunities. Utilization of vulnerable or slopy lands under community agroforestry systems has been a major strategy of SCOR.

The Need for Information on Technology, Resources and Markets

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

[6] Agroforestry systems are defined as the growing of perennial woody tree species deliberately on the same land management system where crops and animals are raised (Singh R.P., 1988).

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., becomes important when attempting to discover new economic potentials. As such, the establishment of appropriate information systems will become an important integral component of SCOR.

The Need for Support Services and Group Action

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 cost to farmers, particularly smallholders, often includes a high proportion of "transaction costs" and those monetary and non-monetary payments that are associated with obtaining approvals, ensuring timely availability of inputs, etc. Some of these input constraints could be reduced through organized group action. This is important in two aspects, (1) the impact on the ability to organize for group economic activities, and (2) the availability of supporting services when they attempt to expand and/or modify their economic activities. Under such circumstances, organizing into groups with appropriate legal rights provides an effective mechanism for overcoming these difficulties.

It is also suggested that the watershed management strategy should also be user-oriented and participatory. The approach will be to increase the share of control of the natural resources of the watershed users and support them as they attempt to intensify, expand, or move into new economic activities. To achieve economics of scale, and utilize group solidarity to promote responsible behavior, the group action can be used as the primary vehicle.

In a sub-/micro watershed where several farmers are operating, generally on smallholdings, cooperation between farmers and group action are required to achieve full benefits of conservation efforts, e.g., planting along contours or graded bunds or regulate runoff and arrest soil movement, etc., need to continue across the private lands. Under such circumstances too, farmer/user organizations (at lower levels) and farmer/user companies (at higher levels on commercial purposes) with appropriate legal rights provide effective mechanisms for overcoming the 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.

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.

The Need for Group Action. It is suggested that the watershed management strategy be user-oriented and participatory. The approach will be 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 utilize group solidarity to promote responsible behavior, the *group action* can be used as the primary vehicle. For example, the 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 can be reduced through organized group action. Small farmers and other small scale individual natural resources users experience significant difficulties when they attempt to expand and/or modify their economic activities.

The Need for a Coordinated Effort

The physical boundaries of the watersheds are not necessarily congruent with the boundaries of the administrative or constituent political entities. This situation complicates the process of planning and implementation. Hence, coordination between the relevant line agencies and between local authorities of such administrative units as well as the coordination / integration of relevant projects and programs will become important in watershed management.

An integrated participatory approach is therefore useful to overcome these problems and to make a substantial effort in linkage and coordination. Integrated planning and improved coordination of natural resources (land and water)-related activities and projects on a watershed basis should be the focus of watershed management. Institutionalization of such an approach will shift the strategy of development of land and water resources (in the watersheds) from an uncoordinated "project" or "activity" mode to a well-coordinated "program" mode.

Shared Control and Usufructuary Rights

Land (and water) tenurial security is widely claimed to be a major factor that impacts on the conservation and productive use of land and water resources. The degree of control the users can exercise over land and water resources relates to the security of tenure under which they use specific areas of land (or volumes of water) over a specific period of time. It is argued that security of tenure will reduce the users' temptation for exploitative use of natural resources, and allow recovery of investment in production and environment protection practices that have relatively long cost-recovery periods. For example, the 1957 nationalization of Nepal's village forests by the government converted a common property regime at the village level into a state property regime. Due to villagers' perception that their forests have been expropriated by the government, the resource became an open access while villages felt free to squander. Such relations, however, do not exist universally, for example, a case is reported from Thailand where more farmers (69%) felt that land tenure made no difference to farming practices and did not limit the

establishment of permanent tree crops. In fact, some farmers asserted that planting fruit trees was a way for them to make a more secure claim to the land they were farming (Bromley and Cerna 1989).

A study conducted by SCOR revealed that there is no significant relationship between the landownership pattern and productivity of farmers. It is argued that "sense of security in ownership" (and not necessarily the legally accepted perfect private title) is a sufficient condition for motivating farmers in the adoption of appropriate production and conservation measures in natural resources management (Jayawardene et al., 1996 and chap. 8 and 9 for a detailed analysis and SCOR interventions on this central theme of SCOR).

Security of tenure is usually assured by ownership title, but other mechanisms are available to provide effective security. For example, irrigation schemes in Sri Lanka offer de facto security as do various types of traditional tenancy. Hence, a different interpretation of the property rights defining in the context of "sense of ownership" or individual and communal access to natural resources, based on culture, local values, and local market conditions, is necessary. Instead of exclusive individual property rights (for example, a complete transfer of ownership of state land to individuals), the concept of shared control, usufructuary rights, longer-term lease arrangements and state-user partnerships are suggested as effective alternatives that are acceptable to both users and the state. Such alternatives will provide a "sense of ownership" which is a necessary condition for sustainable production/integrating environmental concerns into production goals in a watershed context.

Thus, SCOR assumed that any conservation or environment management approach should consider those physical, socioeconomic, and institutional 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 conservation." *In other words, sustainable agricultural development in the broad context of rural development in these areas would benefit from a watershed-based integrated approach that not only optimizes the production, but also ensures the protection of the natural resources or production base with active participation of the users concerned.* Experience in the major irrigated commands in many countries 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. Designers of SCOR realized, such a collaborative effort could be more difficult in the context of the full watershed, but *there is a reasonable probability of success, and the potential for major benefits.*

User-Oriented/Participatory Approach

It is clear from the above discussion that in watersheds where a large number of small farmers are engaged, the environmental problems mainly result from the cumulative effect of the actions of many individuals. Hence, the remedial measures should be user-oriented and participatory. In addition, people in different "zones" or components of the

watershed having access to different aspects of the natural resources base may have different environment conditions, may be engaged in different economic activities, and may be of different social and/or cultural backgrounds. 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 shifting cultivation in upper watersheds (or catchment areas of irrigation reservoirs) and farming in the irrigated commands and drainage areas (downstream) can be influenced by such socioeconomic factors as land tenure, power structure, village institutions, community traditions, seasonal competition for labor, food security, etc. As people are the final decision makers regarding the use of land, water, and other resources, they not only influence these linkages and relationships but also can change the production potential of such resources either favorably or adversely.

Under such circumstances, farmers/users organizations (at lower levels) and farmer/user companies (at higher levels on commercial purposes) with appropriate legal rights provide effective mechanisms for overcoming these difficulties. Therefore, SCOR adopted a user-oriented and participatory strategy.

The project intended to assist the Government of Sri Lanka to identify, develop, and field-test strategies for increasing the sustainable productivity of natural resources, mainly land and water, in a watershed context. These strategies were expected to strike a balance between "production" and "protection" (or conservation) in relation to the utilization of land and water resources through the intensification and institutionalization of participatory processes coupled with appropriate technologies, and also to identify cost-effective sustainable programs and policies that may be replicable in other watersheds of Sri Lanka and elsewhere under similar conditions. Key aspects of this approach are:

- soil and water conservation;
- water saving; water quality improvements in watersheds;
- profitable enterprises - mainly cropping patterns and practices;
- that are conducive to sustainable utilization of land and water resources; community participation in resource use planning and implementation,
- collective action by users groups,
- organizations and small farmer companies;
- natural resource tenurial security and state-user partnerships in natural resources management.

The project objectives were:

- to improve the *incentive* and *institutional context* in which agriculture and other commercial activities are undertaken in the selected watersheds, so as to ensure both productivity and sustainability;

- to get resource users 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 levals;*
- to enhance governmental, groups, and organizations' *information and understanding about potentials and prospects for market-oriented conservation* (in other words conservation based production); and
- to strengthen the capacity of stakeholders (especially the Government authorities at different levels) in *planning for land and water resources utilization in an integrated manner.*

The conservation strategy tested in SCOR is different from traditional approaches. SCOR hypothesizes that a *package* of measures, such as type of vegetation/crops, appropriate land and water saving and conservation practices, user rights to earn economic and other benefits from the (participatory) conservation of natural resources, are more effective in protecting environmentally fragile lands in water basins and watersheds. The "package" was selected jointly by the professionals and users. Important conservation and production or other profitable uses of natural resources were incorporated into this package.

SCOR operated at multiple levels, ranging from resource users or farmers' field to national policy. Field interventions of SCOR action-research has being tested and demonstrated in over 30 sub-watersheds of the two pilot watersheds.

The selected sub-watersheds for SCOR action-research were contiguous areas of manageable size, having characteristic profiles of ecological, socioeconomic and environmental features similar to those of the respective main watersheds. Size of these selected pilot sub-watersheds ranged from about 200 to 1,000 hectares. Action has being taken through a participatory process to learn, test, and demonstrate an "ideal" land use pattern with due emphasis on production and conservation. This participatory approach of developing methodologies for combining technology, organizations, and resources would illustrate the various production-conservation elements with their intimate relationships, that will have to be incorporated in the management of watersheds or ecosystems in a sustainable manner. Micro concentration on *contiguous areas* or tank ecosystems within which "every inch of surface" has been carefully planned and monitored for the impacts of participatory research interventions is a unique characteristic of SCOR.

In the sub-watershed, participatory appraisal of the characteristics of resource uses and users and mapping of *current* resource use were done by groups comprising resource users/farmers, IIMI-SCOR professionals, and catalysts. The SCOR catalysts took the lead role in preparing the resource use maps and recording information. A participatory resource management "mini project" was formulated for each pilot sub-watershed. The "mini project" aimed at changing the present *land and water use pattern to a more profitable and diversified resource use by combining production and conservation using appropriate technologies/ techniques, novel shared control arrangements and resource augmentation.* New commercial enterprises and *soil and water conservation* practices in a typical *sub-watershed in the Huruluwewa watershed included: integrated wet and dry season* water

management in command areas (e.g., water saving techniques to improve cropping intensity and introducing short-duration commercial crops in the dry season, cultivation of medicinal plants, fruits and vegetables in *chena* (shifting cultivation areas), processing industry for medicinal plants, stabilized cropping patterns for *chena* (shifting cultivation) and highlands, contour bunds to cover the entire area, water harvesting techniques, etc.[7] This means that such pilot sub-watersheds have "action plans" that guide them along a path to the planned future from the current status of land and water resource use.

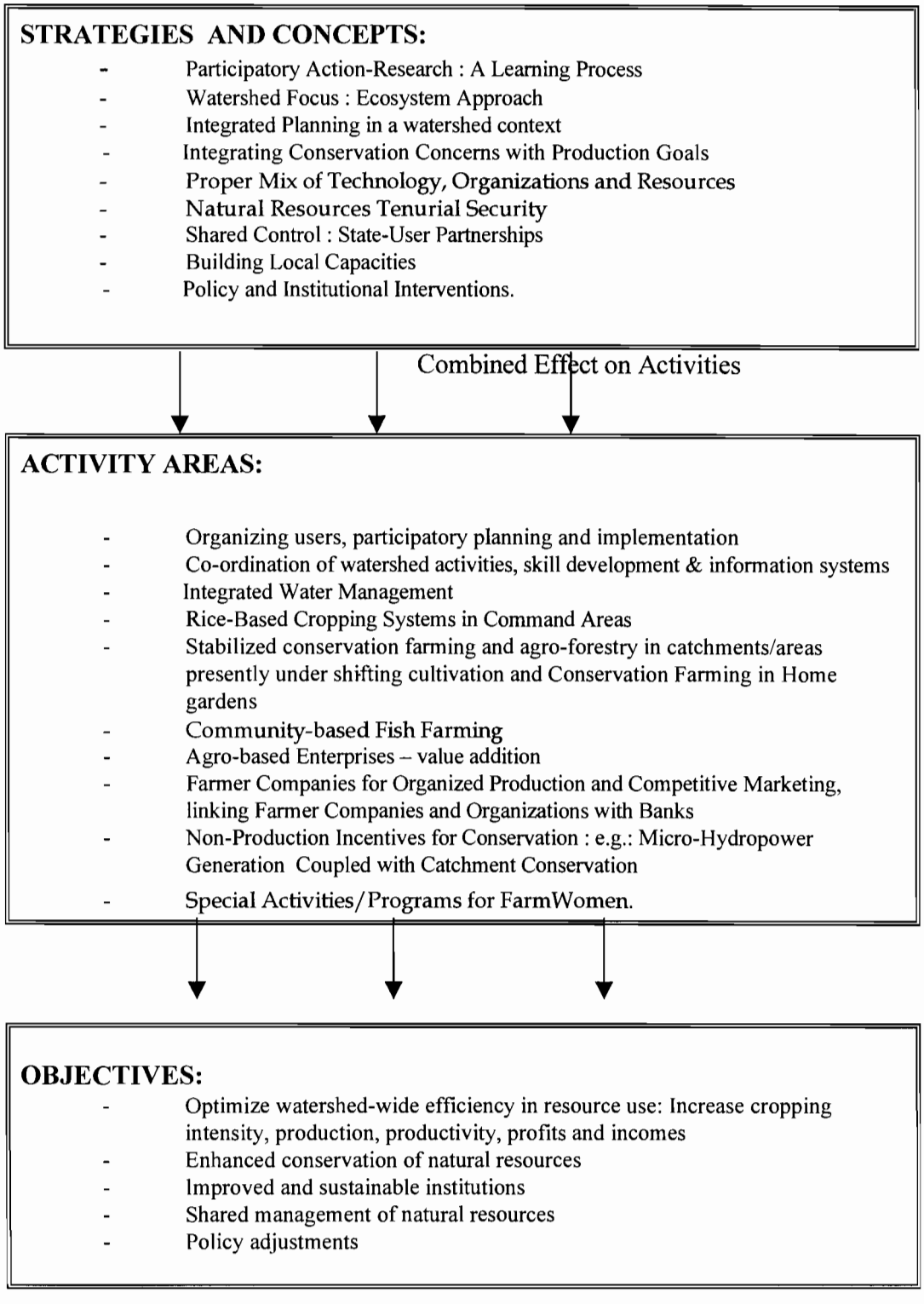
The main thrust of SCOR experimentation could be summed up as an attempt to internalize in a watershed context, a combined strategy of effective application of already known and new technology, strengthening/forming appropriate organizations including small farmer companies to take advantage of scale, pool resources, securing credit from banks, secure assured markets and schedule production, add value to agri-products, acquire appropriate managerial competence, etc., and resources augmentation through measures such as profitable conservation, water harvesting, and human resources development, and innovative policy changes relating to natural resources management coupled with new state-user partnerships based on viability testing and validation on the ground.

SCOR objectives/goals, strategies and major activity areas are summarized in figure 1.4

It is believed that an analytical study of key processes followed in developing and implementing SCOR's innovative concepts, approaches, and strategies for market-oriented and integrated land and water management in a watershed context through shared control mechanisms *and more importantly, the constraints encountered* will be of generic value for the adoption of the management model elsewhere.

[7] In the *Nilwala* watershed similar activities have been included in "mini projects" developed for selected sample sub-watersheds. Because tea occupied nearly half of the watershed area, special activities were included to enhance management while improving conservation. These included: regular maintenance of existing conservation measures, establishment of biological measures such as vetiver grass hedgerows, maintaining a good plucking table to minimize soil erosion and at the same time to improve yields, etc.

Figure 1.4 SCOR: Strategies/Concepts, Objectives and Activity Areas



The information base for this analysis includes: author's personal experience as the leader of the SCOR design (1992-1993) and as the leader of SCOR implementation (from its inception in 1993 till the end of 1997,[8] published research papers and SCOR reports on concepts, approaches, strategies, and monitoring and evaluation. The key components of the SCOR process will be examined in the next few chapters as follows:

- processes involved in the project design (chapter 2),
- description of SCOR project- strategy, activities, field-testing methods, expected policy impact, constraints (chapter 3),
- participatory resources use planning including mapping of land use, including interaction and collaboration with governmental agencies (chapter 4),
- progress monitoring and evaluation of processes, with special emphasis on participatory evaluation and spatial distribution of effects (chapter 5),
- production and resource conservation interventions in sub-watersheds, transfer and adoption of technologies in cropping pattern changes, soil conservation and water saving, quantified effects and impacts (chapter 6),
- a special area of project intervention, participatory micro-hydropower generation and community management of hydro catchment for conservation and profits (chapter 7),
- an in-depth analysis of impact of land and water tenure on production (chapter 8),
- SCOR interventions on tenurial conditions with special emphasis on state-user partnership and "shared management" (chapter 9),
- interventions in policy and institutions, small farmer companies and related entrepreneurial development, linking the organized private sector with farmer companies (chapter 10),
- a strategy proposed for small farmers: reconciling profit goals with environmental concerns (chapter 11).

[8] The project closed in September 1998.

CHAPTER 2

PARTICIPATORY DESIGN OF PROJECTS[1]

This chapter analyzes the processes and experiences of a participatory approach for project design adopted by SCOR. It briefly reviews participatory ideologies and methodologies adopted in the design of projects in Sri Lanka and elsewhere, compares these with the SCOR project design process and identifies the main features and the procedures of a participatory project design process.[2]

PROJECTS IN DEVELOPMENT

Flow of Funds and Modes of Assistance

The flow of capital and technical resources from high- to low-income countries in the form of projects is a well-known feature in development assistance during the last five decades. This assistance has been channeled mainly through bilateral sources including a large number of developed countries, and funding agencies such as the Japanese International Cooperation Agency (JICA), the United States Agency for International Development (USAID) etc., and multilateral institutions such as the World Bank, Asian and African Development Banks, the United Nations, etc. "In 1990 the countries in the OECD were disbursing over $ 55 billion on concessional terms (~~The~~ World Bank 1992). Countries such as New Zealand, Austria, and the United States contributed between .21 to .25 percent of their gross domestic product (GDP) to foreign assistance while Norway, Denmark, and the Netherlands made loans and grants representing .93 to 1.17 per cent of the GDP" {~~Muhamma~~d Aslam and ~~Paul N.~~ Wilson, ~~International Commission on Irrigation and Drainage (ICID) Journal, 44 (1): 42,~~ 1995}. The funding of projects is of two types, namely, grant and loan funding.

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[1] This chapter is primarily based on the notes prepared by Paul Rajasekara and S. Widanapathirana. Both of them were members of the Iimi SCOR design team. Gilbert Levine and Norman Upholf of Cornell University provided substantial inputs, as consultants. Peter Bloc, Wisconsin University also provided consultancy inputs in land tenure aspects. This autor was the leader of the design team.

[2] The design process was financed by USAID and facilitated by IIMI. A core group of senior government officials spearheaded the design process.

Project Coverage, Types, and Extent

The project coverage has extended to almost all the sectors of a country's economy. In Sri Lanka, for instance, since independence, the projects first funded, mainly, irrigation development. The investments required were colossal and beyond the reach of the government budgetary allocation alone. Subsequently, project funding spread into other areas, and at present, there are a large number of projects covering all sectors of the economy from natural resources management to infrastructure development including all the service sectors. At the time of designing the SCOR project there were over 50 projects (ongoing and newly identified) in the natural resources management (land, water, and environment) sector alone. The total amount of grants/loans for these projects amounted to Rs 21,649 million (approximately US$435 million at the 1993 exchange rate).[3] To learn lessons and strengthen SCOR, these projects have been reviewed during the design process.

General Objectives and Performance of Projects

The general objectives of providing project assistance has been to foster development in the recipient countries. It is well-known that the achievement of these objectives have been tremendous in respect of some of the countries in Western Europe, Japan, South Korea, Taiwan, etc. However, in most developing-countries project performances and their actual impact on a country's sustainable development have been disappointing due to factors such as their political instability, ethnic warfare, corruption, weaknesses in government policy planning and implementation machinery and modes, and natural disasters. In countries where these constraints were not so serious, the project performance has been below expectations and the flow of benefits of development to intended beneficiaries has not been fully realized.

According to the Project Benefit Monitoring and Evaluation (PBME) studies of the ADB[4] "on average only 60 per cent of Bank-assisted Projects fully achieve their objectives. Various factors account for less-than-expected performance, many of which are outside the control of both the Bank and the Executing Agency. However, the main factor affecting performance is largely associated with weak project planning, that is failure to anticipate factors that will interfere with project success."

Lack of Participation as a Cause of Poor Project Performance:

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[3] Refer annex ix in SCOR Project Design Paper - Sept. 1992 - IIMI (unpublished).

[4] Project Benefit Monitoring and Evaluation - Evaluation Paper - Gene Owens, Senior Project Economist and George B. Whitlam, Senior Evaluation Specialist, ADB Page 63, Summary of Proceedings of ADB Regional Seminar on Performance Evaluation in Asia and the Pacific, Kuala Lumpur, 11 to 14 March 1992.

Many development analysts[5] have identified the lack of an effective linkage among the donor agencies, the recipient government agencies, and the beneficiaries resulting in a tendency among almost all governments/donor agencies to impose plans on people without securing their participation, as an important factor, among the others that have accounted for poor project performance. "The basic argument of the participatory approach to economic development is that there is a weak, or nonexistent linkage between development professionals and the intended beneficiaries of development projects. According to the proponents of the participatory methodology, the lack of constructive interaction between these two groups biases project design, implementation, and evaluation, and leads to ineffective and inefficient development interventions". (Alsam and Wilson, ~~ICID Journal, 44:1,~~ 1995)

Attempts Made to Improve Beneficiary Participation in Design, Implementation, and Valuation of Projects—A Review of Selected Literature

In general, attempts made by project planners and sponsors to achieve project success through securing beneficiary participation in project implementation have been successful. "Finsterbush and Van Wicklin (1987) reviewed 52 projects sponsored by the U.S. Agency for International Development and found evidence that beneficiary participation during the project implementation phase increased project effectiveness" (Aslam and Wilson, ICID Journal 44 (1): 43)

In Sri Lanka, even though the projects have contributed substantially to development, mainly, of the irrigation sector, there have been several failures in the past. It was found in the early 1970s that the failures were mainly due to lack of beneficiary participation in project implementation. Projects such as the Tank Irrigation Modernization Project (TIMP), were conspicuous by their lack of beneficiary involvement in implementation (Abeysekera 1986). This led to an interesting outcome whereby provision was made to obtain people's participation in all irrigation development projects planned after the mid-1970s. Participation of the beneficiaries in implementation is now considered as a very important requirement in irrigation and other projects such as forestry, water supply, etc. All the irrigation projects which were designed particularly from the latter part of the 1980s, had a predetermined and more emphasized component on beneficiary participation.

The Degree of Beneficiary Participation in the Design of Projects

Even after designing strategies for the involvement of the beneficiaries in project implementation, there have been failures in realizing the intended objectives of projects. These failures have been subsequently identified as resulting from the lack of still another element of participation, namely, *the participation of the beneficiaries in the very design of projects.* The next section discusses the importance of beneficiary participation in the design of projects.

[5] For example A. Waterston - Development Planning - Lessons of Experience; Chambers 1983; Salmen, 1987.

The most important stage of a project cycle is the design stage since it is at this stage that the shape and nature of the project are determined. It is the basis on which funds are allocated to the projects by the donor agencies and its activities implemented. Beneficiary participation at this stage, therefore, is considered crucial to successful project performance.

Rondinelli (1983) observes that development professionals seek quantitative, scientific solutions to problems at the expense of taking time to acquire knowledge and insights from the intended beneficiaries. According to the author, "knowledge of the local environment and people always proves invaluable in the development professional's decision-making processes. A more balanced flow of perceptions, information, and resources between beneficiaries and development professionals is a necessary condition for project success" (Quoted in Aslam and Wilson 1995).

Cernea (1983) and Bagadion and Korten (1985) have reported two examples of application of participatory methodology in project design. One refers to the design of Mexico's PIDR (Integrated Program for Rural Development Project) where farmer perspectives were recognized as a vital input. The other case refers to a project for construction and maintenance of irrigation channels in the Philippines where a participatory design effort bridged the gap between the needs of the target group and the implementation of the project. It was recognized that local knowledge combined with modern technical skills, resulted in a project design with fewer flaws and errors.

Several constraints hinder the adoption of beneficiary participatory methodologies in project design. In the case of grant funds donor agencies usually believe that they have some right to insist the governments to comply fully with the conditions of grant. It should be noted here that many donors and recipient governments use the term *grants* for loans as well. Loans, however, are not outright grants. In the case of loans, in certain projects, some flexibility in adherence to laid down conditions is available to governments. At the design stage of projects, the recipient governments have found it difficult to satisfy the conditions and limitations for making available grants or loans while ensuring that the projects are designed to meet the real needs of a country because

> The planning capacity within government agencies is generally weak. In the hands of donors, the recipient agencies become voiceless yielding to conditions that may not respond to beneficiary needs. Resulting design weaknesses of projects account for the poor ability for implementation. Here, the problem is mainly a result of nonparticipation of the clients in the design of the project.

> A host country government is not in a position to stipulate its own requirements since the country is badly in need of a loan to finance an important pressing need. Additionally, the loan-funded projects are tied up with various requirements that may not be beneficial to the country, but a government finds it difficult to reject them.

Mode of Project Design

The design of a project can be accomplished either through a top-down or a bottom-up approach. The top-down approach involves the design spearheaded by a group of "outside" people who are experienced in similar exercises elsewhere. The people in the team may not usually be affected by the outcome of the project. They may usually not be fully aware of the conditions and the problems in the project area or its people for whom the project is expected serve and benefit. The top-down approach is the traditional method of project design, which is still followed by many development agencies and by the NGOs.

The process begins by assembling a team to study and evaluate a pre-identified problem, frame the course of action necessary to solve the problem, and identify and quantify inputs including the time frame within which the project activities have to be accomplished. In this process, the design team begins with the review of relevant material, organizes a series of discussions with the host country agency staff (since they are easily accessible) who have put forward the request, may or may not make some field visits to ask some questions from the affected beneficiaries, and finally develops the proposal. The entire responsibility for developing the project document lies with the team (particularly with its leader).

Past experience shows that the design is normally done in accordance with the manner the design team[6] feels fit rather than what the beneficiaries consider best for themselves considering the sociocultural and area-specific factors. Lack of participation of all parties involved, agency staff, design team members, local officials, and the beneficiaries, makes the project document less transparent. The task of the design team ends with the submission of the document to the host country government. Certain design teams do not even consider the necessity of giving a copy of the draft document to the recipient government for critical review and study before the team completes its mission. Once the design team finalizes the document, it is formally sent to the recipient government for study and suggestions for improvement, if any. Many governments, at this stage, usually do not wish to undertake a thorough review of the document or to make suggestions for its improvement due to two reasons. First, they may be under pressure by the donor to approve the document, which in some cases will have to be done within a specified time frame with penalties for delay. Second, the funds are provided by the donor who will not be much flexible even if the recipient makes the suggestions. This is more so if the project is a grant. Hence, the project document is approved.

The traditional project design process is wrought with several disadvantages such as inadequate preparations to identify the parameters and the lack of transparency of the design document and its contents leading to reluctant acceptance by the host country governments, and

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[6] For instance, the project paper for phase II of Kirindi Oya Irrigation and Settlement Project, KOISP, Sri Lanka says that the document (project) is based on the consultant's project preparation report, discussions with government officials, and the mission findings in the field. It does not say whether the findings of the mission were discussed with the government officials and whether the proposals contained in the document were acceptable to the government officials. It does not indicate whether the proposals were discussed with the primary beneficiaries. In short, the participatory element is "totally" missing from the design process.

several other problems leading to poor ability in implementation, weak support by the beneficiaries if implemented, and low level of response to the actual needs. Because of the short time involved, the design team cannot recognize all the important parameters and the arguments may not be valid. The lack of transparency of the document in all stages of its evolution may be even subject to manipulations by the donor to suit its advantages. All these lead to poor ability in implementation and failure to accomplish the final goal of the project.

The *bottom-up design approach*, on the other hand, is expected to be carried out with greater beneficiary participation. Given the fact that local people have no experiences in project design, what in fact happens is that a team that works with the local people including the government agencies take the responsibility for the preparation of the document. Several strategies are adopted to work with the people such as meetings, workshops, dialogues, and group consultations. Some merits of this approach should be mentioned. The ideas and suggestions are made by the people and they have a feeling of belonging to the project. The ideas are workable as they are much closer to the reality. Since the government agencies/departments have worked very closely with the design process, they may be willing to approve the project. The ideas, strategies, and methodologies are owned by the people themselves, and this is another reason to give the consent for its approval once formulated. The final outcome is improved ability for implementation and greater accountability to the project.

There are several arrangements for the design of a project such as a donor/loan agency single/team member design, team design with minimal host country participation, single member/team of donor/loan agency with full participation of host country officials plus beneficiary participation. It is the last approach that was adopted in the design of the SCOR project.

The next section examines the reasons for adopting a participatory approach to the design of the SCOR project, the process of its accomplishment, and the main merits of this unique design process.

THE DESIGN OF THE SCOR PROJECT

The USAID mission in Colombo indicated its interest in providing grant funds for the design of a project on land and water resources utilization in Sri Lanka. Accordingly, a study mission comprising three expatriates and one local specialist were fielded and the design work started in Colombo early in 1991. The duration of this mission was 4 weeks. The mission prepared what is called a Project Identification Document (PID) by the end of the period. PID was expected to be followed by the design of the Project Paper (PP).

The main focus of the PID was on the concept of 'shared control of resources' as a means to increase productivity and profitability of the natural resources base in Sri Lanka. The objective of the proposed project as surfaced by the PID was to increase local control of land and water resources by accelerating changes in regulatory and organizational structures of control.

The PID highlighted the tight controls exercised by the government on the utilization of land resources of the country and pointed out the need for relaxing these controls for the efficient utilization of these resources. Accordingly, land was the main focus of the PID and the proposed project was given the title "Rights to Resources" (R2R). According to the PID, the important features expected out of the R2R project are stated below.

Goal : Increased shared control of natural resources through increased number of resource user organizations; increased extent cultivated, registered and titled land, and the establishment of a national water policy.

Purpose : Increasing local control of land and water resources by accelerating changes in regulatory and organizational structures of control.

Outcome : Institutional changes within the Ministry of Land, Irrigation and Mahaweli Development, MLIMD, improvements to local level organizational setup, and expansion of analytical capabilities and knowledge base.

Initial Problems

Since the land issue has been socioeconomically and politically sensitive in the country, the PID, which was focusing on the creating of a market for land, was a still more sensitive issue. Hence, the PID surfaced a series of questions that led to several discussions among the government officials involved in land-related matters. The majority of them raised the question "why only the rights issue of land" when there are a host of other problems affecting agricultural productivity of the country. Meantime, USAID continued to press that "rights to land" should be the focus of the proposed project. It had indicated its unwillingness to change this concept.

IIMI's Involvement in the Project Design

IIMI had several years of experience in working with government agencies in Sri Lanka on water-related issues. Because of its high credibility and capacity, USAID proposed to IIMI to undertake the design of the project. As mindful problems have already been raised by the government, IIMI proposed a novel design strategy. The salient features of the approach proposed by IIMI were :

- A senior group of government officials and a few independent senior professionals called the Core Group (CORE) should spearhead the design process.

- The design itself should be done through a series of discussions and consultations backed up by appropriate review of literature and analysis.

- All the documents produced should be fully transparent to all the parties involved.

IIMI appointed a four-member team of professionals as the Core Design Team (CDT) to facilitate the design to back up the Core Group and also to undertake specific reviews, as well as to do the necessary preparations including all aspects related to documentation. IIMI's role was merely to facilitate the design of the project while the overall directions were to be determined by the Core Group through a process of consultation and consensus building.

The USAID mission agreed to the above design process proposed by IIMI and the design itself commenced, first on an informal basis, since the decision of the USAID's office in New Delhi was still pending. The official time of commencement of the design was May 1992 when the mission approved the proposals and the funds were released.

Design Proper

At the outset of the design process, the core design team (CDT) identified a series of issues to be addressed by the proposed project. These were presented at the first meeting of the CORE for discussion when appropriate modifications were suggested. The meetings were cordial and the issues were discussed freely and in a professionally sound manner. Since the CORE felt that the resource users should be consulted in respect of some issues presented, it suggested the CDT to make field visits and to have consultation with the users. Accordingly, the CDT made field visits to a number of potential areas and the farmers were consulted. These meetings and discussions provided adequate materials and justifications for the proposals developed. It was during these discussions with the farmer organizations (FOs), that the need to consider the entire watershed as a whole, as the basic unit for planning and implementation, first emerged. This was quite different from what was agreed at the first meeting of the CORE where the focus was on the watershed as a whole ~~as proposed by farmers, which~~ did not receive attention. Subsequently, however, the approach adopted was to focus on the watershed as an ecosystem. For example, in the dry zone of Sri Lanka, a typical watershed includes the catchments, reservoirs, irrigated command areas, the highlands, and drainage area as the natural unit to base project activities. (A detailed account of this subject was given in chapter 1). The suggestion to focus on the "watershed" came from the farmers. During the design process a series of consultations were conducted with farmers in groups, in the North Central and Southern provinces. At a consultation meeting with the farmers of the Nachchaduwa irrigation scheme of the North Central Province (NCP), farmers quoted the degradation of the catchment of their tank (which is a major reservoir in the NCP) as a major problem. Farmers referred to this area as the "feeding" or "source" area of water. They believed that the destruction of forest and shifting or slash-and-burn cultivation has resulted in siltation of the

tank, reducing its storage capacity. They urged the design team to take measures to tackle this problem. During the discussion it was revealed that most of those who were engaged in shifting cultivation are the members of the second generation of original settlers in the irrigation scheme. It was revealed that because of the lack of alternative employment opportunities they had "encroached" into government-owned land in the catchment of the reservoir.

In each selected province, after a series of field visits, farmer consultation, and meetings with field-level officials, a workshop was organized and to which all the relevant provincial heads, selected field-level government officials, and other agencies were invited. At this workshop, the important issues were presented for study by the officials and for their ratification before inclusion in the proposed project.

The schedule in annex 2.I, gives the nature of participants who contributed to consultations at the field and district/provincial levels in the NCP of Sri Lanka.

A series of subsequent visits cum discussion sessions in the southern province were made culminating in a provincial workshop at Galle. The objectives of the tour as well as the workshop were similar to those of the NCP. The list of places visited and the major consultations held are given in annex 2.II & 2.III.

(a) Project Title

The suggested title given in the PID was "Rights to Resources" abbreviated R2R since "rights" issue became the focal point of the PID. The design team reviewed this issue and arrived at the title "Shared Control of Natural Resources—SCOR" from among some 28 titles submitted by the CDT. A local name representing the issues tackled by the project was not found at this stage.

(b) Subsequent Issues

A draft document containing the objectives, issues to be tackled, and the institutional arrangements was submitted to a national level workshop held on 6 July 1992. The workshop was attended by 28 officials representing 16 Sri Lankan and international centers during which 3 main problems were raised with regard to the contents of the document as given below.

The list of activities prepared was too long.
The field locations for the project had to be reviewed.
The budgetary limitations had to be considered.

The proposed set of activities was found to be too broad and it was considered impossible to tackle all of them. A request, therefore, was made to prioritize and limit the number of activities, to a manageable level. The CORE felt that all the activities listed were important

to bring about the desired benefits and cutting down some activities was like dissecting a human body and consequently it will not be possible to pursue the activities over time. Hence, the group agreed that no activities could be dropped from the draft document, but the degree of emphasis given to some activities could be reduced.

With regard to the project area, the USAID was of the view that it should be implemented first in the NCP and then spread into the SP, subject to its performance in the NCP. The stand taken by the CORE was that considering the socioeconomic pressure experienced by the SP and the opportunity for experimenting in a watershed different from the other selected from the NCP, the simultaneous implementation of the project in the NCP and SP would be important. After a process of discussions and dialogues, a consensus was reached among all the members of the CORE with regard to the location of the project and it was decided to implement the project in the SP as well.

The CORE suggested that the expatriate inputs be brought down as far as possible so that the accomplishment of all the proposed activities within the stipulated budget would be possible. The matter was thoroughly discussed by the CORE which finally convinced the USAID of its feasibility.

A comparison of the features and components of the PID developed through the traditional project design approach with that of the PID developed through the novel approach are summarized in table 2.1.

A perusal of the above schedule shows that the goal, purpose, locations, and the expected outcome of the PID and the PP are different. The above information also shows that the approach of the PID and the PP are different from one another. The PID focused on the changes at the higher level of the institutional system so as to bring about changes within the ministries and other institutional changes while the focus of PP is to work at lower levels and to recommend policy adjustments, only if they were found to be necessary to facilitate field-level activities. In other words, the impact of the project according to PID was to come from institutional changes at higher levels while the PP directly emphasized increase of productivity/institutional change at the field level.

As the project funds were given as a grant, the USAID could have insisted on conformity to its own policy in the development of the PP. However, the intervention of the CORE, adequate analysis, and the manner in which user and local-level official participation was obtained for the design process involving a large number of farmers prompted the USAID to appreciate the democratic process of information-gathering on which the PP was based, and the likelihood of fostering a feeling of ownership of the project among the government officials from the top to the field level and the farmers. Officials at the field level too appreciated the project since their views too were considered in its design.

Table 2.1. Comparison of project components in the PID and PP.

Component	PID	PP
Goal	To increase the shared control of natural resources.	To increase the sustainable productivity of the natural resources base.
Purpose	To increase local control of land and water resources through change of regulatory and organizational mechanisms.	To increase shared control of natural resources while conserving the environment through a proper combination of technology, organizations including state-user partnerships, resources, and appropriate policy.
Provinces	Central, Uva, Southern, and Sabaragamuwa.	North Central and Southern.
Expected Achievements	Institutional changes within MLIMD.	Improved quality of the environment and livelihood of the people with equity.
	Improvements to local level organizational structures.	Better environmental management.
	Expansion of analytical capabilities and knowledge base.	Increased agricultural and other productions.

Output of Participatory Project design Process—The SCOR Project

The output of the participatory project design process was the development of PP, the goal of which is 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 for the environment. The purpose is to increase shared control of natural resources in ways that contribute to intensified and sustainable agricultural production while conserving the physical, biological, and social environments, particularly those vulnerable to destructive pressures, through public-private partnerships. *The output of the participatory design process, namely, the Shared Control of Natural Resources Project, is described in the next chapter and the conceptual framework on which SCOR was built, was given in chapter 1.*

Summary and Conclusions

The process adopted for the design of SCOR had four features and, therefore, it was a unique exercise. They were the participatory approach, peer reviews, and analysis supported by field evidence and a process of continuous dialogue with the users and clarification of the issues with the local officials. USAID's willingness to accommodate the proposals made by the CORE was another positive aspect of the design process. A brief discussion of these aspects is given below.

With regard to the participatory approach to the project design, it is significant that as many as 413 people representing different hierarchical positions involved in land and water resources management were consulted in the design process. Some of them were consulted only once while others were consulted several times on separate occasions. A breakdown of the people consulted is given in the table 2.2.

Table 2.2. Participation of the people in the SCOR project design.

Type of Participant	Number
Resource users	132
Field-level officials	80
Provincial officials	61
National officials	30
NGOs	12
Private-sector representatives	2
National specialists	56
Expatriate specialists	25
Core group members	15*

* The members of the core group were consulted on eleven separate sessions.

The roles played by various participants were different. Some offered suggestions and ideas with regard to possible areas for SCOR project intervention. Others offered suggestions to improve the quality of the PP while still others critically reviewed the document. Some were involved throughout the design process. Their active participation is considered to be very important for the successful completion of the design process. The suggestions made by others helped reach consensus on the priorities and to convince USAID of the need for the interventions in the issues identified. The process of participation was facilitated by the democratic nature of transactions involved, inclusion in the CORE, officials from the two provinces, and the transparency of the document to all the participants at all the stages of its development. The latter gave the participants in the design process a feeling of ownership of the project that was being formulated. It has contributed towards better ability of implementing the project.

Second, the thoroughness of preparations and analyses performed utilizing all relevant and available experiences both local and outside should be highlighted. The process was facilitated by the CDT, utilization of both local and expatriate specialists, and in-depth review of field situations by making field visits and discussion with the resource users in the field.

Third, the flexibility of and willingness to accommodate suggestions made by the CORE on the part of the donor, USAID in this case, is considered to have contributed greatly to the design of SCOR. In this regard, it should be pointed out that USAID agreed to the participatory design process proposed by IIMI. If not for this, the approach itself would not have been possible since it is the donor who has the right to decide the nature of the outcome. Additionally, the very close interaction between the donor and the CORE as well as the CDT throughout the design process facilitated the acceptance of the document by USAID.

Salient Lessons Learnt

The design process adopted in the SCOR project paper offered several new experiences, which are as follows:

utilization of development aid for the country's interests
employment of a core group for guidance, reviews, and analysis
strategy to consult senior agency officials at national and provincial levels
direct involvement of senior officials at different levels

These issues are briefly discussed below :

The most important lesson was that contrary to the popular myth that donors are dictating terms with regard to grant-funded projects, this process depicted that development aid could in fact be better utilized in the best interest of the country. As shown by the SCOR design, the above was ensured by adopting a unique design strategy. SCOR was the first experience in the country where a grant-funded project was designed through the participatory process. The participatory nature of the design adopted where the donor was not in a position to make the decisions on behalf of the host country should also be pinpointed.

Second, the strength, unity, commitment, and seniority of the CORE and their dedication to the project design process have to be pointed out as very important factors, which facilitated the design process and improving its acceptability to the USAID. The inclusion of all relevant agency staff including those from the provinces and divisions, openness in transactions, and reaching a consensus before taking a decision have to be highlighted.

Third, the employment (by IIMI) of a team of professionals (CDT) with adequate field experience to collect necessary data and undertake analyses, make preparations, and present the results were found to be very important. This particular element facilitated decision making by the CORE, in addition to reviewing the necessary documents in time. The back-up support given

to the CORE by this team was remarkable. This was emphatically acknowledged by all the core group members, the donors, senior government officials, and others.

Finally, the involvement of national and provincial officials from the most senior levels down to field-level officials was a unique feature in project preparation not adopted earlier in the country. The CORE itself consisted of senior national-level officials and two officials from the two provinces and thereby the provincial and national thinking on natural resources management were harmonized. Because of this harmony, the implementation of the project was facilitated. This particular marriage was another feature appreciated by the donor.

General Conclusion

The most important lesson learnt through the SCOR design process was that contrary to the common belief that "donors dictate terms to recipient countries" when disbursing development grants, the experiences reported in this chapter show that such grants can be utilized for the best advantage of the country. For this purpose, the design itself was done in a participatory manner and secured the consensus of all those involved. The participatory aspect to project design was supported by a few key professionals who did the detailed analyses and preparations. Participation should go all the way down to the actual resource users and they must be consulted at length.

Annex 2.I - Affiliation of Core Group Members for SCOR Design

Ministry of Lands, Irrigation & Mahaweli Development

Secretary to State Minister for Irrigation
Secretary, Ministry of Lands & Land Alienation
Director, Irrigation Management Division
Director, Land Use Policy Planning Division
Director, Water Resources Development Division
Land Commissioner
Director of Irrigation
Director, Planning & Monitoring Unit, Mahaweli Authority of Sri Lanka

Ministry of Agricultural Development & Research

Head, Land Use Division, Department of Agriculture
Commissioner, Department of Agrarian Services

Ministry of Environment and Parliamentary Affairs

Secretary, Ministry of Environment

Provincial Councils

Government Agent, Polonnaruwa District
Land Commissioner, Southern Provincial Council

University

Professor of Geography, University of Sri Jayawardanapura

IIMI

Head, Sri Lanka Country Program/Leader SCOR Design Team

Annex 2.II - Consultations Held for SCOR Design in the North Central Province

Date	Place	Type of Consultation	No. of Participants
24.6.92	Rajangane	FO members in the major irrigation scheme	21
24.6.92	Ulankulama	FO members in the minor irrigation scheme	17
24.6.92	Meegassegama	FO members in the minor scheme and field officials	15
24.6.92	Anuradhapura	Chief Secretary and his staff	8
25.6.92	Nachchaduwa	FO members in the major scheme and officials	40
25.6.92	Polonnaruwa	Government Agent and district administrative staff	9
25.6.92	Hingurakgoda	Divisional Secretary and his staff	9
26.6.92	Polonnaruwa	FO members in the four major schemes and officials	59
26-27.6.92	Habarana	Workshop for provincial officials	43

ANNEX 2. III - Consultations Held for SCOR Design in the Southern Province

Date	Place	Type of Consultation	No. Participated
7.7.92	Galle	Chief Secretary and staff of Southern Provincial Council	9
8.7.92	Deniyaya	Members of User Organizations and Local Government staff	29
8.7.92	Udukawa	Members of Youth Organizations and Officials	21
9.7.92	Muruthawela	Members of Farmer Organizations and Officials	27
9.7.92	Nilwala	Members of Farmer' Organizations and Project Officials	20
10.7.92	Ginganga	Users and Officials in the Ginganga Flood Protection Scheme	26
20-11.7.92	Koggala	Workshop for Provincial and Field Officials	21

CHAPTER 3

SHARED CONTROL OF NATURAL RESOURCES PROJECT, SCOR

The *goal* of this *action-research* project was to develop and test strategies 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 SCOR Project expected to assist the Government of Sri Lanka to identify, develop, and field-test a strategy for increasing the sustainable productivity of natural resources, mainly land and water, in a watershed context. The strategy aimed at striking a balance between "production" and "protection" in relation to the utilization of land and water resources through the intensification and institutionalization of participatory and shared management processes coupled with appropriate technologies and resources. In addition, the project intended to identify policy changes that may help to adapt the SCOR strategy to other watersheds of the country and elsewhere, under similar conditions.

The SCOR strategy was to catalyze a process to motivate partners to use an integrated package of technology, organization, resources, and policies through collaborative initiatives. The appropriateness of this strategy has been tested and demonstrated in two pilot watersheds in the country (Huruluwewa in the North Central Province and Nilwala in the Southern Province) chosen for their different social, agricultural, and environmental characteristics. *In these pilot areas, appropriate production and conservation techniques and technologies have been used to augment and sustain the resource base and its productivity through the active involvement of small farmers in competitive markets, participatory processes, novel modes of tenurial arrangements, and state-user partnerships.*

Project Goal, Objectives, Strategy, and Activities

In this context, SCOR was designed as a participatory action-research project aimed at developing and testing a holistic interdisciplinary approach to integrate environmental and conservation concerns with production goals in the watershed context. 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.

In Sri Lanka, there is an urgent need for more intensive but environmentally appropriate utilization of the 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 smallholdings, 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' 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.

Organizing users into groups, facilitating a process of linking users with 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 "user- and market-oriented conservation" (such as scale constraints). SCOR, however, assumed 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 (TOR).* The project activities, (classified under four themes) are aimed at an appropriate mix of TOR.

The "protection" strategy of SCOR was different from traditional approaches. SCOR believed 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 (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 nonmonetary benefits, to the user to motivate her/him to protect natural resources.

The prime goal of this action-research project was to develop and test strategies 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 and health.*

Key aspects of the models that have been developed were, soil and water conservation, water saving and conjunctive use, water quality improvements in watersheds, cropping patterns and practices that are conducive to sustainable utilization of land and water resources, *natural resource tenurial security, community participation in resource use planning for development and state-user partnerships in natural resources management.*

The SCOR Project has pursued this purpose by assisting Sri Lanka to intensify sustainable productivity of land and water resources within selected watersheds while conserving the physical, biological, and social environments through novel management models and shared control by local user groups and the government, involving formal agreements and joint management.

Specific Objectives of SCOR

To achieve the aforesaid goal and overall objective, the following specific objective and hypotheses were used to validate the outcome of this action research process.

- *to develop and test strategies to optimize the* ***watershed-wide macro efficiencies in land and water resources use, with due regard to the environment;***

Assumptions

Watershed is the rational basic planning, coordinating, and implementing unit for integrated land and water management aimed at optimizing production and conservation goals. An effective and profitable combination of different sources of water, rain fall, river flow or reservoir storage, and groundwater, can be achieved (spatially and temporally) if basin watersheds/sub-watersheds are taken as planning and management units and if the hydrological and other interactions between different segments of watersheds/sub-watersheds are considered in production-protection strategies.

Integrated and participatory land and water management on the basis of watersheds improve land and water productivity and total production, and reduce conflicts between different uses and users.

Institutional linkages (e.g., federation of user organizations) between different segments (e.g., upstream and downstream) of the watershed promote profitable and sustainable use of land and water resources.

Institutional mechanisms/structures can be established at local, regional, and national levels to facilitate watershed planning.

- *To improve the incentive and institutional context in which land- and water-related activities are undertaken in pilot watersheds (Huruluwewa and Nilwala) through appropriate modes of production and state-user partnerships to ensure both the productivity and the sustainability of these resources.*
- *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.*

Assumptions

A proper mix of Technology, Organization/Institutions and Resources (TOR) will help integrate production goals with conservation concerns. *Then the production can be used as an incentive for conservation/protection.* An appropriate policy support such as sufficient security of tenure/"sense of ownership" is a necessary condition for promoting sustainable and environmentally friendly production.

- *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.*

  Assumptions

  Adequate knowledge of the natural resources base and resource use of a watershed are essential in designing, planning, and implementing management interventions, which would be mutually beneficial to different segments of the watershed, e.g., water use and reuse.
  Knowledge about resources base information systems and capacity building are necessary conditions for decentralized management of natural resources.

- *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."*

  Assumptions

  Improved coordination among projects, programs, and activities on a watershed basis will enhance the efficiency of land and water resources use in watersheds.
  Experiential learning and participatory approaches will improve the local capacity of planning, implementation, monitoring, and evaluation of watershed management.

  As explained earlier, the SCOR strategy was designed to be user-oriented and participatory. This means that much of the emphasis and activities of the project were at the field level in the selected watershed. The adopted approach was 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 was based upon group action as a primary vehicle for project implementation.*

Activities/Inputs and Outputs

In SCOR implementation, five major activity areas can be identified:

- **Participatory Appraisal and Planning Interventions:** Establishment of information and M&E systems, and special research studies.

- **User Groups, Organizations, and Small Farmer Companies for Local Control :** Forming, expanding, and strengthening resource user groups, especially through the introduction of environmentally sound production processes.

- **Tenure Rights:** Assistance to establish tenurial and usufructuary rights, and promoting user-state partnership in the control of land and water resources.

- **Sustainable Institutional Mechanisms for Replication and Viability (Linked to Item Two, above):** Small farmer companies, and formal links with user organizations and the private sector. Assistance to government agencies and NGOs, to replicate and expand SCOR activities, work with resource users, and monitor resource use in the watersheds.

- **Special Studies and Monitoring and Evaluation Systems**

Specific Inputs and Activities

The major activities that IIMI conducted to achieve the goal and objectives of SCOR are summarized below:

1. Participatory appraisal of natural resources including resource mapping, participatory planning, and M&E at sub-watershed and village levels, with the active involvement of users. Collective actions were also helpful in undertaking participatory land and water use planning at the watershed level, including soil and forest conservation, working with the administrative and technical personnel, and sharing in local knowledge about sustainable resources use under local conditions (chapter 5).

2. Working with user groups and government and local government departments and agencies and NGOs, etc., within watersheds in *facilitating and catalyzing* the implementation plans developed. Plans were provided for crop diversification or specialization depending on the circumstances, coordination of seasonal schedules, economizing on irrigation water, enhancing crop protection, making marketing more efficient and profitable, and value added production, etc. (chapters 6, 7, 9 and 10).

   Strengthen collective action: The project has supported federations/councils user groups and especially farmer companies that use resources in different parts of the watershed and whose uses have impacts on one another. Such organizations have helped improve coordination and cooperation not only among users but also between government agencies and user groups. For example, the user organizations were not confined to irrigated commands and for irrigated cultivation. Instead organizations have been established to link the activities of various components of the watershed such as reservoir, command, upper catchment, drainage, etc., and to link all of them to *companies* (chapter 10).

3. *Coordinating mechanisms for land- and water-related activities*: Watersheds have been overseen or managed by different government agencies and they often cross administrative boundaries. This made coherent planning, monitoring, and evaluation difficult. The project has paved the way to achieve more rational, long-term resources management through

administrative mechanisms that achieve interdepartmental and interjurisdictional coordination. The *Watershed Resource Management Teams* (WRMTs) proposals for project implementation have acted as the main mechanism for this, as they were interdepartmental and where the selected watershed crosses administrative boundaries, they were also interdivisional. During the project period, these institutional mechanisms proved to be effective. However, in the absence of follow-up work towards institutionalization, the long-term sustainability of such tested institutional mechanisms is questionable (chapter 10).

Another focus of project activity was to strengthen connections between provincial and divisional planning and implementation. The powers and capabilities of both these governmental levels have been determined and defined with respect to natural resources planning and management. The project facilitated productive working relations through committees (such as the provincial steering committee) between these two levels in the selected provinces, to serve as models for evolving productive relations elsewhere. The structures and procedures worked out included user participation or consultation as part of the coordination/linkage effort.

5. *Establishing Tenurial Security and Securing Shared Control of Resources:* A sense of security and a right to income streams generated from land and water resources are essential to the users' adoption of more sustainable land and water management practices. At a minimum, this must include guaranteed access to land and water resources by the user; the authority for users to determine and control the best uses of the resources, consistent with government guidelines for environmental sustainability and other reasonable considerations of society; and long-term (minimum 20 years) usufruct rights. (chapter 10)

SCOR, through diagnostic research has identified major policy constraints to such security of tenure. For some cases, security may best be obtained through group action and shared control mechanism. SCOR *undertook a program of field studies on the impacts of tenurial status on the use, productivity, and conservation of natural resources* (chapter 8).

In addition, SCOR *designed action-research and interventions*, and conducted them to find ways to overcome these constraints through policy reform measures. The project has also organized workshops and working groups, etc., to discuss and formulate policy changes, as and when necessary.

SCOR's major theme has been "shared management;" hence, this aspect was considered to be extremely important. More specifically, under this theme, SCOR performed the following activities under this component:

a. Examined and evaluated regulatory and legal mechanisms concerning land and other natural resources. The project was also ascertained the need for changes in the existing legislation to consolidate, modify and implement it as found appropriate.

Changest included were:

Strengthening resource policy analysis, and test novel approaches.

- Improving natural resources land tenure or leasing procedures between resource users and government.

- Land permitting and leasing to small farmers or farmer groups by the government (e.g.. Forest Department), Divisional Secretaries and Provincial Councils.
- Formal, transparent procedures for resolution of conflicts over resource rights.
- Interdisciplinary teams (e.g., Watershed Resources Management Teams, WRMT) to serve user groups, including the resolution of tenurial disputes.

6. The project had designed a model for an improved resource use information and monitoring system (chapter 7). This information system had supported the national, provincial, and division-level capabilities for monitoring and evaluating trends and performance in the target watersheds, with regard to shared control of natural resources. Such a system was useful to local communities and resource users to national, provincial, and divisional-level decision makers, to NGOs, and others. The elements of this M&E system included:

    - Information on new and sustainable technologies, involving both production and protection, flow to the resource user groups. The catalysts were the active agents for disseminating that information.

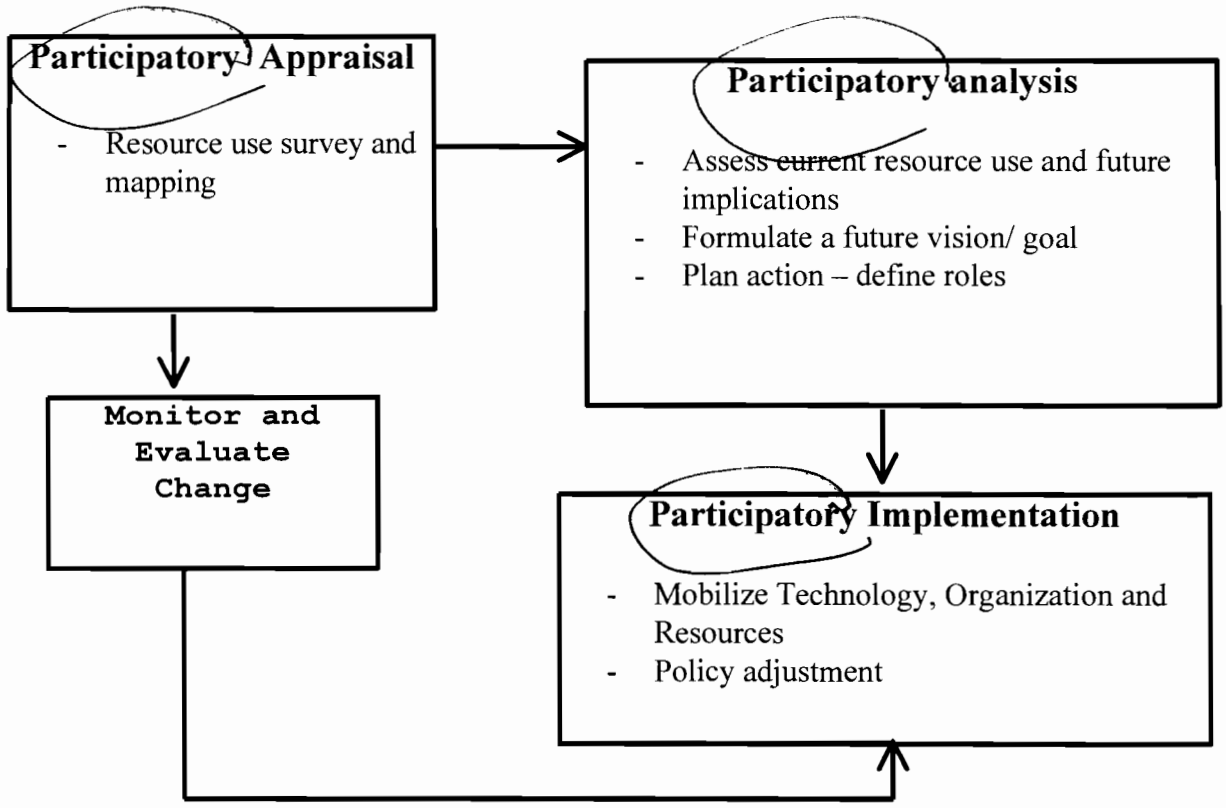
    - Information on products, and services such as banking and credit facilities, markets, and processing facilities available in the area, was similarly available to the user groups including companies (chapter 10). Access to up-to-date market information was also critical to most producers.

    - Information on potential of and changes to the natural resource base in the target areas needs to be obtained, aggregated, and made easily available to all the partners. Information collected included the number of user groups, the number of people using control practices, disputes arisen and resolved, types of production, new investments, and changes in vegetative cover (chapter 7).

THE PROCESS

The appropriateness of the SCOR approach has been demonstrated in two pilot watersheds of Sri Lanka, namely, Huruluwewa in the North Central Province and Nilwala in the Southern Province.(See annex 3.1 at the end of this chapter for watershed characteristics). These watersheds were chosen for their differing social, agricultural, and environmental characteristics. In these pilot areas, appropriate production and conservation techniques and technologies were used to augment and sustain the resource base and its productivity through participatory processes and novel modes of tenurial arrangement and state-user partnerships. Based on watershed and field-level experiences, relevant policy changes were formulated and programs designed to spread the benefits from SCOR through replication by other agencies. Hence, SCOR was operational at multiple levels. The SCOR implementation process is illustrated in figure 3. 1.

Figure 3.1 SCOR Learning Process



In each selected watershed a sample of sub-watersheds (or contiguous areas) was selected for action research on changes in land and water use (chapter 5). It should be noted, however, that the SCOR Project was in operation at multiple levels: farm and sub-watershed (focusing on micro level land and water use), division and watershed (focusing on integrated planning and interactions among sub-watersheds) and national (focusing on policy). Institutional/organizational development information systems and experiential training activities, etc., have cut across these levels.

At the outset, a participatory assessment of the current pattern of resource use 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.

Next, the project, through participatory processes, developed a "future vision" and 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.

Organizing users into groups and linking them with institutions such as markets, credit, and information/extension, and providing users/groups with appropriate legal rights provided an effective mechanism for overcoming such difficulties as scale constraints.

The "contiguous area" or "sub-watershed" approach of implementation has facilitated the testing of models and also illustrate the various production-protection elements along with their intimate relationships that have been incorporated in watershed management in order to produce a sustainable land and water resources base.

Moreover, this mode of operation with a contiguous area focus has facilitated a convenient geographical base for monitoring of the land and water resources management processes and activities, and evaluating their outputs and effects, leading to the anticipated impact.

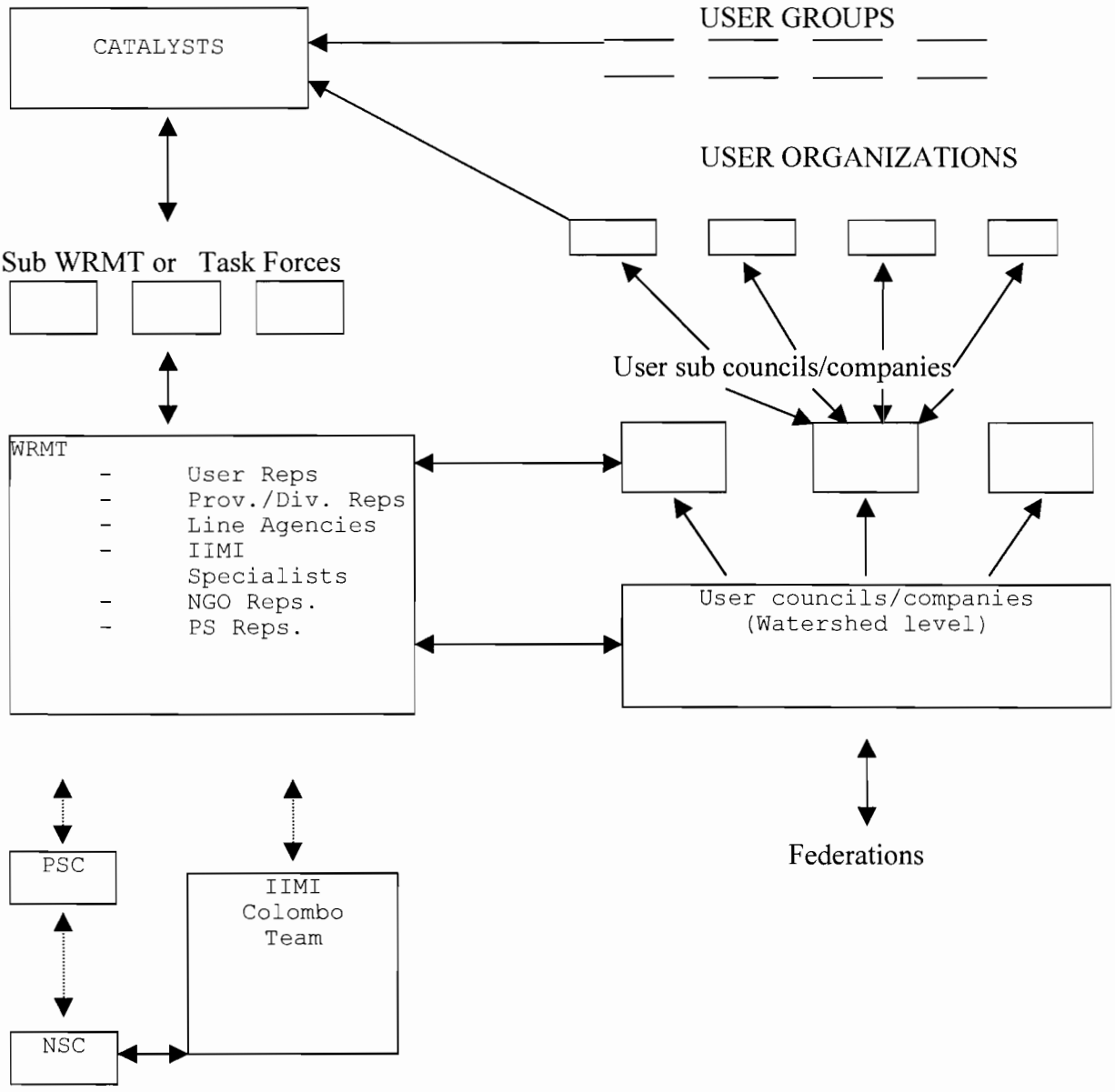
It should be noted that the sub-watersheds were selected on the basis of existing community interventions. For example, existing forest reserves were not included when there was no community/user activity. The irrigation command areas, catchments including "encroached forest areas," scrub/grassland, and croplands have been selected. It has been observed that settled communities are already cultivating in such areas without proper conservation methods. These farmers were organized into groups and their access to more profitable, yet environmentally sound, technologies/crops, resources, and markets has been improved.

5. SCOR PROJECT MANAGEMENT

Organizational Structure

For the effective management of the SCOR Project, it was necessary to ensure the high quality, adequacy, appropriateness, and timeliness of the flow of all necessary inputs: technical, financial, and administrative. Some of these flows have been direct and continuous while others have been occasional. The macro-micro linkages that have been established to facilitate these flows are illustrated in the following figure.

Figure 3.2 SCOR - Planned Organizational Stucture



NSC = National Steering Committee
PSC = Provincial Steering Committee
WRMT= Watershed Resources Management Team
Prov. = Provincial
Reps = Representatives
Div = Divisional
PS = Private Sector
IIMI = International Irrigation Management Institute

* Note: This was the "planned" structure. However, the number of user groups formed has been smaller than the number expected at the project design stage. Also, user councils/companies were not federated up to the national level.

A National Steering Committee (NSC) was established. The NSC will continued to provide a locus for policy dialogue and direction as well as the senior level oversight needed to monitor progress and resolve problems. Similarly, at provincial level, there were Provincial Steering Committees (PSC).

The National Steering Committee for SCOR comprised senior representatives of the relevant government agencies and project implementers. Its specific responsibilities were:

- Reviewing program progress on the basis of quarterly progress reports prepared by IIMI and also to examine any discrepancies between planned benchmarks and the progress actually achieved, and make recommendations for accelerating progress in the upcoming quarter.
- Reviewing and approving the quarterly and annual work plans, recommending such changes (in collaboration with IIMI and USAID) as may be needed to maintain satisfactory progress towards achieving overall program objectives.
- Facilitating progress by adding to the effort of those implementing the project in the field.
- Discussing and resolving specific policy and/or procedural impediments to implementation of sub-project activities or achievement of the project's objectives.

The Provincial Steering Committees (PSC) were also performed a similar role at the provincial level.

While the Steering Committee reviewed, coordinated, and advised, the responsibilities of the Watershed Resource Management Team (WRMT) were:

* Catalyzing all aspects of SCOR project implementation.

* Providing professional expertise for project implementation.

* Preparing work plans and budgets at the watershed and provincial levels.

* Conducting regular sub-project reviews and analyses.

* Arranging for specialized assistance as required, including preparation of terms of reference, work supervision, and evaluation.

* Providing guidance and technical advice to the PSC, NSC, Coordinating Committee, and catalysts, as required.

* Developing close links and working relationships with relevant government or other donor-funded projects operating in the area that address land, water, irrigation, forestry, and environmental issues.

* Monitoring sub-project progress and performance.

* Sub-contracting, through IIMI, project work to user organizations, NGOs, and others, and monitor performance of the contractors.

* Aggregating project reporting at the watershed and provincial levels.

* Participating in provincial and divisional meetings.

* Attending to other functions that may be decided upon by the NSC or PSCs.

Sub-Watershed Resource Management Teams, SWRMT, or Task Forces, were established to perform similar tasks at sub-watershed levels.

Linkages with Other Projects

The SCOR Project established working relationships with other projects relevant to its scope of work. One of the major objectives of the SCOR project was to enhance the capacity at Divisional and Provincial levels to integrate land and water resources management activities on a watershed basis. Hence, it was essential that the SCOR Project maintained close working relationships with other projects/programs (dealing with land and water resources) in pilot areas.

The SCOR concepts, strategies, and major areas of activity are summarized in Chapter 1. and the logical framework relating the project's activities and expected outputs to its goals and objectives is given in figure 3.3 and table 3.1.

Figure 3.3 – Logical Framework of SCOR

LOGICAL FRAMEWORK

Objective	Objectively Verifiable Indicators	Means of Verification	Risks and Assumptions
GOAL 1. Increase incomes of watershed resources users, particularly smallholder farmers 2. Improve living standards of watershed resources users 3. Reduce environmental degradation in watersheds 4. Increase local control of Watershed Resources Management	• Production in two watershed increased directly through interventions and production in several other areas will increase through spread effects • Reduced environmental degradation (incl. Slash and burn cultivation) • Watersheds stabilized with a sustainable production and conservation system • User share in managing watershed natural resources increased	• Monitoring and evaluation	Profit oriented conservation technologies and increased local control will provide incentives to users to reconcile production goals with environmental concerns.
OBJECTIVES 1. Optimize watershed-wide sustainable land and water use efficiency	1. - **Production** per family, unit of land and water increased - **Distribution** of income and profits increased	M & E Indicators	
2. Introduce and internalize profit-oriented conservation farming techniques eg: Agroforestry systems	2. Adoption of environmentally sound production practices increased	M & E Indicators	

Objective	Objectively Verifiable Indicators	Means of Verification	Risks and Assumptions
3. Strengthen capabilities of resources users, user organizations, user companies NGOs, Govt. agencies.	3. - No. Of organizations and companies - Measures of organizational strength - No. Of NGOs actively involved in watershed management	M & E Indicators	
4. Improve land (and water) tenurial arrangements	4. Policy changes on tenure, (include. Usufructuary rights) and decentralized management established	M & E Indicators	• Effects of policy changes will be demonstrated in SCOR pilot watersheds
5 . Improve co-ordination and linkages for land and water management in watersheds.	5 . Degree of integration and co-ordination of activities of Govt. Agencies, interactions between them and users	M & E Indicators	• Collaborative relationship among policy makers, other government partners resources users etc.

INPUTS

Increase Production Opportunities consistent with maintaining natural resources base (LAND AND WATER)

- Constraints analysis to identify incentive, knowledge and institutional factors
- Policy and process reform
- Local-level production planning
- Assess small farmer companies

Improve Coordination and linkage among agencies, donors, levels of government, resource uses and users

- Methodologies for Multi-level Participatory Planning
- Focus on watershed as integrated management unit: (Catchment areas, Control structures, Command areas & Drainage areas)
  - Federation of user groups
  - Administrative boundaries transcended by coordination mechanisms(WRMT)

- Provincial and divisional planning of land and water use
- Communication and cooperation with regard to programs and projects related to land and water use

Strengthen capabilities of resource user groups

- Create and assist user groups
- Provision of legal status and powers for resource user groups
- Support experiment with economic opportunities in agriculture, forestry, and other economic sectors
- Strengthen user groups' financial base and contribute to the local economy

Improve water and land tenure and other arrangements and access

- Examination and evaluation of policy, regulatory and legal mechanisms concerning land and water resources
- Applied research on existing land tenure including water arrangements as they affect production practices in catchment, command and drainage
- Experiment with land consolidation
- Support land titling

Strengthen Government, NGO and private sector capacities

- Information systems
- Develop planning, monitoring and evaluation capabilities at Provincial and Divisional levels.
- Non-governmental organizations to be engaged and strengthened for implementing goals
- Private sector organizations linked with resource users

For Strengthening the Capabilities of Resources User Groups

- Participatory Appraisal and Planning of Natural Resources Mgmt.
- Creation of user organizations & companies
- Legal Status and Powers for User Groups including formal agreements between user groups and state
- Skill Development and Training for User Groups
- Environmentally sound economic opportunities for user groups
- Appropriate technologies and techniques aimed at balancing production and protection: eg: selection of crops, cropping patterns and practices, inter and intra segment mgmt. of water, conservation farming, water saving techniques, conjunctive use of water acquaculture, agro-forestry.
- Supporting services and facilities for user groups, especially

Objective	Objectively Verifiable Indicators	Means of Verification	Risks and Assumptions
OUTPUTS			
• Targeted hectares under improved production and protection techniques	• 18,202 for life of project	• Survey M&E, PRA	
• Value of targeted investment by the resource users in environmentally sound production practices.	• Investment per year $(M) 1.0 for life of project	• Survey, M&E, PRA	
• Targeted land area covered by agreements between GSL and user groups (Extent now under protection and production practices expecting user rights)	• 522 Ha	• Survey, M&E, PRA	
• Farm households using improved environmental techniques	• 12, 689 households	• Survey, M&E, PRA	
• No. of policy/procedures, organisational changes exacted and adopted	• 6 policy changes	• Government Decisions	
• Number of user organisations conferred with legal status and powers	• 50 user groups	• Survey	

Objective	Objectively Verifiable Indicators	Means of Verification	Risks and Assumptions
• User groups organised/assisted to take joint responsibility for management of land and water resources	• 67 user groups	• M & E	
• Number of new commercial activities supported by linking to markets	• 160 commercial activities	• M & E	
• Land leasing/usufruct agreements issued for establishments and functioning of production companies and commercial activities	• 5	• M & E	
• Training opportunities provided to representatives of resource user groups, NGOs and other private sector organisations in participatory natural resources management	• 17,919 stake holders	• M & E	
• Number of officials trained in local level planning, user groups formation, support and collaboration	• 420 officials	• M & E	

Objective	Objectively Verifiable Indicators	Means of Verification	Risks and Assumptions
• Number of NGOs and private sector agencies providing technical, managerial and commercial information to user groups	• 15	• M & E	
• Research studies completed on natural resources issues	• 25 Publications/reports	• Published documents	

Table 3.1 Expected outputs of the Shared Control of Natural Resources Project.

Indicator	Unit/ No.	Target up to 30 Sept. 1998
1.Targeted areas under improved production and protection techniques	ha	18,202
2.Value of targeted investment by the resource users in environmentally sound production practices	$(million)	1.0
3.Targeted land area covered by agreements between the government and user groups. (Extent now under protection and production practices expecting user rights)	ha	522
4.Farm households using improved environmental techniques	#	12,689
5.No. of policy/procedures, organizational changes exacted and adopted	#	6
6. Number of user organizations conferred with legal status and powers	#	50
7. User groups organized/assisted to take joint responsibility for management of land and water resources	#	67
8. Number of new commercial activities supported by linking to markets	#	160
9. Land leasing/usufruct agreements issued for establishments and functioning of production companies and commercial activities	#	5
10. Training opportunities provided to representatives of resource user groups, NGOs, and other private sector organizations in participatory natural resources management	#	17,919
11. Number of officials trained in local-level planning, user groups formation, support and collaboration	#	420
12. Number of NGOs and private sector agencies providing technical, managerial, and commercial information to user groups	#	15
13. Research studies completed on natural resources issues	#	25

Source: SCOR Project Proposal, 1995 (Revised).

Annex 3.1
Watershed Characteristics

Huruluwewa Watershed: The upper part of the *Yan Oya* watershed is refer to as the "Huruluwewa watershed." It falls within the central dry zone of Sri Lanka and covers an extent of about 41,950 ha. Out of this, 39 % is classified as crop land and 27 % as scrub land. Homesteads cover 10% of the area. Paddy extent is 9.9%. Area under forest cover is low: 4.2 % "open forest" and 2 % dense forest. Huruluwewa is basically an agricultural watershed containing about 200 small tank, in addition to the major reservoir. The population is about 38,000. The watershed receives an average rain fall of about 1000 mm per annum. Rain fall distribution is basically bimodal with nearly 75% of precipirtation is received during the months of November, December and January. Period of May to August is "dry". The major river flowing across Huruluwewa is Yan Oya. (Land Use Policy Planning Division, Ministry of Agriculture, 1995). The same study revealed that, the original land allotments given under the irrigation settlement scheme has been subjected to fragmentation up to three generations. Fragmentation of agricultural holdings is an acute problem in Sri Lanka, specially in low land paddy in the dry zone.

The population of the Huruluwewa watershed is primarily a farming community. The farm size for rice varies between 0.2ha and 0.8ha (Jayawardane, Wijayaratna, and Rajasekara 1996). Most farmers of the area practice slash-and-burn cultivation resulting in clearing of large extents of forests. Inadequate nutrient-replenishing time due to continuous cultivation and shortened follow periods, loss of top soil and low moisture retention levels, etc., have contributed to the loss of fertility.

A man-made canal referred to as the "Feeder Canal" diverts Mahaweli water from Lenadora tank to Kandalama and Huruluwewa tanks. The canal is 33 km long from its point of origin at Lenadora up to the point of confluence with Sigiri Oya[1] at Sigiriya . The Feeder Canal is designed for a carrying capacity of 1,000 cusecs of which 700 cusecs are conveyed to the Kala Oya, diverted at Lenadora, and 300 cusecs are conveyed to Huruluwewa tank (150 cusecs) and Kandalama tank (200 cusecs) (Ariyaratne 1995). The Canal lies within the District Secretariat (DS) Divisions of Naula and Dambulla in the Matale District (see figure).

The soil of the area surrounding the Feeder Canal and Yan Oya consists of Low Humic Gley (LHG), favorable for rice cultivation, and Reddish Brown Earths (RBE), suitable for other field crops (OFCs) (Survey Department 1988). OFCs can be grown on this soil with irrigation in the dry season and with or without supplementary irrigation in the wet season. The terrain of the area is undulating with slopes between 0 and 8 percent (Survey Department 1988).

[1] Sigiri Oya is the upper part of Yan Oya, and oya means a stream, sometimes as large as a river.

The availability of Mahaweli water for the area (since 1976) opened more land for cultivation and new cropping patterns thus tempting encroachers into the vacant land not claimed by earlier inhabitants, including the state reservation land (Ariyaratne 1995; and IIMI-SCOR 1993a). Waterway reservations were especially attractive to the newcomers due to free and easy access, abundance of water, and rich, moist soils. These conditions enabled them to obtain high yields and profits within a relatively short period. The high-value crops they cultivated, such as tobacco, chili, and big onion, provided them with a significant income. This is evident by the permanent and semi-permanent dwellings put up by them.

Reservation land, having free access, is used extensively for cultivation of short-term crops and grazing of cattle. Prior to the SCOR Project interventions in 1993, vast extents of the land adjacent to the moisture-rich right bank (at a higher elevation than the left bank) of the Feeder Canal were used for the cultivation of tobacco. The land was cultivated right up to the banks of the canal, without leaving any type of buffer between cultivation and the waterway.

Under these conditions the SCOR team decided to include the feeder canal area for intervention purposes. This is an interesting case where it is difficult to confine the watershed management efforts to the natural boundaries of the watershed.

Nilwala Watershed

The Nilwala watershed is the southernmost of Sri Lanka's principal river basins. The upper catchment of the basin consists of steep slopes and is subject to high rainfall, with a 75 percent expectancy of about 3,140 mm/year (Abernethy, Elkaduwa, and Wijayaratna 1996). The rain fall varies from about 1750 mm (near the coast) to about 4000 mm at the North- West portion of the watershed. Rainfall distribution is much better compared to Huruluwewa. The main river is the Nilwala, starting at an elevation of 1066 meters and traverse through a length of 72 km before discharging into the sea at Matara. A major portion of the river is only few meters above the sea level (Land Use Policy Planning Division, 1995).

Both the upper and lower parts of the Nilwala catchment are densely populated. The principal form of land use is agriculture and the principal crop is tea. Land rights are largely private, but there are also substantial state lands. There has been significant encroachment into state land, which the relevant authorities have not been able to prevent. About 22 percent of the upper catchment is under forest, of which about two-thirds is dense, protected forest (Abernethy, Elkaduwa, and Wijayaratna 1996). These protected forests too are being threatened by various encroachment activities, primarily around the boundaries. Tea covers nearly half of the upper watershed land and its expansion has often been at the expense of protected forests. The Government has recommended that trees should not be felled in these two reserves or in the areas reserved along the river banks. However, illicit felling and clearing of the boundary of these reserves for plantation crops — especially tea — are taking place. Tea plantations exist even in the middle of forest reserves. Improper selection of sites for tea planting combined with improper planting and other agronomic operations have resulted in severe soil erosion and fast

degradation of the land areas. Unplanned extraction of non-timber products such as rattan, bamboo, and medicinal plants, although illegal, is fast taking place. The reservations along the banks of the river have been encroached by the people living by its source. Poor agronomic practices, partly related to insecurity of tenure, have resulted in soil erosion. People living downstream complain of water problems not only for cultivation but even for drinking. This process of drying up the land is common in the lower reach of the river where the Nilwala flood protection program is in operation. The program involves the operation of flood protection dikes and the pumping of flood water from the land area into the river which ultimately discharges into the sea.

The Nilwala floodplain is subject to a high groundwater table and flooding during heavy rainfall periods. In recent years, flooding in the wet season and salt intrusion in the dry season in lower watershed areas have become serious, primarily due to the indiscriminate land clearing in the upper catchment areas and the poor town planning activities in lower catchment areas (Abernethy, Elkaduwa, and Wijayaratna 1996). The harmful changes of land use have their origins in the high population density and consequent demand for land and other resources, to which sometimes people have no legal rights. Some contributing factors have been the boom in world tea prices and people's realization that the state's capacity to enforce its own protective laws, ordinances, and even property rights is weak.

Abernethy, Elkaduwa, and Wijayaratna (1996) note the deterioration of natural resources in the Nilwala watershed. Reservations along the banks of the river have been encroached by the people, especially in source areas.. Apart from the poor agronomic practices, partly related to insecurity of tenure, other activities have also resulted in a high degree of soil erosion. Unplanned extraction of non-timber products such as rattan, bamboo, and medicinal products, although illegal, is conducted extensively. In addition, in certain places, both illicit and legitimate gem extraction takes place along the river, accelerating bed scour and river bank erosion.

As of early 1994, before SCOR interventions, most of the reservation land in Huruluwewa and Nilwala watersheds was being encroached and subjected to illicit tree felling and clearing of land for cultivating rice and short-term crops in Huruluwewa and primarily tea in Nilwala. The preparation of land for the cultivation of such crops involves the use of undesirable agronomic practices, such as tilling, which cause erosion in waterway corridors and the subsequent sedimentation of the waterways. This serious natural resource management issue was addressed at length by the Shared Control of Natural Resources (SCOR) Project.

Some basic information related to agricultural and socioeconomic conditions of Nilwala and Huruluwewa are given in Tables 6.1 and 6.2. Distribution of the sub watersheds where SCOR interventions were conducted is given in Figure 6.1.

Table A3.3 Nature of Maha Cultivation - Huruluwewa (96/97)

Indicators	Mahasengama	Mahameegaswewa
Crops grown	Maize, gingerly, kurakkan, black-gram, paddy, chillies	Maize, gingerly, chillies
Land extent	2.00 acres	1.25 acres
Cash income	Rs. 7700.00	Rs. 5700.00
Crop failure rate	9 (25%)	13 (40%)

Source: Vidanapathirana, Upali., Review of rural credit experiments with special reference to the shared control of natural resources approach: Huruluwewa and Nilwala experiments. January 1998.

Table A3.2 Nature of Yala Cultivation – Huruluwewa (1997)

Indicators	Mahasengama	Mahameegaswewa
Crops grown	Chillies, B-onions, elabatu	Chillies, vegetables, kurakkan, elabatu
Mean land extent	2.00 acres	1.25 acres
Cash income	Rs. 3800.00	Rs. 3200.00
Crops failed	12 (38%)	16 (45%)

Vidanapathirana, Upali., Review of rural credit experiments with special reference to the shared control of natural resources approach: Huruluwewa and Nilwala experiments. January 1998.

Table A3.3 Other Income Sources and Contributions – Huruluwewa, 1997

Indicators	Mahasengama	Mahameegaswewa
Sources	Brick-making, carpentry, fishing, hired labour.	Hired labour, security services
Mean Income	Rs. 6100.00 (34%)	Rs. 5300.00 (37%)

Source - Vidanapathirana, Upali., Review of rural credit experiments with special reference to the shared control of natural resources approach: Huruluwewa and Nilwala experiments. January 1998.

Table A3.4 Socio-conditions of Farm Families – Huruluwewa, 1997

Indices	Mahasengama	Mahameegaswewa
Mean Household income	Rs. 17600.00	Rs. 14300.00
No. receiving poverty assistance	29 (82%)	(30 (93%)
No. substandard houses	12 (35%)	20 (62.5%)
Houses with TVs	12 (34%)	3 (9%)
No. of bicycles	22 (62%)	16 (50%)
Mean Family size	4.52	4.9
Dependency burden	58.9%	40.5%
Average No. of years schooling	5.9	4 (yrs)
Monthly income per person per month	Rs. 266.60	Rs. 238.33

Source - Vidanapathirana, Upali., Review of rural credit experiments with special reference to the shared control of natural resources approach: Huruluwewa and Nilwala experiments. January 1998.

Table A3.5 Economic Activities and Land Ownership – Nilwala, 1997

	Diyadawa Tanipita	Illukpitiya
Average size of tea holdings (Acres)	0.61	1.07
Villagers without tea holdings	5	-
Holders with more than once acre of tea lands	9	12
Average yield (kgs of green tea per month)	384	514
Average cash income from tea (gross) Rs./month	6720	9252
Average annual cash income	Rs. 92232 (74%)	Rs. 123360 (62%)
Other incomes (per annum)	Rs. 31768	Rs. 73840
Gross household income per annum	Rs. 124,000	Rs. 197,200

Source: Vidanapathirana, Upali., Review of rural credit experiments with special reference to the shared control of natural resources approach: Huruluwewa and Nilwala experiments. January 1998.

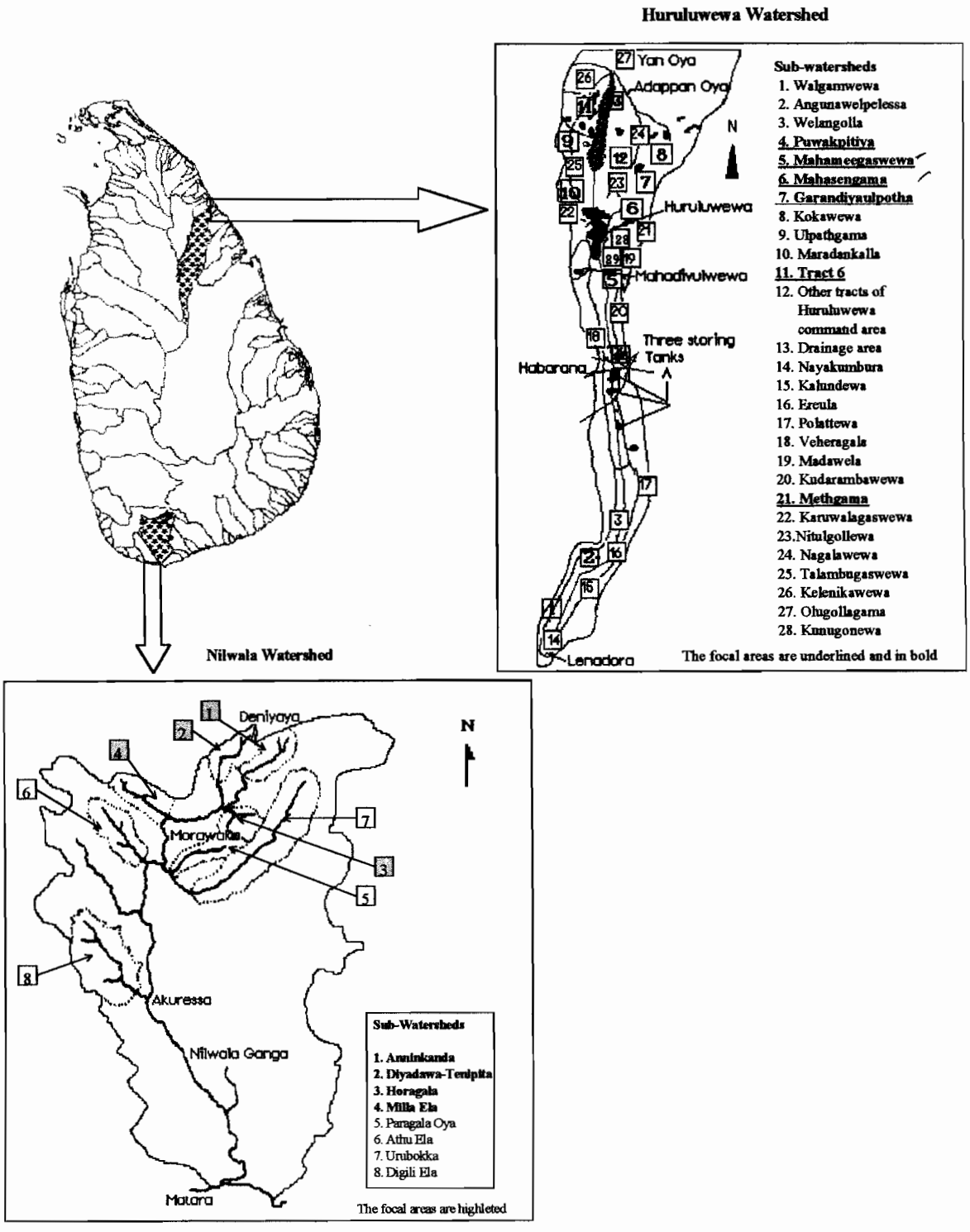
Table A3.6 Data on Standards of Living – Nilwala, 1997

Information	Duyadawa Tanipita	Illukpitiya
Per capita cash receipts (Rs. Per year)	24,505.00	40,244.00
Per capita net margin (Rs. Per year)	9002	12,073.00
Net income per household	Rs. 45,550.00	Rs. 58,981.00
No. of standard housing units*	23 (76%)	24 (80%)
Houses with TVs	12	7
Samurdhi beneficiaries	5	-

*Houses built of bricks, plastered with cement walls and floor, with tiled roofs

Source - Vidanapathirana, Upali., Review of rural credit experiments with special reference to the shared control of natural resources approach: Huruluwewa and Nilwala experiments. January 1998.

Figure A3. Distribution of pilot sub watersheds in Niwala and Huruluwewa watersheds



CHAPTER 4

Monitoring and Evaluation (M&E) and Management Information Systems (MIS)[1]

A continuous flow of information is required to enrich the participatory watershed management process in facilitating interaction among participants. The prudent use of information technology in the generation, processing and analysis of information is crucial to support planning, implementation, and evaluation. For this, SCOR adopted *two modes* of Management Information Systems (MIS) and M&E:

- *Participatory M&E and MIS* integrated into watershed action planning. This was conducted jointly by the resource users, implementers, facilitators and researchers.
- *In-depth M&E conducted by researchers/scientists*: This mode involved M&E of watershed management interventions using objectively verifiable indicators and sample data. This activity was aimed at a scientific audience.

MIS & M&E systems reviewed the progress and employed feedback/correcting mechanism to ensure that project inputs, work schedules, targeted outputs, and other related actions were proceeding according to plan. This mechanism also provided data for continuous and periodic evaluations to determine systematically and objectively the relevance, efficiency, and effectiveness (and impact) of project activities.

MIS and M&E systems of SCOR monitored and evaluated *project activities* or inputs as well as the *achievement of specific objectives of the project.* Obviously, these two (namely inputs and outputs) are related to each other and it was expected that they would eventually lead to the *project's impacts.*

F*igure* 4.1 illustrates the SCOR M&E and Research "model".

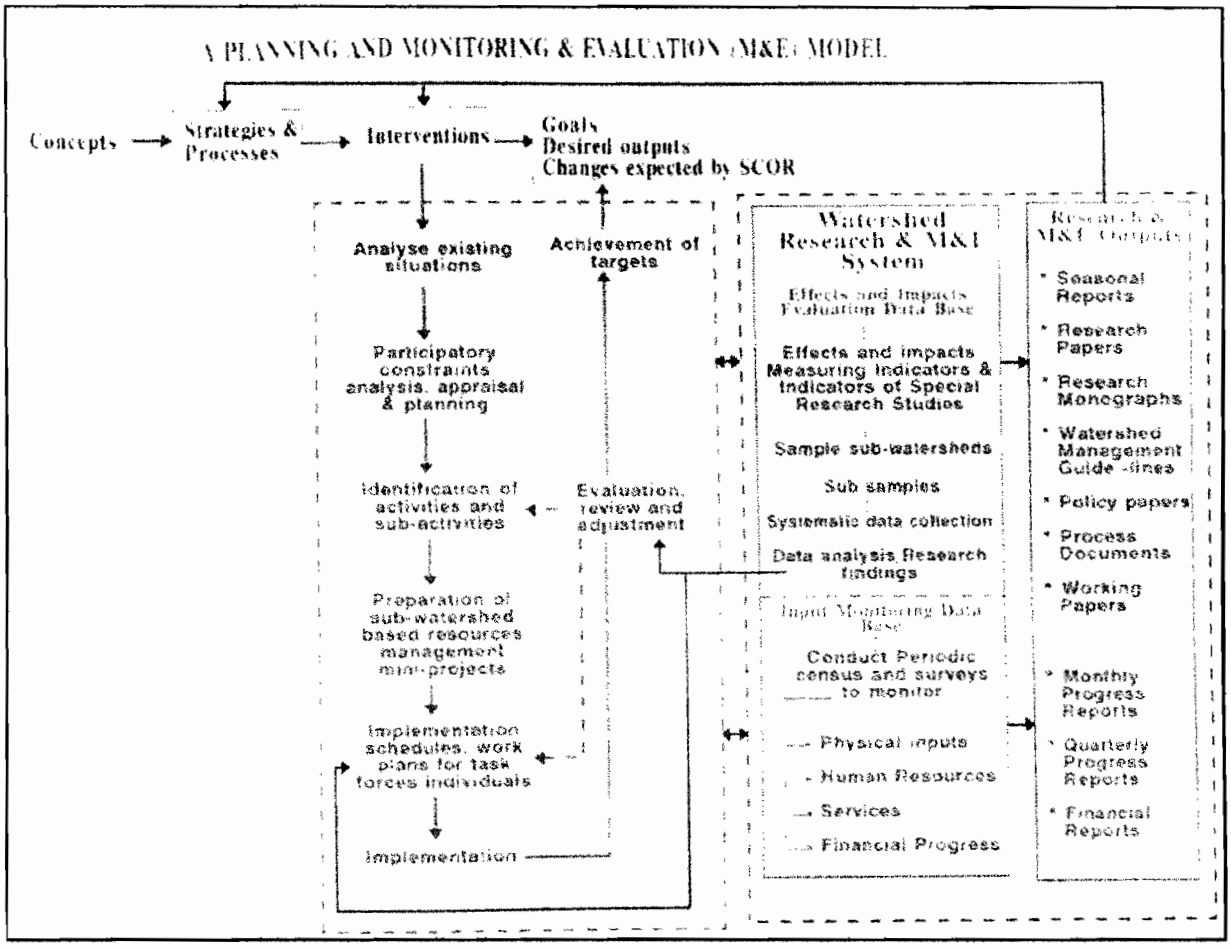
PARTICIPATORY M&E AND MIS SYSTEMS INTEGRATED INTO ACTION PLANNING

SCOR intervention/action-research adopted a learning process approach. With *man/land and water* interface in a natural setting, that is the watershed, and the resultant implementation activities were looked at holistically from a real world perspective. The current status was assessed in a participatory mode. A future desired status, and interventions and activities that need to be implemented to get to that status were also agreed upon in a participatory manner, based on the existing knowledge and availability

[1] This chapter is adopted from a paper presented by the author to the seminar on "Tools for Analysis and Evaluation of Sustainable Land Use in Rural Development" organized by the Food and Agriculture Development Center (ZEL) of the German Foundation for International Development (DSE), 2-14 December 1996, Zschortau, Federal Republic of Germany.

of the technology, resources, and organizational capacity. The interventions/activities were then linked to action-research in an effort to learn from ongoing experiences to test the validity of the models and hypotheses researched upon. In the process, the researchers as well as the resource users learnt to realize the value of research and benefit from it.

Figure 4.1. A planning and monitoring and evaluation (M&E) model.



Based on above, the field teams conducted *a participatory appraisal* of pre-project status of natural resources use *in selected sub-watersheds*, developed a future vision through the generation and utilization of relevant data, and prepared *mini-projects* and *detailed action-plans* involving local people and professionals. Chapter 5 will present a detailed account on this exercise. It did not depend solely on indigenous or external skills—instead, it was a collaborative effort. This process was characterized by the integrated use of participatory mapping indicating the *anticipated changes* in land and water use and associated production-conservation targets at different times of the project. In other words, *MIS and M&E systems* have been *integrated into action plans*.

As described elsewhere, the selected sub-watersheds for SCOR action-research were contiguous areas of manageable size, having characteristic profiles of ecological, socioeconomic and environmental features similar to those of the respective main watersheds. The size of these selected pilot sub-watersheds ranges from about 200 to 1000 hectares. Two such sub-watersheds are used here to illustrate the SCOR participatory Monitoring and Evaluation process that has been linked to the action-research process aimed at testing hypotheses and developing models for integrated land and water development. Hydrological characteristics of the sub watershed selected from the Huruluwewa watershed, namely Maha Meegaswewa (MM), is shown in *figure 4.2.* Action has being taken through a participatory process to learn, test and demonstrate an "ideal" land use pattern with due emphasis on production and conservation. This participatory approach of developing methodologies for combining technology, organizations, and resources have illustrated the various production-conservation elements with their intimate relationships. These were incorporated in the management of watersheds or tank ecosystems in a sustainable manner. This subject is discussed in detail in the next few chapters.

In the selected sub-watersheds, participatory appraisal of the characteristics of resource uses and users as well as mapping of *current* resource use were done by groups comprising resource users/farmers, local officials of government agencies such as Irrigation, Agriculture, Forestry and Agrarian Services departments, IIMI-SCOR professionals and catalysts. The catalysts took the lead role in preparing the resource use maps and recording information (chapter 5).

Figure 4.2. Maha Meegaswewa micro watersheds.

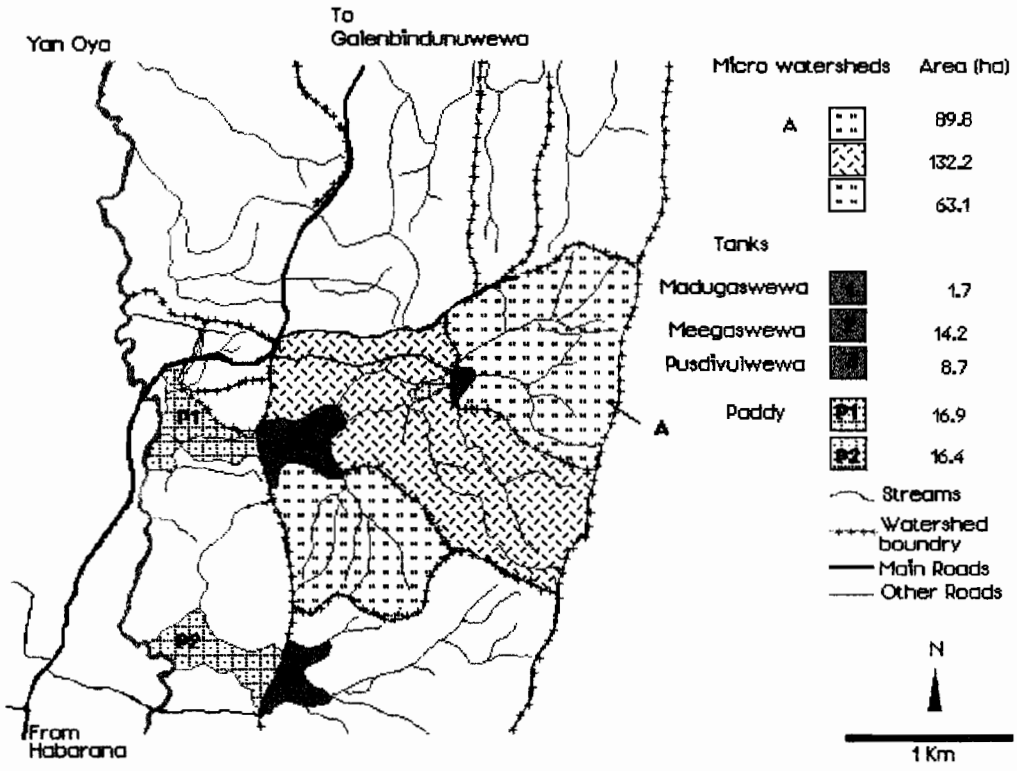
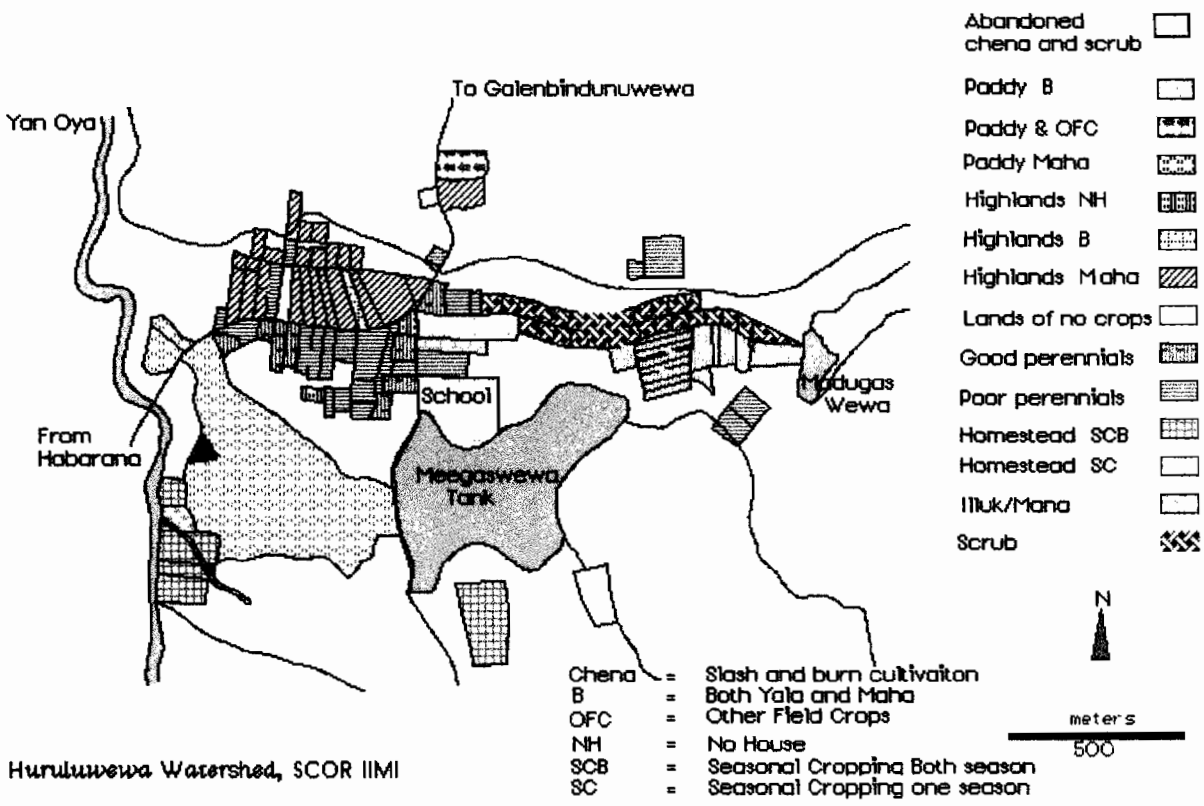


Figure 4.3 shows the pre-project land use (as of January 1994) by individual plot of one such sub-watershed, in this case the Maha Meegaswewa, MM tank ecosystem. For this village, a participatory resource management "mini project" was formulated with an investment of Rs 1.2 million (US$24,000). The mini project aimed at changing 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 (chapters 5 and 6).*

Figure 4.3. Maha Meegaswewa land use - January 1994.



The planned future land use pattern is illustrated in *figure 4.4* while the March 1995 and March 1997 status are illustrated in *figures 4.5 & 4.6.*

Figure 4.4. Planned future land use for Maha Meegaswewa..

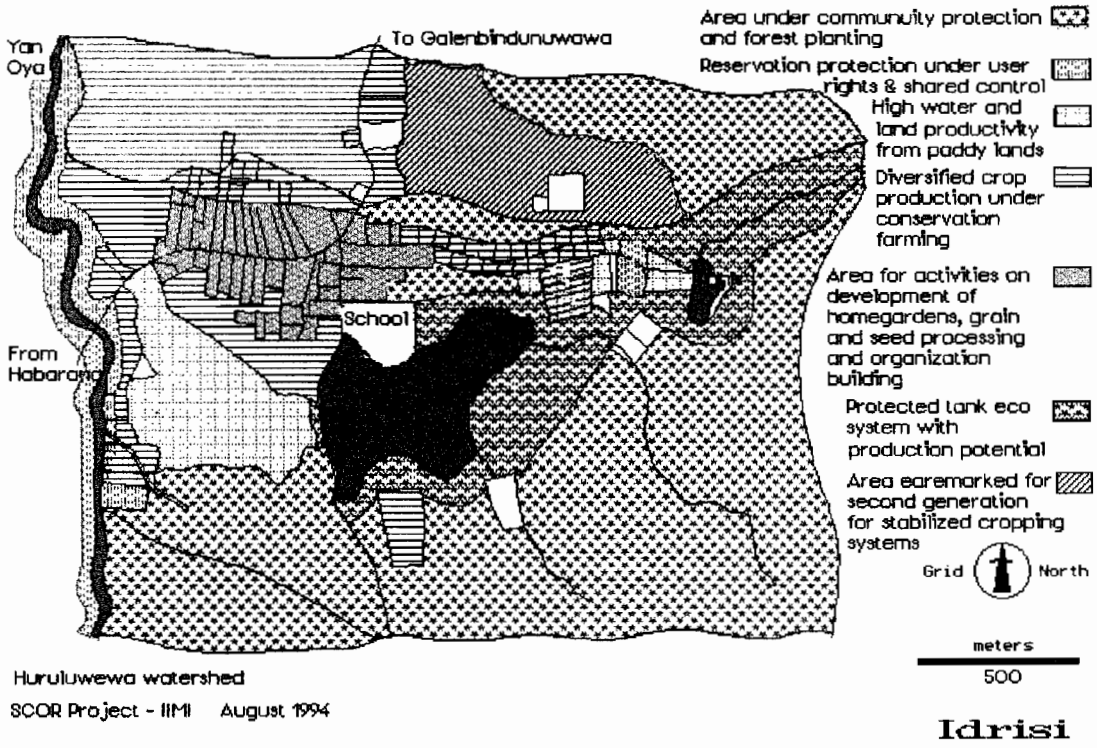


Figure 4.5. Maha Meegaswewa land use - March 1995.

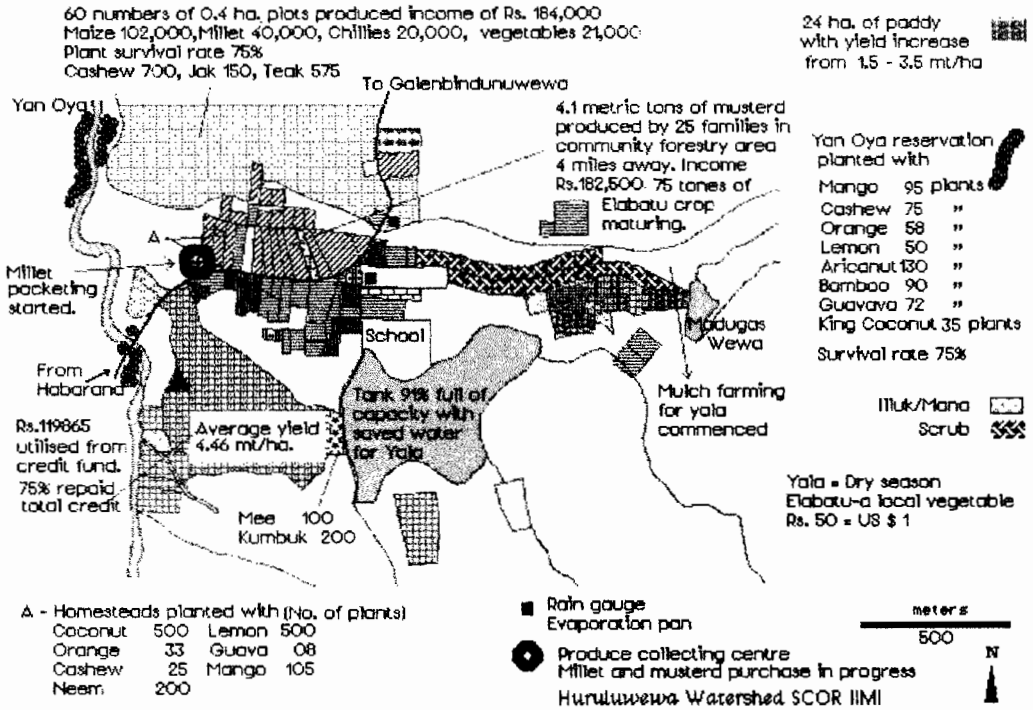
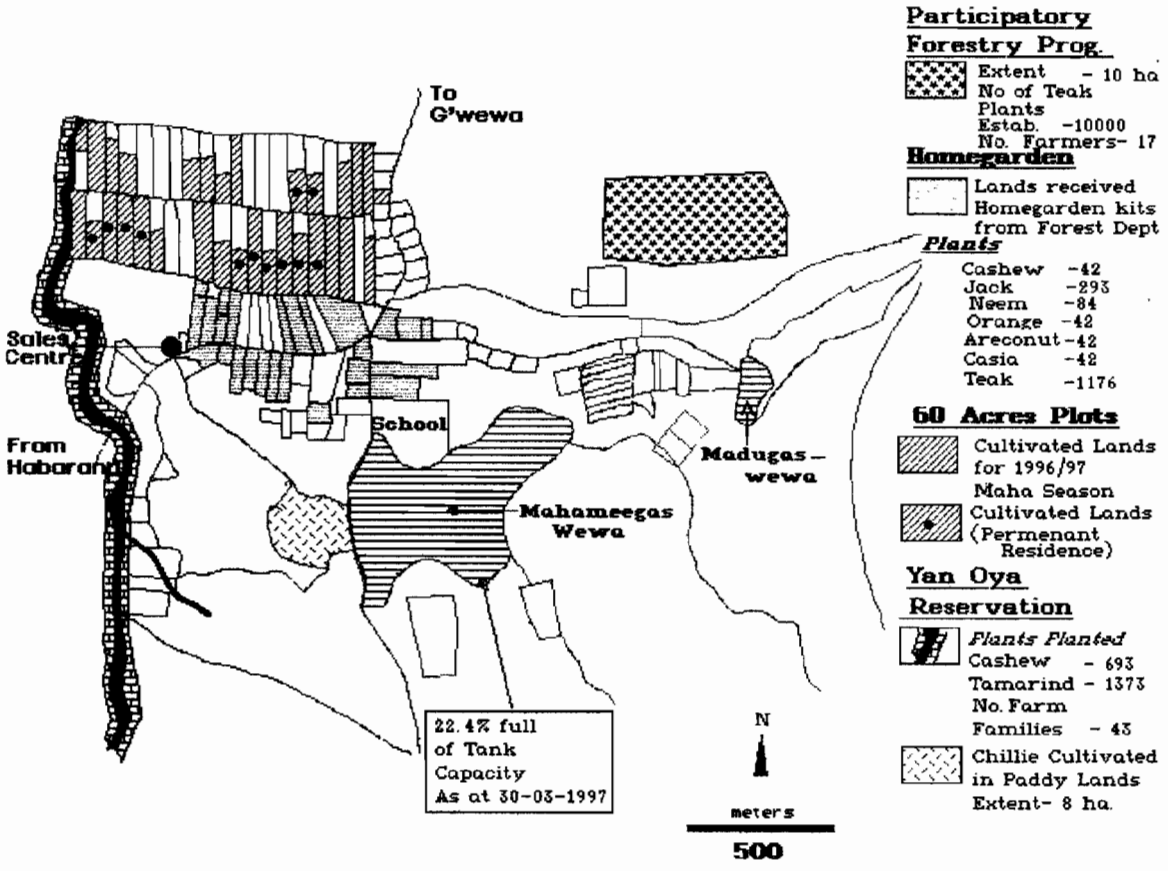


Figure 4.6. Maha Meegaswewa land use – March 1997.



In order to illustrate the participatory Monitoring and Evaluation process of the Nilwala watershed, Anninkanda sub watershed is selected. The pre project land use, Future vision and status on of December 1996 are illustrated in figures 4.7, 4.8 and 4.9.

Figure 4.7. Anninkanda, Pre Project Land Use – January 1994

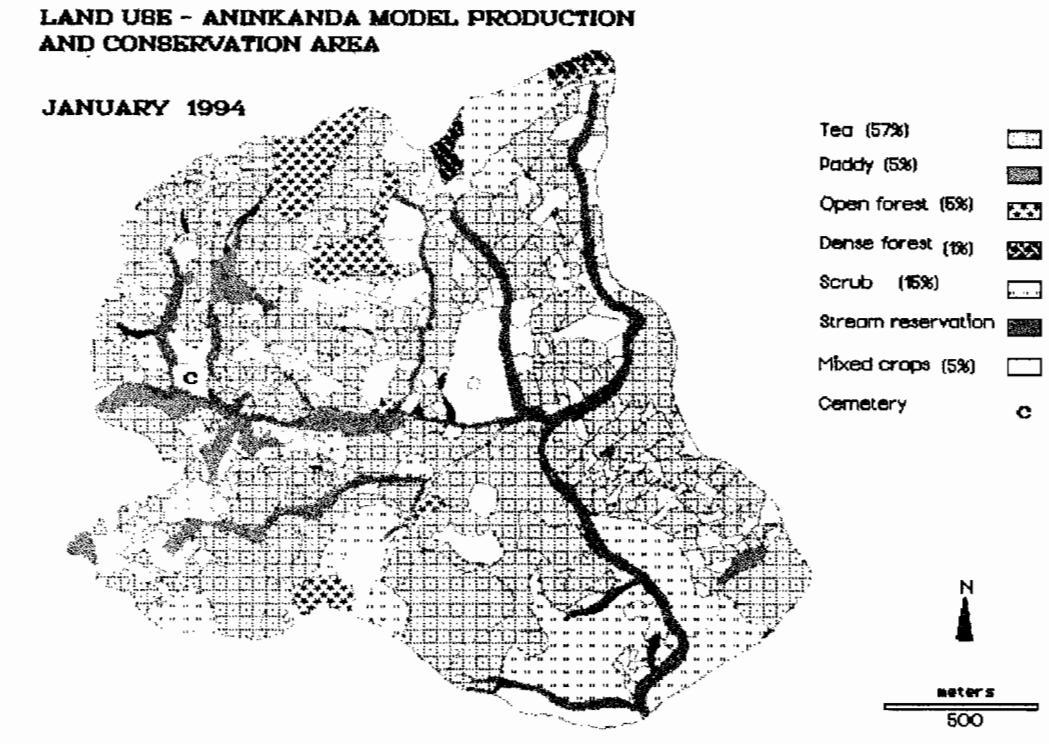


Figure 4.8. Planned Future Land Use For Anninkanda.

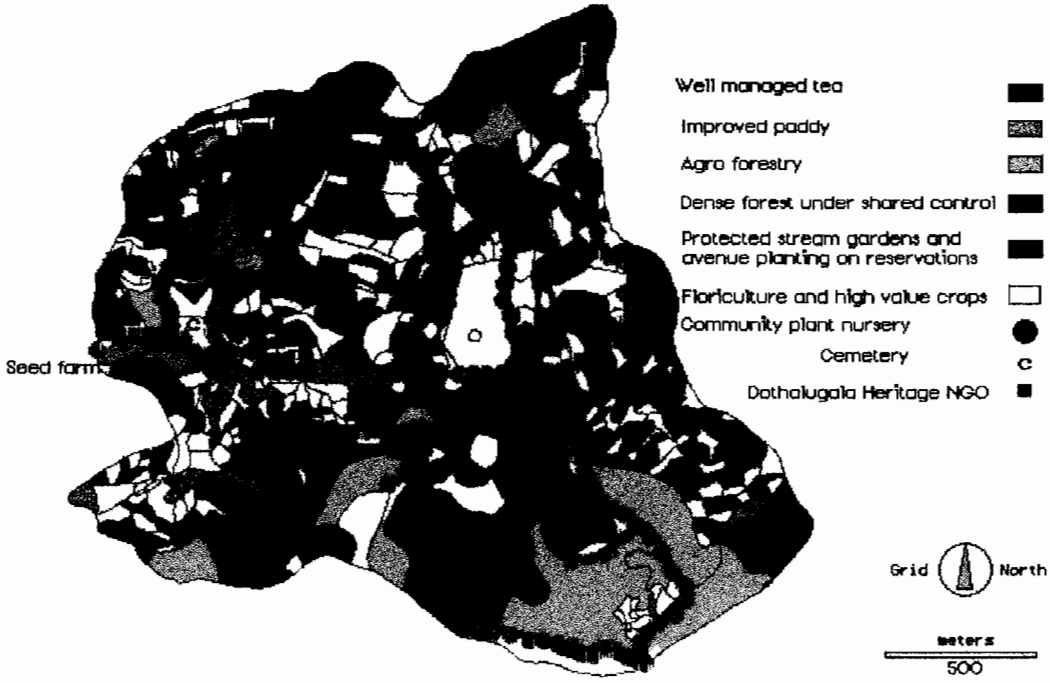
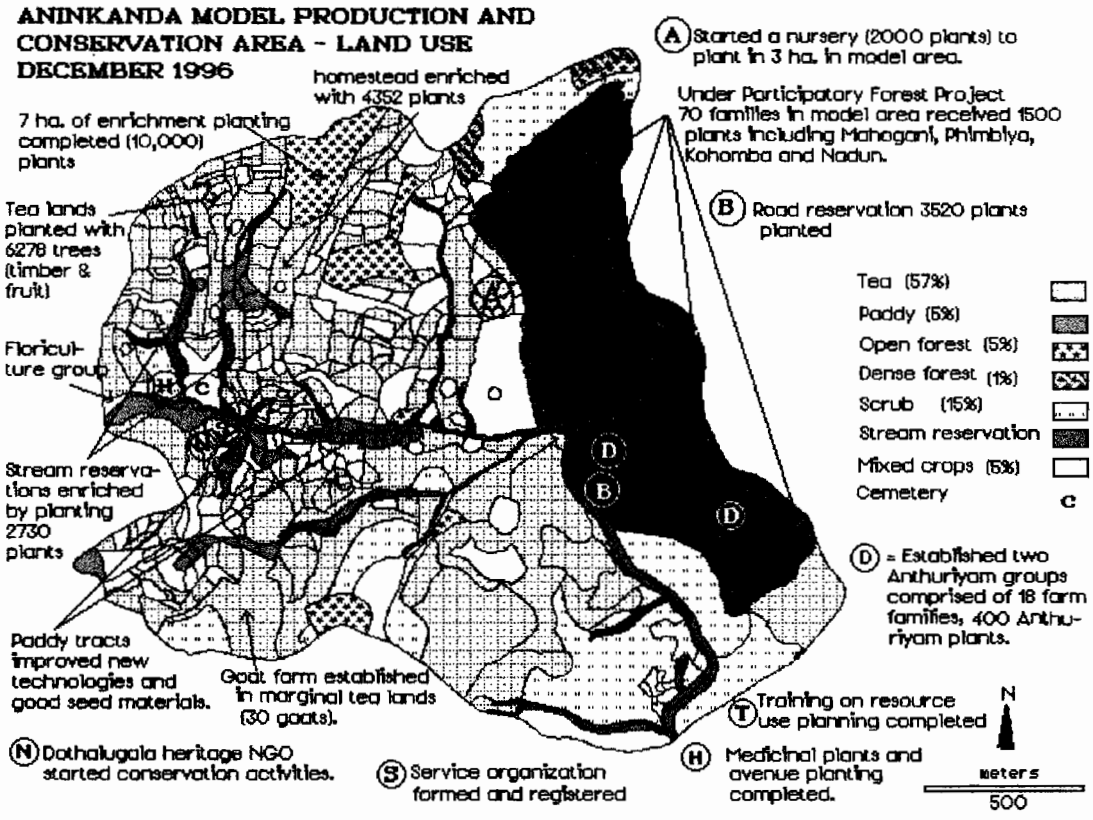


Figure 4.9. Anninkanda land use – December, 1996



Involvement of resource users, local officials of relevant agencies, NGOs, etc., in participatory resource use survey and mapping and in planning has *paved the way for participatory M&E and MIS.* The mapping exercises helped the participants to view the forms in which land and water resources are available in different locations and facilitated the articulation of a possible future vision for respective sub-watersheds. The map was linked to a database that carries information at plot and sub-watershed levels. This set of data was used for planning interventions and is being used by participants for M&E during the implementation period.

In the hilly areas of Nilwala upper watershed, in the wet zone of Sri Lanka, the elevation data were used to create digital elevation models and slope maps. Land cover images were superimposed on the terrain images. Database management has become an essential function and contribution by the facilitators to help the farmer organizations to *monitor* the business ventures and conservation practices.

The database at this level was then integrated into M&E and MIS at higher levels (*figure 4.1*). Use of a computerized database that monitors the watershed interventions and changes in production, conservation and institutional aspects in the selected sub

watersheds has become an integral component of SCOR action-research. At this level, the database is strengthened by in-depth analyses using objectively verifiable indicators.

IN-DEPTH M&E CONDUCTED BY RESEARCHERS/SCIENTISTS

At this level, a set of objectively verifiable indicators were used to check whether the targets were being approached (i.e. monitoring) and in the end to evaluate if the objectives have been achieved and whether the production-conservation practices are *indicating a desirable trend of sustainability.*

Indicators were defined as specific (explicit) and objectively verifiable measures of changes or results brought about by interventions. As much as possible, indicators have been selected considering characteristics such as: validity, reliability, sensitivity, specificity and cost-effectiveness. Both qualitative and quantitative indicators were also included. Qualitative characteristics of some indicators--such as those related to organizational behavior and strength--have been transformed into quantitative measures by assigning scores and converting into indices.

In respect to certain types of indicators and measures, it was difficult to claim generalize the results. Soil loss and sediment transportation were two examples for such indicators. The difficulty arises when the results are used to generalize claiming effects/impacts attributable to a particular intervention across the watershed. In the SCOR project, each indicator has been evaluated in respect of its validity, generalizability and adaptability in terms of time, cost and degree of contribution to SCOR process. Generalization is attempted across space where in-situ values of change can be computed at a lesser cost and time. Also, priority is given to a combination of factors directly revealing the usefulness of interventions (Batuwitage 1994).

As far as the strategic development targets of the SCOR project were concerned, three broad indicators have been defined :

- targeted hectares under improved production and conservation
- value of targeted investments by the resources uses on environmentally sound production practices, and
- government policies initiated. e.g.,: natural resources tenurial forms.

Short-term effects and possible long-term impact of watershed management interventions were evaluated in respect of four broad areas:

1. effects of hydrological conditions and water use (considering water as the key natural resource affecting production and conservation in watersheds)
2. effects on production,
3. effects on conservation, and
4. effects on organizational and institutional aspects.

Indicators were classified under these four categories. Some selected indicators are listed below:

Water Related Indicators

Indicator	Variables/ Parameters
Relative Water Supply (RWS) Ratio of the crop water to the amount of water used RWS = (R+IS)/(ET+S&P)	R - Rainfall IS - Irrigation supply ET - Evapotranspiration S&P - Seepage & percolation
Staggering Index (SI) Time gap between the date of commencement of land and the date of completion of preparation SI = D2 - D1	D1 - date of commencement of land preparation D2 - date of completion of sowing (Date of first ploughing and Date of sawing)
Soil Moisture Drying Soil moisture change over time SMDC = (Sm2-Sm1)/(T2-T1)	1. Soil moisture over time
Sub watershed water balance	Rainfall, runoff, infiltration, drainage, soil moisture variation, interception, tank water water balance, ground water fluctuation
Water quality (surface and	EC, pH, turgidity, nitrate content

Production and market related indicators

Indicator/Index	Variable/Parameters
Yield	Total physical production. Gross cropped extent.
Profitability	Cost of production (value of inputs) Value of outputs, physical production by output market prices.
Productivity (Water/land/Labor)	Amount of rainfall used, amount of agro-well water irrigation supply, area cultivated, area and amount no. of labor days used (including family labor).
Annual Total Income House hold	Aggregate Farm income, aggregate non-farm income
Input use efficiency	Technical efficiency, economic efficiency : amount used, price of input used, amount of out output price of outputs
Cropping Intensity	Available area, cultivated area, harvested area.
Change in labor Demand	Cropping intensity Increased, crop area expansion, change of cropping pattern, labor requirement of & maintenance of cropping patterns, opportunity labor requirement for value addition Processes.
Value addition	Number, types, and volumes of products processed, value of processed products, cost of value addition (processing, packaging, storage), price of raw
Degree of output disposal	Composition of profit margin for agricultural & non-agricultural products. Cost and time of market chain involved. Degree of processing, storage. Composition and type of market. Price and stability. Forward contact.

Soil and water conservation related indicators

Indicator/Index Conservation	Variables/Parameters
Percent soil protection (PSP) PSP=(ANRO-ANRC)/ANROx100	ANRC- average net reduction of soil depth with ANRC - average net reduction of soil depth without under different: soil type, degree of slope, distance contour bunds & height of contour bunds, Average intensity, canopy cover, method of land preparation
Soil Moisture Depletion Ratio SMDR=DWc/DWo	DWc- Days to reach 50% field capacity after (with conservation). DWo-Days to reach 50% field capacity after (without conservation).
Soil fertility Index	Changes in weed composition. Earth worm counts and Organic matter content.
In-situ soil loss at farm level	Sediment yield per storm event
Forest related indicator Species composition Index (SCI) SCI=SPiLn(Pi)	S= number of species Pi= proportion or relative abundance of the species in
Canopy Stratification Index (CSI) CSI=(Pc-Po)*NL	Pc-percent vertical projection Po-percent overlap having number of vertical zones or depths (NL) in multy story vegetation
Vegetation cover	Percent area of land unit covered by tree canopy
Diversity of canopy structure	No of layers. Economic value of each layer.
Area of forest conserved (reforestation, enrichment and protection)	Extent of degraded forests enriched Extent of reforestation, Extent of agroforestry/woodlot established, Extent of stream/road reservations enriched, No of plants established in each case & their extent of forest protected by voluntary groups/NGOs, Extent of forest conservation linked to micro-hydroelectric power projects
Structure & Composition of home gardens (potentials for structure/production)	Canopy cover, vertical structure (height, diameter & of canopies, Species composition/ Density, Input use, management & income

Institutional and Organizational Indicators

Indicator	Variables
Organizational Performance	1. Degree of population participation 2. Degree of membership participation at meetings 3. Degree of membership participation at organizational 4. Record keeping 5. M&E of organizational activities 6. Leadership quality 7. Affiliation with other organizations 8. Representation at higher level management bodies 9. Institutional recognition 10. Legal recognition
Organizational Financial	1. Membership fee payment, 2. Membership savings 3. Organizational credit recovery, 4. Investment and 5. Bank credit recovery
Membership Satisfaction Index	1. Arrangements for credit, 2. Arrangement for input 3. Arrangement for marketing, 4. Communication 5. Decision making, 6. Conflict resolution, 7. profit 8. Community welfare
Organizational Sustainability	1. Organizational performance, 2. Organizational 3. Membership satisfaction
Constitution (Qualitative)	1. Organizational structure and functions, 2. Rules and 3. Conformity to regulations
Level of Involvement of key interventions (Qualitative)	1. Target settings and achievements in production and
Level of involvement in (Qualitative)	1. Linkages with Government sector, 2. Linkages with (local) 3. Linkages with private sector (national and
Arrangements for collaboration integration	1. Sub watershed level arrangements, 2. Divisional arrangements, 3. System Level arrangements, 4. District arrangements, 5. Watershed level arrangements

Technology Knowledge index of conservation farming	1. Farmers knowledge on recommended conservation
Attitude index of conservation farming	1. Initial adoption rate (from adoption index) 2. Farmer view on usefulness after initial adoption
Sustainability index of conservation farming	1. knowledge of conservation farming 2. Attitude of farming 3. trend towards continuation after initial
Decrease in resource degrading practices index	1. Decrease in burning of recyclable matter 2. Decrease pesticide use, 3. Decrease in inorganic fertilizer use
Water use efficiency improving practices index	1. Use of rain water for land preparation 2. Implementation of water distribution schedules 3. Cultivation of crops requiring less water 4. Use of mulching and other water conserving practices

Only a few selected indicators from this set are used in the present analysis (see chapter 6).

It is argued that the participatory M&E and MIS integrated into sub-watershed action plans are more useful, especially in a participatory approach, to the resource users and implementers / facilitators in initial planning as well as in monitoring and evaluating the progress of interventions related to land and water use. It adopts a holistic approach and focussed on a spatial database covering the *entire extent* (plot-by-plot) of a given sub watershed. At this level the M&E and MIS of SCOR use simple indicators and a limited set of data in a participatory self-evaluation "mode". At the next level the project conducts an in-depth evaluation of effects, outputs and impacts of watershed management interventions. This is a more scientific phase of M&E and MIS and is being conducted by a multi-disciplinary team of researchers consisting of : social scientists dealing with organizational and institutional aspects, hydrologists, agronomists, conservation farming specialists and resource economists. These two modes of M&E and MIS, however, are integrated. A comparison of the features of the two modes is given below :

Comparison of the two modes of M&E and MIS	
Participatory M&E Integrated into Action-Plans	**In-depth M&E conducted by Researchers/scientists**
• aimed at resource users, implementors and facilitators	• aimed at a scientific audience
• used as a feed-back and corrective mechanism	• used as a feed-back and corrective mechanism
• participatory mode : small farmers, govt. agencies, researchers and facilitators	• conducted by scientists/researchers and based on disciplinary-oriented indicators but researchers work as a multi-disciplinary team
• covers the full extent of sub-watershed, plot-by-plot	• sample data from sample areas
• limited set of data and indicators as the full extent of sub watershed is covered	• extensive set of data and indicators as only sample areas are covered
• limited analysis for initial planning, monitoring and evaluation	• in-depth analysis on effects, outputs and impacts of watershed management interventions
• focus on a spatial database, especially changes in land and water use, *spread of* conservation measures, enterprises and organizations	• focus on direct measurements and detailed analysis of different aspects related to production, conservation, hydrology and organizations/ institutions at sample locations

CHAPTER 5

PLANNING WITH PEOPLE FOR WATERHED RESOURCE MANAGEMENT

This chapter presents a participatory methodology for planning natural resource management—mainly land and water—in a watershed context. The planning process involved a mixed group of people including local resource users, professionals/Government officials, catalysts/change agents and in certain cases Non Governmental Organizations, NGOs. This "planning team" adopts an interdisciplinary holistic approach in watershed management and combines endogenous and exogenous knowledge/information in developing market-oriented and sustainable use of land and water resources. It generates and utilizes relevant data. This is a collaborative exercise and does not depend solely on either local or external skills and knowledge. It is neither a "top-down" nor a "bottom-up" approach. Rather, it integrates both approaches[1]. The planning process, like the project design process examined in the previous chapter, is primarily based on SCOR experience.

The application of concepts of decentralization in integrated watershed management is now being considered essential and local administration, local knowledge, and local participation at district and regional levels have been recognized as prerequisites for the successful implementation of integrated watershed management projects (UNDP/FAO/Netherlands Government Regional Watershed Project Newsletter, Vol. 2 No. 2, 1990). As explained in the previous chapter, SCOR participatory action-research program considered the total utilization and management of water resources and associated land in a given watershed. The project aimed at optimizing the use of watershed-wide land and associated water use efficiency. The SCOR strategy has been based on the need for understanding the hydrological, socio-economic, and other interactions between different segments of watersheds and between different uses and users of natural resources. Accordingly, the project design utilized the experience in group economic and natural resource management efforts—notably of the water user groups associated with irrigation; and the assumptions related to tenurial security, usufructuary rights, state-user partnerships, and other shared control mechanisms in natural resource management (SCOR Project Proposal, IIMI, 1993). Hence, participatory planning, developing a sense of "ownership" among stakeholders and participation in community based implementation mechanisms were considered to be integral components of the project approach.

[1] Note that this approach does not depend solely on local knowledge but brings in external knowledge (such as production and conservation technologies) as well. While respecting local knowledge, it is assumed that a proper mix of exogenous and endogenous knowledge would be more beneficial.

In addition, SCOR aimed at developing and testing a holistic, interdisciplinary approach to integrate environmental and conservation concerns with production goals. The conservation strategy that has been tested in SCOR was different from traditional approaches. SCOR hypothesized that a *package* of measures—such as the type of vegetation/crops, appropriate land and water saving and conservation practices, and user rights to earn economic and other benefits from participatory conservation of natural resources—are more effective in protecting environmentally fragile lands in water basins/watersheds. The project design assumed that this "package" will be selected jointly by professionals and users and both conservation and production or other profitable uses of natural resources are incorporated in it.

The planning as well as implementation, monitoring and evaluation (M&E) processes were characterized by integrated use of participatory resource use surveys and mapping and Geographic Information Systems, GIS. Appropriate methods have been employed to maintain desirable levels of accuracy during the participatory mapping which in turn produced digitizable maps. The project considered *participatory appraisal of the current status of natural resource use in watersheds and the diagnostic analysis of problems* as the first step in the action research process. Next, the project, through a participatory process, developed the *vision and a plan to achieve its future goals*. This chapter focuses on these two initial steps of participatory watershed management process.

The chapter is organized in three parts: following this introductory section, a brief overview on participatory appraisal of "pre-project resource use pattern" will be presented. In this section it is argued that the participatory appraisals can be employed, not merely as processes of gathering and reporting local knowledge, but as integral components of collaborative planning and implementation, which would have development impact. Following this, the collaborative planning process adopted by SCOR action-research will be examined. The final section presents a summary of the discussion.

PARTICIPATORY APPRAISAL OF PRE-PROJECT RESOURCE UTILIZATION

Participatory Appraisals are methodologies which have the potential of bringing community focus into rural development. They can motivate local communities or beneficiaries to participate and collaborate, not only in gathering information, but also in planning and implementation of rural development projects and programs.

Participatory Appraisal has been widely recognized as an effective methodology for rural development planning. A variety of methods have been adopted for collection, analysis and interpretation of data in the past. Rapid Rural Appraisal (RRA) and Participatory Rural Appraisal (PRA) are two dominant approaches used. Chambers makes a clear distinction between RRA and PRA, attributing more local ownership and participation to the latter.

"Participatory Rural Appraisal (PRA) describes a growing family of approaches and methods to enable local people to share, enhance and analyze their knowledge of life and conditions, to plan and to act. PRA has sources in activist participatory research, agro-ecosystem analysis, applied anthropology, field research on farming systems, and rapid rural appraisal (RRA). In RRA, information is elicited and extracted by outsiders. In PRA it is more shared and owned by local people. Participatory methods include mapping and modeling, transect walks, matrix scoring, seasonal calendars, trend and change analysis, well-being and wealth ranking and grouping, and analytical diagramming. PRA applications include natural resource management, agriculture, poverty and social programs, and health and food security. Dominant behavior by outsiders may explain as to why it has taken time until the 1990s for the analytical capabilities of local people to be better recognized and for PRA to emerge, grow and spread as an effective tool." (Chambers 1994, p. 953).

Chambers (1994) has stated that, because of the "dominant behavior of outsiders" it has taken such a long time even for PRA to recognize local analytical capability. The SCOR project considered PRA as an evolutionary process and assumed that its utility value can be enhanced if it is not limited to knowledge generation and is coupled with action. Moreover, it was assumed that the accuracy of PRA can be improved if its use is integrated with other techniques such as: advanced mapping and incorporation of more external inputs (in addition to indigenous inputs) statistical sampling, direct measurement, and use of objectively verifiable indicators and rigorous analytical tools.

Objectivity and Utility of Appraisals

In general, appraisals are based on collection, analysis and interpretation of information/data. These involve strategic choices aimed at **maximum** inferences and predictions from relatively **low levels** of appraisal inputs in the **shortest** possible time.

e.g. If the objective is to estimate population characteristics based on projections from a sample, correct random sampling would be essential. Then both the sampling error as well as the measurement error would become important.

- if the study is focused on an analysis of input-output relations in farm business and if the farms are relatively homogenous, the measurement error would be more important than the sample error,

- if the objective is "problem-solving" then a participatory, multi-disciplinary approach would be the best to be considered.

Hence, a clear understanding of the specific objectives of the appraisal and the definition of the target population are required for decisions such as: type of information to be gathered, and the methods to be employed. For instance, RRAs/PRAs may avoid sophisticated sampling methods by involving local skills and interests as much as possible.

Strategies to Improve Accuracy and Utility of Participatory Appraisal

The process of planning for "future pattern of resource use", in the sub watersheds selected for SCOR interventions, commenced with an assessment of current or "pre-project" status of natural resource utilization. Popular methods of participatory rural appraisal (PRA) were used at this stage. However, the participants were convinced that the PRA was not merely a knowledge generation activity. Instead, it was considered a first step of an action research program aimed at developing a package of interventions related to technology, organization/institutions, resources and policy. More specifically, it focuses on a process of participatory appraisal of the current levels of management of natural resources in degraded watersheds, participatory design of a future vision of reconciling environmental concerns and production goals, and the development of collaborative action plans to achieve such goals. The following were among the strategies adopted by SCOR to improve the accuracy and utility/impact of the pre-project appraisal.

Start with Maps Drawn to Scale

The plot level mapping has been undertaken by small groups on small blocks with known boundaries such as roads, streams or canals. For this purpose, the 1:50,000 map was enlarged to different scales such as 1:5,000, and 1:2,500 depending on the details required to be mapped. Hence, the area within a block should be known.. During the participatory "walk-through survey", plots were marked on those enlarged **block** maps. Therefore, the accuracy of mapping was maintained relatively at a high level, when compared to mapping techniques used in PRA/RRA. As the literacy level of the members of the group, including the small farmers was at a higher level, it was possible to use an advanced technique. The extent of the plot was recorded separately during the survey. In addition, the services of a Draftsman were obtained to redraw the final plot maps for correcting plot size to scale thereby minimising errors. The final plot map thus becomes digitisable. Once the map was digitised, data pertaining to each plot was linked to the map in the spatial database. Each data field was mapped separately using the plot map as the geographic definition image. In database query, values pertaining to the extent in the data field were used to eliminate the chances of slight errors in drawing plots entering into computation..

Walking through individual plots, talking to owners/operators of plots

This allowed the resource users and the professionals including local level Government Officers to have a fresh look collectively on the issues of resource use, management levels, problems encountered and solutions possible.

Participation of Resource Users

Farmers participated willingly in the mapping and data collection with a view that the output by way of mapping of resource availability, as it was be useful to them individually and as a community group.

Consciousness on the purpose of data collection and Sense of Ownership

As mentioned elsewhere, people knew that the task was not just information gathering (for the sake of knowledge generation) but developing and implementing "their own project". The two maps, one showing the current resource use with individual plots marked, and the other showing the desirable and shared future vision in which action for individuals were indicated to create a sense of ownership, belonging-ness and commitment for action for the future.

Use of different sources of data

Data from different sources were available for the participatory appraisal as follows.

1. Topographical and land use maps produced by the Survey General's Department.
2. Information on watershed resource profile prepared by the Land Use Policy Planning Division of the Ministry of Agriculture and Lands on the pilot watersheds on SCOR initiative.
3. Final Village Plans (FVP) from Grama Seva Officers, and plans containing administrative boundaries and socio-economic data from Divisional Secretariats.
4. Blocked-out diagrams of the command area from the Irrigation Department.

Since certain secondary data were not up to date, primary data had to be collected in respect of major areas of information needs. For example, land use data on topographic sheets were five years old at the time of undertaking the participatory appraisal. The plot level map produced by the participatory appraisal exercise was the most recent map available for the sub-watershed and it was partially updated on a quarterly basis.

Local Knowledge and Sustainable Development

With regard to different aspects of sustainable development, for example, in the case of conservation and production technologies, no doubt, indigenous knowledge is of crucial importance -the natural resource users have accumulated a wealth of experience and participatory appraisals are useful to collect and review such knowledge and to utilize them in the formulation of plans for wider application. However, the process of planning for sustainable development may not depend solely on indigenous knowledge. Rahnema (1992, p.123) is of opinion that the "*instrumental task undertaken by the users of participatory approaches is "to involve the patients in their own care".*

In order to understand environmental cause-and-effect relationships, (to plan for conservation-based production or "market oriented conservation"), and to evaluate their physical, economic, and social impact, *information* on the environment as well as on environmental friendly yet profitable production technologies should be available. Relevant data should be collected, processed, analyzed and made accessible in usable form for the

resource users as well as for other decision makers at different levels. To help in the identification of potential opportunities, and plan for sustainable development such information must encompass a wider range.

Information on new technologies, infrastructure, availability of natural resources such as water, marketing facilities and prices, etc., become important when attempting to plan for sustainable development. A rapidly and efficiently managed set of spatially defined data, should also allow for a combination of variables (for example the transportation network, market potential and alternative cropping patterns) according to different criteria. The resulting combinations can be displayed readily as maps, charts, tables or other forms of data dissemination. These spatial information systems are being adopted rapidly by planning agencies and others involved in natural resource management and utilization.

With regard to mapping of data/information, it should be clear that, in many developing countries, rural communities, have an accumulated wealth of experience and are able to "visualize" and draw detailed maps of local conditions and realities. However, it is argued that such information/data can be augmented (by adding information/data on modern technology and other aspects described earlier in this section) and such techniques as GIS could profitably be used in planning, implementation, monitoring and evaluation of rural development.

To conclude, it is proposed that both **indigenous knowledge** and information on **modern technology** (related to production and conservation - price relations, markets etc.) should be considered in participatory rural planning processes. This approach is beneficial to a country like Sri Lanka. Its future prosperity depends heavily on the practical approaches the country adopts towards modernization and industrialization. Development strategies to achieve this end, have to take off from its rural agricultural base which still covers as much as one half of the country's land area and which supports the main livelihood of nearly half of the country's population.

In order to take-off for this transformation and to **broadbase the benefits accruing from an open economic policy**, the researchers, development workers, analysts and policy makers should facilitate the emergence of a new production environment that would motivate the rural communities to engage in profitable economic ventures. Strengthening the peoples' organizations and the establishment of peoples' companies in rural areas, providing them with *information related to modern technologies and linking them with financial institutions, markets etc., will facilitate the desired development process.*

Participatory Appraisal in Sub-Watersheds

The selected sub-watersheds for SCOR implementation are contiguous areas of manageable size within the main watersheds, each having characteristic profiles of ecological, socio-economic, and environmental features similar to those of respective main watersheds. The size of the selected sub-watersheds ranges from 75 Ha to 1000 Ha. Action was 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-conservation 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* resource use mapping were done by a group comprising IIMI professionals, catalysts, local officials (such as G*rama Niladhari* or the village-level Government Administrative Officers, Colonization Officers of the Land Commissioner's Department, Agriculture Instructors), and farmer/user representatives. The catalysts took the lead role in preparing the "map" and recording information. Other group members helped the catalysts in the identification of land-holdings in consultation with the users, and in providing information. The groups were guided and supported by senior IIMI professionals, Divisional Secretaries, Irrigation Engineers and Technical Officers, Divisional Officers and senior officials of the Departments of Forestry, Agriculture, Agrarian Services etc. The general objectives of a participatory appraisal are 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 intensity, 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).[2]

The steps used in the participatory appraisal were as follows :

Use of Existing Maps and Secondary Data

For all areas topographic maps prepared in 1986 by the Survey General's Department and aerial photographs taken in 1983 were available. In these maps, sub-watershed hydrological boundaries were demarcated. Several maps from different sources were

[2] This is supplemented by other sources such as: sample surveys, direct measurement of additional variables/indicators etc. See MIS & M&E process in chapter 4 for details.

available for almost all sub-watersheds selected for SCOR interventions. For example, Huruluwewa command area has been developed under a resettlement project and the original blocking out plans prepared for land alienation were available. For many other villages, maps at plot level were available. However, illegal land transactions and fragmentation of original holdings—mainly due to the subdivision among children of original settlers—had significantly distorted the original land alienation pattern.

Availability of maps and the higher literacy level of participants, including farmers, had prompted the researchers to design a mapping process which is more accurate than the "village mapping and transect surveys" normally used in PRAs. For example, in order to maintain accuracy, topographic maps of 1:50,000 scale were enhanced with land marks such as roads, streams, schools, temples, etc., for the use of small groups engaged in walking though every plot in an assigned smaller area to map the plots and collect basic data[3].

In addition, secondary data and data relevant to resource management from special bench mark surveys conducted on a sample basis were used. These included elevation, farm management, input-output levels, prices and profits, available from sample surveys, general demographic characteristics, information related to availability and nature of land, water resources, raw materials and suitability of new crops for environmentally sound enterprises.

Training and Familiarization

Special training sessions were conducted for SCOR catalysts who performed a leading role in the Participatory Appraisal. The catalysts were a "mixed" group with varying knowledge and skills who had been working earlier as school teachers, agricultural instructors, social mobilizers, etc. They were trained on the advantages and disadvantages of popular PRA techniques, SCOR concepts, basic farm management aspects, and social organizations, etc. In addition, discussion sessions were held with farmers and farmer leaders.

Group Formation for Conducting Appraisal Exercise

As mentioned earlier, local officials, school children, farmer representatives, SCOR catalysts, and professionals were involved in the exercise. Each selected sub- watershed was divided into "zones" such as low land rice tracts, home garden area and shifting or slash-and-burn cultivation area. Each group comprising a few catalysts, 2-3 local officials and professionals and a few farmer representatives was assigned a "zone" and was provided with a base map.

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[3] For PRA conducted in Nov. 1995 for the second set of SCOR sub watersheds, an updated land use map of 1:50,000 scale, prepared by the Land Use Policy Planning Division of the Ministry of Agriculture under SCOR initiative was available.

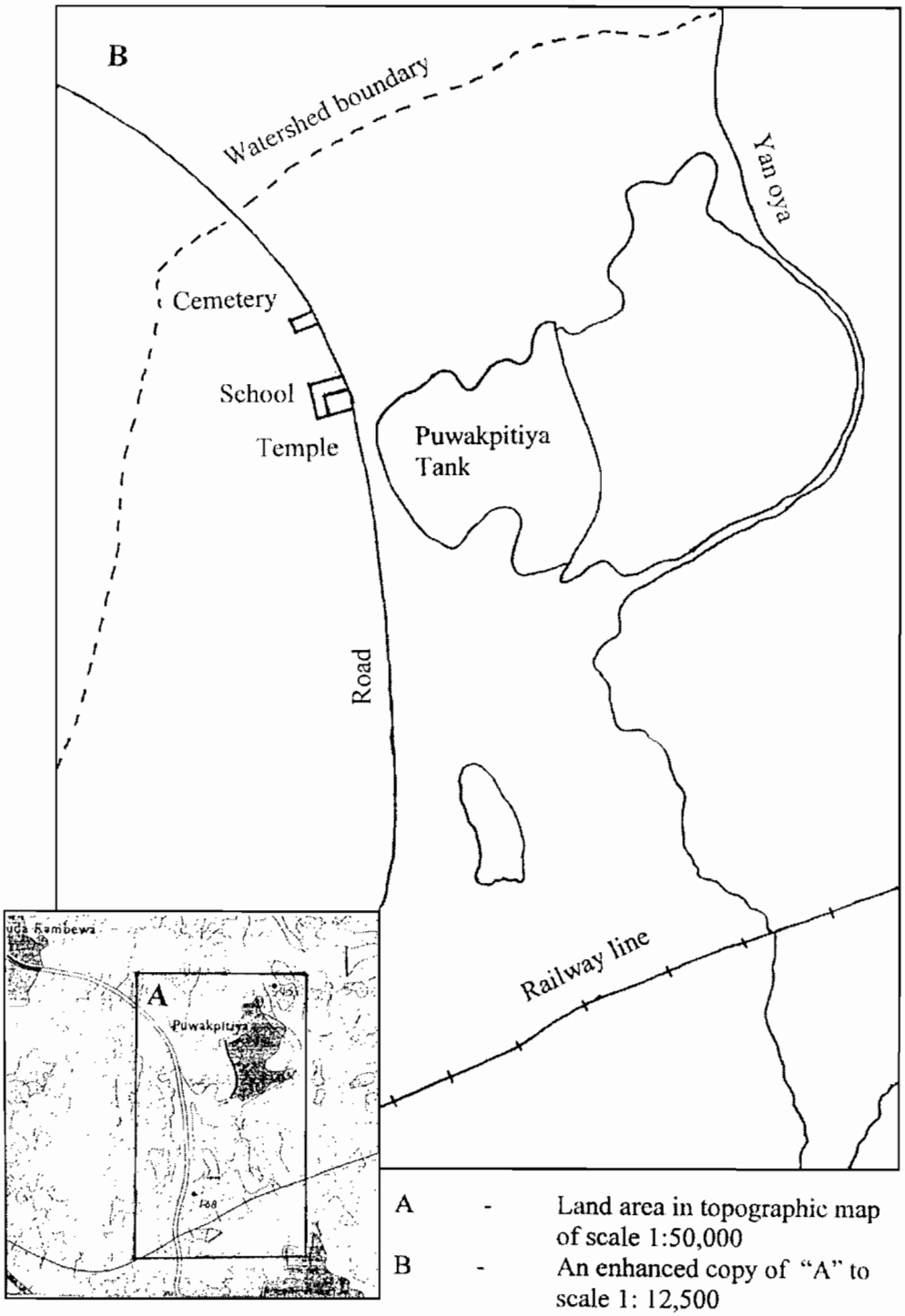
Conducting Participatory Appraisal

The appraisal was conducted in each zone by the appraisal groups walking through every plot and talking to farmers. A questionnaire and a data format were used to collect basic data at plot level. All plots and the land use pattern (e.g., seasonal and permanent crops, livestock etc.) were marked to scale, as far as possible.

At the end of this step, the zonal maps drawn by each team were "joined" together to prepare the sub-watershed or micro-watershed maps. A working sheet of a group assigned with the task of conducting participatory appraisal in the Puwakpitiya sub watershed is illustrated in figure 5.1 while the map indicating the pre-project resource use pattern of this sub-watershed, prepared at the end of this step is presented in figure 5.2. A typical small tank based sub watershed in the dry zone of Sri Lanka (in this case Puwakpitiya sub watershed in SCOR Huruluwewa watershed) is selected for these illustrations.

Figure 5.1

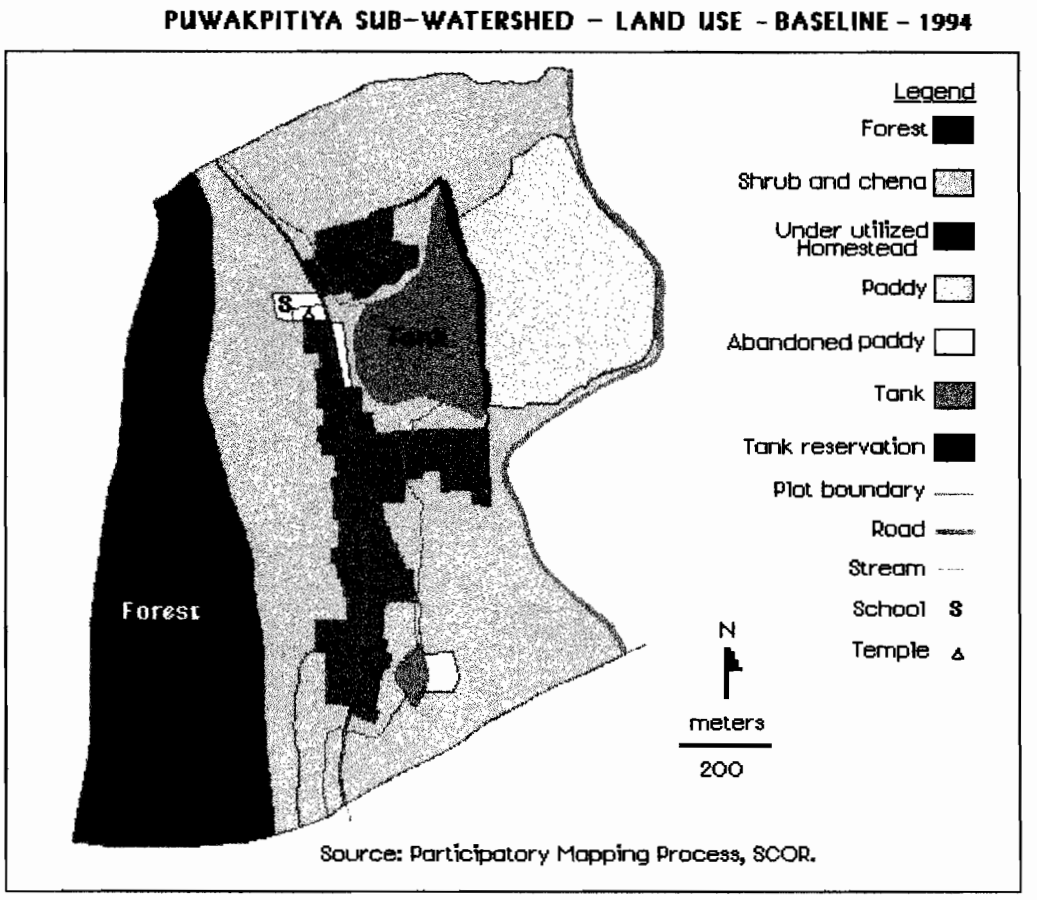
Figure Participatory mapping of resource use by plots – Puwakpitiya sub-watershed.



A - Land area in topographic map of scale 1:50,000

B - An enhanced copy of "A" to scale 1: 12,500

Figure 5.2 Puwakpitiya sub watershed, pre project land use (1994)



Establishing Benchmark Database in Relation to Pre-project Natural Resources Management

Data and information collected during the Participatory Appraisal, the base maps, and secondary data were used to establish a benchmark in relation to pre-project natural resources management. An example is presented in tables 5.1, 5.2 and 5.3.

Table 5.1 Land use, Puwakpitiya sub watershed, 1994

Land use	**Extent (ha)**
Forest	39.8
Shrub & chena	73.6
Under utilized homesteads	14.3
Paddy	16.9
Abandoned paddy	0.55
Tanks	8.32
Tank reservation	0.88
School, temple and cemetery	0.89
Yan oya	1.31
Roads	1.3
Total	**157.85**

Table 5.2 Land ownership, Puwakpitiya sub watershed, 1994 [4]

Land ownership	**Extents (ha)**
High Security	4.20
Medium security	28.04
No Security (Government land being encroached)	76.15
Others	49.47
Total	**157.85**

[4] There are around twelve land ownership categories in Sri Lanka. These categories are classified under three categories according to their security levels.
High Security – Clear titles(single ownership), Paraveni(settled), Temple lands
Medium Security - Clear titles(multiple ownership), Paraveni (unsettled), Swarnabhumi, Jayabhumi, LDO permits, Long term permits Annual permit
Others: Reserved forest, Water bodies & Roads
These tenurial forms will be discussed in a separate chapter.

Table 5.3 Soil Erosion, Puwakpitiya sub watershed, 1994

Soil erosion	Extent (ha)
High	74.4
Moderate	7.9
Not significant (including paddy, Reserved forest)	64.62
Total	146.9

Moderately eroded - (sand or/& humas deposited)
Highly eroded - (gravel exposed or/& stone exposed)
Not significant - (Including paddy and reserved forest)

Several GIS procedures were adopted to transform the PRA output to a GIS output:

a) Maps drawn to scale were enhanced with land marks such as roads, rivers, and locations of schools, temples, etc., for the use of small groups engaged in walking through plots for mapping them.

b) A questionnaire was used to collect basic data

c) Plots were marked to scale by a draftsman using the data on plot size for accuracy.

d) The map was digitized and linked to the database enabling the preparation of different thematic layers reflecting the attributes in each data field.

e) Topographic maps of 1:10,000 and 1:50,000 scale were used to digitize elevation. A digital elevation model was produced by interpolating contour data and producing a surface image showing slope. An orthographic view of the landscape was produced to improve its visual image.

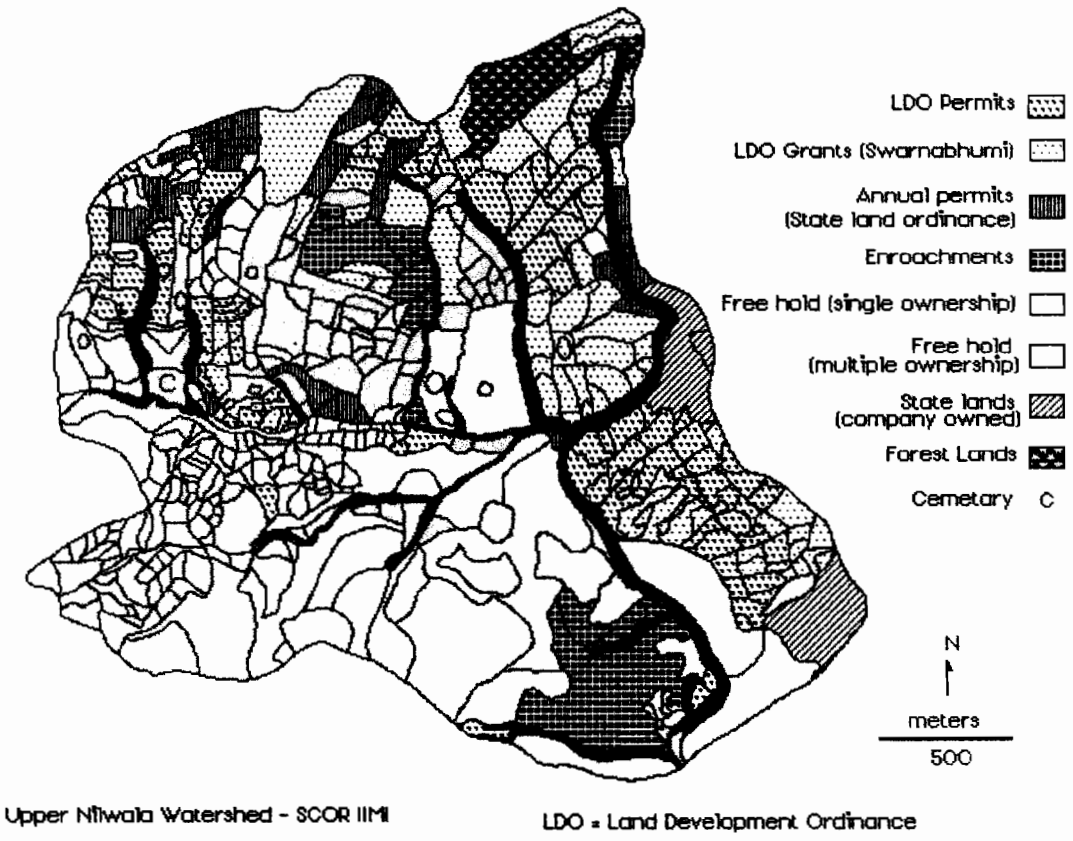
f) Superimposing the land use map on elevation, a map visualizing the problems of land degradation was produced. Table 5.4 shows consistency of information mapped and verified in group discussions in participatory appraisal of conditions with the resource users[5]. Similarly, distribution of land plots and the distribution of tenurial forms were merged together. Figure 4.7 in chapter 4 shows the pre-project land use pattern of the Anninkanda sub-watershed in Nilwala, while Figure 5.3 shows the distribution of land plots by tenurial forms in Anninkanda. It was observed that there is a mixture of

[5] As the Puwakpitiya sub watershed is located in the relatively "flat" landscape of the dry zone of Sri Lanka, a sub watershed from the SCOR Nilwala watershed (in this case the Aninkanda sub watershed is used here for illustration purposes.

tenurial patterns with marked encroachment on state lands for undesirable land use such as tea cultivation on steep slopes. Private land-holdings are predominant, presenting a contrast with the patterns prevailing in the dry zone watershed.

(g) Using the secondary data digitized and mapped along with the current data, constraint analysis was undertaken through group discussions and workshops to draw a new map showing the desirable future resource use. The baseline map was updated to reflect the future vision by plot-wise.

Figure 5.3 Distribution of land plots by tenurial forms, Anninkanda sub watershed



Note: Land tenure forms are described in the annex 8.1 of chapter 8.

Table 5.4 Information from primary and secondary sources.

Map information		Information from group discussions	
1.	Shrinking dense forest cover from 3% in 1983 to 1% in 1994. (Area covered by hill tops and slopes over 60% is 33.7% of total extent of this sub-watershed. Ideally, this area should be fully covered with thick forest.)	1.	Rocks on hill tops are exposed to a threat of landslides
2.	Tea cultivation and encroachments expanding from lower elevations to hill tops and on slopes > 60%	2.	Villagers move into state forest lands to grow tea for which a ready market is available.
3.	The source of origin of streams has been stripped of its tree cover .	3.	A drinking water supply project was be abandoned for want of water during dry months. A serious water problem is predicted. The dry weather affects the tea crop which is the main source of family income.
4.	Fern lands continue to be a feature of the landscape	4.	Clearing and burning of state forest and scrub continue to make way for seasonal crops on slopes by encroachers. Once abandoned, such lands become covered with fern and fall easy prey to fires during dry months.

Some Important Characteristics of Participatory Appraisal conducted

Several important characteristics of Participatory Appraisal:

(a) Appraisal was undertaken by resource users, local officers and IIMI professionals including the catalysts.

(b) Information gathered from the secondary data and participatory mapping were used to stimulate dialogue on resources use.

(c) Interactions and dialogues focused on three major aspects: description, analysis, and prediction. The current use of land and water resources in the sub-watershed was described. How such resource use patterns have evolved was described to analyze processes and trends. The future was predicted as the outcome with implications if the current use patterns and trends would continue.

For example, in Anninkanda sub-watershed, the participatory appraisal described the land use categories given in figure 5.3, and when analyzed, reasons for denudation of forest areas in the past and at present, revealed the processes of motivating users to encroach on state lands for the expansion of tea plantations, and predicted possibility of future land slides from hill tops with exposed boulders, and continued dryness and absence of stream flows depriving the users with drinking water and forcing them to leave the area. Moreover, maps have been used to analyze and understand the spatial distribution of land ownership/tenure, level of degradation of resources etc. (figures 5.4 and 5.5).

(d) A desirable future resource use as a shared vision was mapped out based on analysis.

(e) Action planning was undertaken collectively with activities included to actualize the future vision.

(f) Information was extracted to prepare a "mini-project", with a balanced portfolio of activities to ensure equity, and investment in areas for conservation-based production to mobilize financial resources from local banks and other resources from local agencies. This process of planning future resource use is briefly outlined in the next section[6].

PLANNING NATURAL RESOURCE MANAGEMENT INTERVENTIONS

After refining the map (indicating the pre-SCOR resources management pattern), the same group of resource users, local staff of line agencies and IIMI professionals used the map and the corresponding data-base for participatory planning of future use of natural resources of that particular sub-watershed. The formulation of a participatory resource management "mini project" was the an output of the planning process. For the Puwakpitiya sub watershed, such a mini project was formulated with an investment of over US$20,000 (Rs. 1.3 million).[7] The project aimed to change the pre-project *land*

[6] An indepth analysis of the "mini project" strategy can be found in the next chapter.

[7] This process of formulation of participatory natural resources management MINI PROJECTS as well as an indepth analysis of participatory implementation and Monitoring and Evaluation

Figure 5.4 Puwakpitiya sub watershed, Land ownership, pre project, 1994

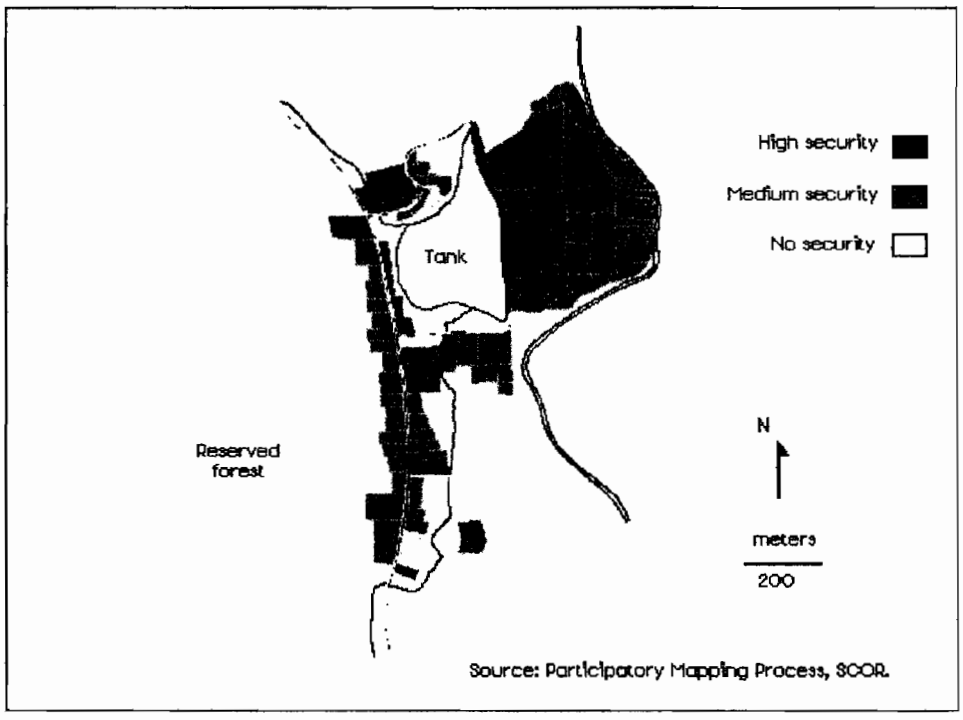
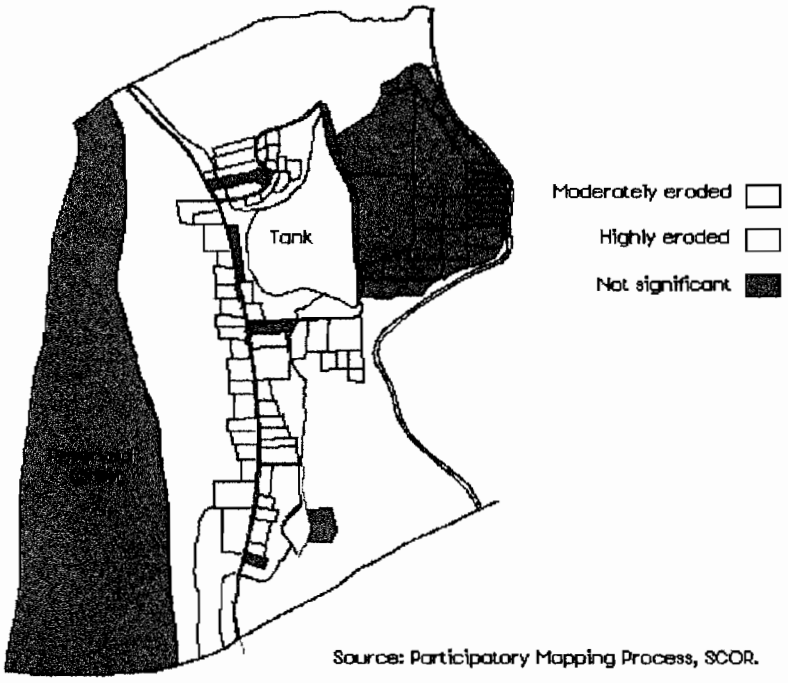


Figure 5.5 Puwakpitiya sub watershed, Soil erosion, pre project, 1994



and water use pattern to a more profitable and diversified process combining production and conservation with use of appropriate technology, shared control arrangements, and resource augmentation. New commercial enterprises and conservation practices in a typical sub-watershed in the Huruluwewa Watershed included: cultivation of medicinal plants, fruits and vegetables in *chena* (shifting cultivation areas), processing of medicinal plants, use of stabilized cropping patterns for chena and highlands, *contour bunds to cover the entire area*, and water harvesting techniques.

This means that the villagers in such pilot sub-watersheds have "action plans" that guide them along a path to a planned future from the current status of resource use. The planned future land use pattern is illustrated in Figure 5.6 while the status as of end of 1997 is illustrated in Figure 5.7. Contour bunds and drains have been established, by the farmers could not cover the entire landscape with conservation measures during the 5-year project period.[8] Other activities included were: 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, and organic farming. Novel modes of state-user partnerships in land and water resource use have been arranged. This mini-project has been backed up by SCOR with a sub-grant of approximately Rs 300,000 (US$6,000).[9]

[8] The outputs are analyzed in chapters 3, 4, and 5.

[9] 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 intimate 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.

It was expected that such grants will be transferred to new organizations after the completion of mini-projects. Hence, grants were expected to be used as revolving funds. However, only a few user organizations could achieve this target before the end of the project period.

Figure 5.6 **Puwakpitiya Sub Watershed, Land Use, Future Vision**

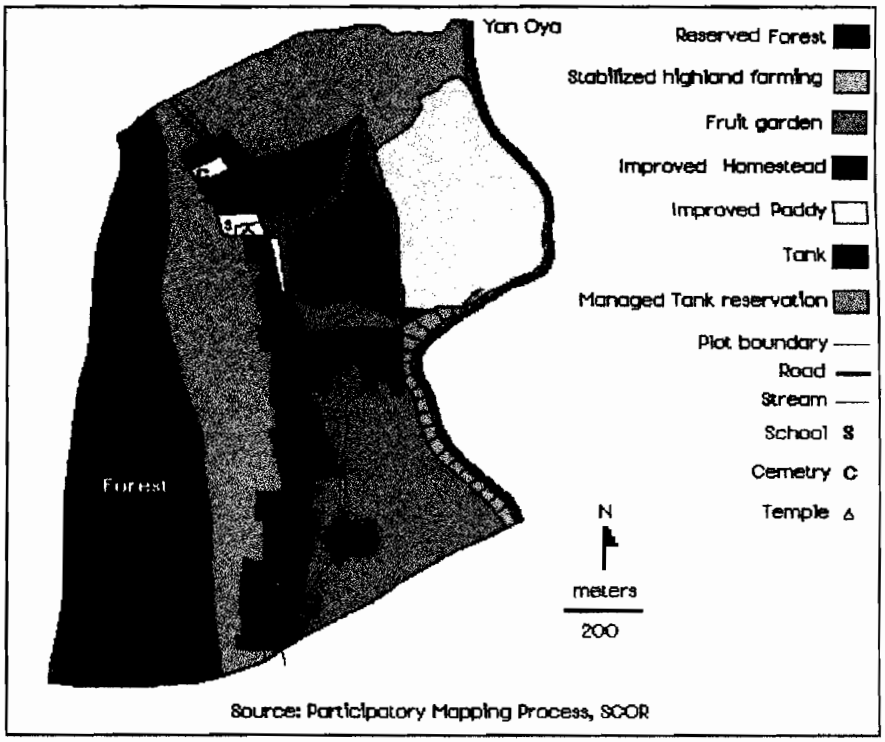
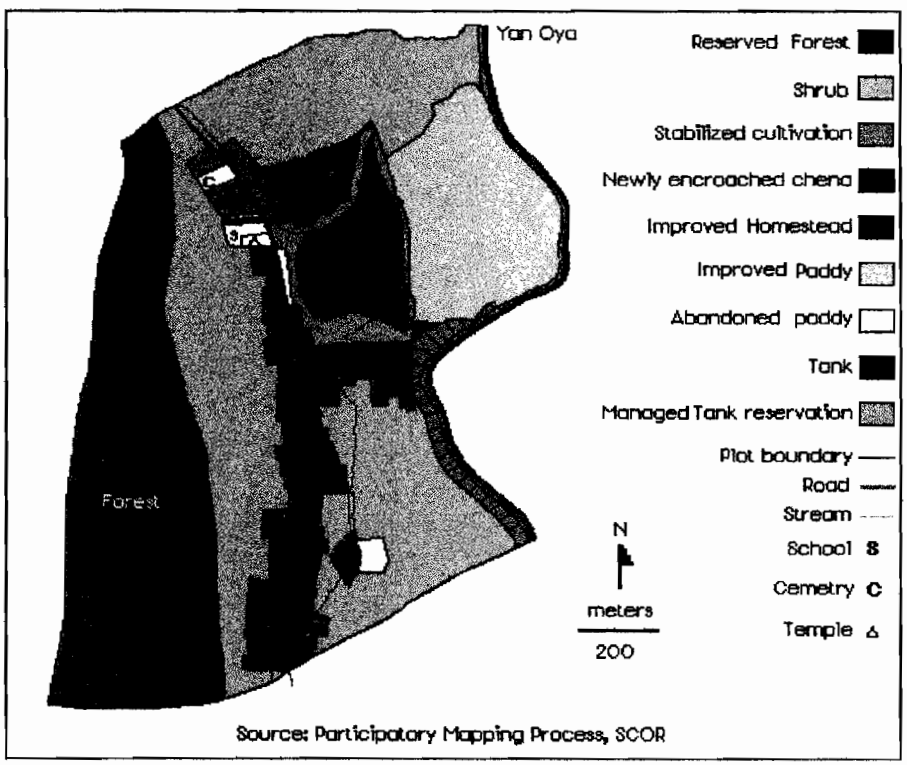


Figure 5.7 **Puwakpitiya Sub Watershed, Land Use, Status In 1997**



For a viable "mini project," SCOR provided one-third or one-fourth of the total *external funding requirement*. The farmer organization/company negotiated (with the assistance of SCOR staff) with the bank and got the balance (2/3 or 3/4) as a loan. The farmer organization/farmer company deposited the SCOR grant in the bank and this (money "freezed" in the bank) was accepted as the collateral for which the farmer organization/company earns interest. Hence, the effective interest rate was less than the market rate. This was useful for the farmer organization/company at the initial "take-off" stage.

A bank agreed to provide a loan four times larger than the SCOR grant for the user organization using the grant deposit as a collateral. A Colombo-based company entered in to a forward contract with the Huruluwewa Farmer Company to purchase soybean and maize, the two major non-rice crops grown in the Huruluwewa watershed (after SCOR intervention) and the Puwakpitiya user organization, like many other user organizations in the area, benefited from this arrangement.

Several mini projects of this nature have being implemented in a large number of sub-watersheds in the two pilot watersheds, Huruluwewa and Nilwala. In the wet zone watershed (Nilwala), it has been observed that deforestation and inappropriate hillside cultivation in the upper Nilwala resulted in reduced water availability in the dry season, erosion, sedimentation, distorted run-off patterns and decline in water quality. During the planning process it was proposed that the 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 concerned agencies joined the user groups to plan reforestation on the hillside, helped raise nurseries, and facilitated replanting. The appraisal and planning group decided that in areas within the range of 46-60 percent slope, a production oriented intervention should 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 have been* adopted for this region. The emphasis was on *conservation farming* aimed at balancing production and protection.

The main features of the sub-watershed production-protection plan or the"mini-project" strategy were :

a) An action plan covering the entire geographic area of the sub-watershed (typically ranging from 75-600 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 livelihood of all the people. Example : it involves all the families in the

village in sharing the efforts 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 activities can be organized enabling the organization to enter into forward agreements, mobilize resources, and exercise joint control over production processing and marketing with the membership.

e) It has a path for new technology to flow into the community to improve the balance between protection and production. Example: For the first time the Puwakpitiya villagers were exposed to new knowledge on conservation farming. They moved *chena* (shifting cultivation) farming from the catchment area 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 (see figure 5.7). In addition, valuable timber trees planted on boundaries provide security for the future. They also tried out mulch farming using straw in the rice fields raising a crop in the dry season for the first time in their village.

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

h) It provides credit worthiness for resource users so that they can mobilize capital for economic ventures from available 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 in business ventures increase the credit worthiness of each individual resource user family. These factors can be considered as positive in assessing the credit worthiness of each farm family, the recognition of which would further help resource users to increase their rating.

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

SUMMARY

This chapter presents a participatory methodology for planning natural resources -- mainly land and water -- in a watershed context. The participatory appraisal of the planning process which involved local people, professionals, Government Officials and catalysts in generating and utilizing relevant data; promoting an inter-disciplinary holistic approach in watershed management and combining endogenous and exogenous knowledge and information in developing market-oriented and sustainable use of land and water is reflected here. The action program aimed at developing a package of interventions related to technology, organizations/institutions, resources, and policy too are elaborated here as they were adopted by an action research project on participatory watershed management, namely the Shared Control of Natural Resources (SCOR).

More specifically, the chapter focused on a process of participatory appraisal of the current levels of management of natural resources in degraded watersheds using improved PRA techniques, participatory design of a future vision of reconciling environmental concerns and production goals and the development of collaborative action plans to achieve such goals. The output obtained during the planning and implementation phases of SCOR have been used as evidence of results to illustrate the methodology of participatory appraisal for planning natural resource management in two pilot watersheds. The selected sub-watersheds for SCOR action-research are contiguous areas of manageable size, having characteristic profiles of ecological, socio-economic and environmental features similar to those of the respective main watersheds. The size of these selected pilot sub-watersheds ranged between 75-6000 ha. This chapter examined the initial action-research which was taken through a participatory process to learn, test and demonstrate the ideal land use pattern with due emphasis on production and conservation.

The SCOR catalysts took the lead role in preparing the resource use maps and recording information. Measures adopted by the action-research team in order to improve the accuracy and acceptance of the appraisal and planning process included, participatory mapping using air photos/ topographic sheets; walk-through surveys; use of different sources of data and the use of GIS; use of mixed groups of participants including resource users, local officers, scientists and catalysts and developing a "sense of ownership", belonging-ness and commitment for action by users and partners etc. A participatory resource management "mini project" was formulated for each pilot sub watershed with a view to change the present land and water use pattern.

CHAPTER 6

PRODUCTION AND CONSERVATION INTERVENTIONS IN SUB-WATERSHEDS

The previous chapter focused on a process of participatory appraisal of the current levels of management of natural resources in degraded watersheds using improved PRA techniques; participatory design of a future vision of reconciling environmental concerns and production goals; and the development of collaborative action plans to achieve such goals. This chapter examines the testing or implementation process of these action plans, and the outputs of production and conservation interventions in the sub-watersheds. It should be noted that SCOR was designed to be intervened at multiple levels, including national policy. The SCOR outputs at these higher levels and its impact on institutional development in the small farm sector of Sri Lanka are elaborated in chapter 11.

For most part of this chapter, the implementation process and the outputs of three sample sub-watersheds, selected purposely for their characteristic differences, will be used. The selected sub-watersheds are: *Puwakpitiya* and *Garadiya Ulpotha* in the Huruluwewa watershed and *Bovitiya Dola* in the Nilwala watershed. The chapter begins with an analysis of changes in the land use pattern in these three watersheds with special emphasis on their spatial distribution.

The chapter will next describe the natural resource conservation methods promoted by the project and examine the outputs of these interventions in the home gardens and other highlands. SCOR intervention in integrating micro hydropower generation and community management of hydro catchment is considered as a special activity and the next chapter is devoted to examine this effort.

Finally, Next, the chapter will present a comparative analysis of SCOR interventions in small tank command areas of three sub-watersheds. As mentioned in the introductory chapter, a typical sub-watershed in the dry zone of Sri Lanka comprises two important zones: the tank, its command and drainage area; Highlands which can be subdivided into home gardens and other highlands including tank catchment. The latter includes open forest and shrub areas normally used for slash-and-burn cultivtion and are degraded, in general.

Production and Conservation Interventions in Sub-Watersheds

The outputs of SCOR Monitoring and Evaluation process are used[1] to illustrate the

[1] Gamini Batuwitage, M&E Specialist, Kumudini Jayawardene, Computer Analyst and Samarakoon Banda, Research Associate of SCOR were actively involved in the design, processing, and analysis of SCOR outputs.

results of SCOR interventions. Table 6.1 compares the targeted outputs of SCOR with the achievement at the end of the second quarter (i.e., 3 months before the end of the project).

Table 6.1. Performance (in summary) by output indicators, aggregated.

Indicator	Unit/No.	Target up to 30 Sept. 1998	Total to date
1. Targeted area under improved production and protection techniques	ha	18,202	14,606
2. Value of targeted investment by the resource users in environmentally sound production practices	Million US$	1.0	1.73
3. Targeted land area covered by agreements between the government and user groups (extent now under protection and production practices expecting user rights)	ha	522	503
4. Farm households using improved environmental techniques	#	12,689	12,615
5. No. of policy/procedures, organizational changes enacted and adopted	#	6	3
6. Number of user organizations conferred with legal status and powers	#	50	85
7. User groups organized/assisted to take joint responsibility for management of land and water resources	#	67	44
8. Number of new commercial activities supported by linking to markets	#	160	138
9. Land leasing/usufruct agreements issued for the establishment and functioning of production companies and commercial activities	#	5	2
10. Training opportunities provided to representatives of resource user groups, NGOs, and other private sector organizations in participatory natural resources management	#	17,919	17,231
11. Number of officials trained in local level planning, user groups formation, support and collaboration	#	420	430
12. Number of NGOs and private sector agencies providing technical, managerial, and commercial information to user groups	#	15	27
13. Research studies completed on natural resources issues	#	25	19

Source: SCOR Progress Report, 2nd quarter 1998 (July 1998).

As mentioned earlier, for each selected sub-watershed, a participatory resources management "mini project" was formulated. The mini 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 methods of resource augmentation (e.g., conjunctive use of rainwater, tank water, and groundwater, conservation farming, water harvesting, etc.) New commercial enterprises and conservation practices in a typical sub-watershed in the SCOR experiment in the Huruluwewa watershed included: integrated wet and dry season water management in command areas (e.g., water-saving techniques to improve cropping intensity, and introducing short-duration commercial crops in the dry season, cultivation of medicinal plants, fruits and vegetables in *chena*, processing industry for medicinal plants, stabilized cropping patterns for chena and highlands, *contour bunds to cover the entire area*, water harvesting techniques, etc.).

The villages in such pilot sub-watersheds had implemented these "action plans" in line with the planned future from the current status of resources use.

As of early 1994, before SCOR interventions, most of the reservation land in Huruluwewa and Nilwala watersheds was being encroached and subjected to illicit tree felling and clearing of land for cultivating rice and short-term crops in Huruluwewa and primarily for tea in Nilwala. The preparation of land for the cultivation of such crops involves the use of undesirable agronomic practices, such as tilling, which causes erosion in waterway corridors and the subsequent sedimentation of the waterways. This serious natural resource management issue was addressed at length by SCOR.

Several mini projects, combining production and conservation components, have being implemented in 35 sub-watersheds in the 2 pilot watersheds, Huruluwewa and Nilwala. In the wet zone watershed (Nilwala), it has been observed that deforestation and inappropriate hillside cultivation in the upper Nilwala have resulted in reduced water availability in the dry season, erosion, sedimentation, distorted runoff patterns and decline in water quality. In all the pilot sub-watersheds in Nilwala, during the planning process it was 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 concerned agencies joined the user groups to plan and implement reforestation on the hillside, helped raise nurseries, and facilitated replanting. Conservation measures have been promoted in areas under tea.

Mini project in Puwakpitiya, like in other SCOR sample sub-watersheds, aimed at changing the pre-project *land and water use pattern to a more profitable and diversified resource use pattern. This was attempted by combining production and conservation using appropriate technologies/ techniques; novel shared control arrangements and resource augmentation.* New commercial enterprises and conservation practices included: integrated wet and dry season water management in the small tank command area, e.g., water saving techniques to improve cropping intensity and introducing short duration commercial crops like soybean in the dry season; fish farming; and in highlands, participatory forestry and stabilized cultivation (of field crops such as maize for an identified market, medicinal plants, fruits and vegetables). An attempt was made to couple this production with

conservation methods - - such as contour or graded bunds, alley—cropping, mulching, water harvesting, green manuring, integrated pest management, mixed cropping and integrated livestock farming, combination of agriculture and forestry, etc.—in areas hitherto used for slash-and-burn or shifting cultivation. The pre-project land use pattern was illustrated in figure 5.2 and table 5.. Figure 5.6 indicated the "planned/future vision"of the Puwakpitiya sub watershed.

The achievement as of 1997 is illustrated in figure 5.7. In annex 6.1 at the end of this chapter, the pre-project resource use, planned future vision and achievement as of 1997 of *Garadiya Ulpotha* and Bovitiyadola are illustrated.

The concept of "mini projects," profit- and market-oriented conservation, and participatory and collective action had contributed to the level of outputs. Providing small grants to the existing and new user groups was considered to be crucial. *There were instances (for example, in Padikaramaduwa sub-watershed in Huruluwewa) where some organizations, after making progress out of these initial "mini projects," offered loans to other farmer organizations. However, only a few user organizations could achieve this target before the end of the project period. Nevertheless, it should be noted that the Huruluwewa Farmer Company became the first ever farmer organization of Sri Lanka to issue production loans to the shareholders (through respective farmer organizations) coupled with a guaranteed price and forward contracts to purchase their products at harvest.*

As explained earlier, local banks agreed to provide loans about four times the SCOR grant for the user organization using the grant deposit as collateral. A Colombo-based company entered into a forward contract with the Huruluwewa Farmer Company to purchase soybean and maize, the two major non-rice crops grown in the Huruluwewa watershed (after SCOR intervention); and the Puwakpitiya user organization, like many other user organizations in the area, benefits from this arrangement (see chapter 11 for a detailed analysis).

In "mini projects," novel modes of state-user partnerships in land use (such as the long-term usufructuary rights for participants who do not "own" the land) have been arranged. SCOR learning experience suggested that the issue of property rights should be treated in the context of culture, local values, and local market conditions. For example, a complete transfer of ownership of land and water to individuals (i.e., individual property rights) may be important in some cases while in certain other cases, such as irrigation canal or natural stream reservations, instead of exclusive individual property rights, the concepts of *shared control,* usufructuary rights, longer-term lease arrangements, and *state-user partnerships* provided adequate incentives to the users to make investments and productive decisions. Such alternatives to exclusive individual property rights provide the respective natural resources users a *sense of ownership* (see chapters 8 and 9 for a detail analysis on the impact of different forms of tenure on the effective utilization of natural resources and on SCOR intervention in this major area of the project).

Natural Resource Conservation Interventions by SCOR

As stated earlier, SCOR was not designed or intended to discover new tools / methods of soil and water conservation. It was not intended to test the validity of various conservation or crop/ livestock practices. *Instead, SCOR was a management intervention* and aimed at testing a strategy to reconcile production and conservation goals, using already available production and conservation technologies.

In addition to these conservation farming technologies, SCOR, in collaboration with respective government agencies, introduced management options aimed at soil and water conservation. The methods/practices promoted by the project include:

- Reforestation: the major approach was to collaborate with the Forest Department programs and projects, especially the Participatory Forestry Project (see chapter 10). This covered several zones of a sub-watershed such as: home garden, road, canal and reservoir reservations, etc. (chapters 6, 7, 9 and 10).
- Protection of existing forests through participatory mechanisms. This included the improvements to open forest or shrub areas, participatory mechanisms to reduce illegal felling, , etc., e.g., participatory micro hydropower projects (chapters 7 and 10).
- Improving the management of crops to enhance conservation: e.g., maintaining a good cover or plucking table of tea in the Nilwala watershed where nearly half the land area is under tea (chapter 6).
- Stabilization of areas presently under slash-and-burn cultivation (chapter 6).
- Changing cropping patterns aiming at soil and water conservation integrated with higher profits (chapters 6 and 10).
- Encouraging the adoption of conservation practices in farming;[2]
    - Live fencing,
    - Graded bunds and drains,
    - Biological stabilization,
    - Mulching,
    - Alley cropping,
    - Recycling of crop residues/composting,
    - Water harvesting,
    - Mixed cropping,
    - Maintaining multi-strata canopies, and
    - Crop- livestock integration.

Comparison of "Pre-" and "Post-" Project Status in Three Sub-Watersheds: Pre-project status in relation to the adoption of conservation practices in the three selected watersheds are given in figures 6.4 to 6.6 and in table 6.4. During the implementation of sub-watershed action plans, the recommended conservation farming practices have been

[2] This section is based on notes prepared by W. L. Weerakoon, Conservation Farming Specialist of SCOR.

promoted in sample areas with the leadership of the Conservation Farming Specialist of SCOR, and under the guidance of the Department of Agriculture and in collaboration with the government agencies. For live fencing, many farmers use *Grilicidia sepium or Pavatta indica.* This is a common practice, especially in the dry zone of Sri Lanka. In most of the home gardens this was the only conservation measure observed prior to SCOR interventions (refer figuresA6.7 to A6.9 and tables A6.4 to A6.6 in Annex 6.2).

Graded bunds[3] and associated drains have been recommended on the basis of the findings of field research conducted by the Department of Agriculture. Most of the lands in the dry zone are undulating or rolling. The primary purpose is to control field rates of erosion and soil loss, especially during heavy monsoonal rains. To stabilize the bunds, farmers have been advised to grow *pawatta indica.*

As for organic matter management, the project, in collaboration with the Department of Agriculture, promoted agro-forestry, mainly headgerow planting and alley cropping, composting, recycling of crop residues, incorporation of weed trash and other waste material, etc. These are "tested technologies" and the literature on the technical suitability of these methods, especially for the dry zone of Sri Lanka, is given by Weerakoon and Seneviratna (1984), Weerakoon (1989), Sisira (1992), and Gunesena et al. (1992).

One of the major constraints to the establishment of trees in the dry zone is the soil moisture deficit in the dry months of the year. The young seedlings are highly vulnerable to moisture stress. Eyebrow bunds and buried clay (pitcher) pots have been promoted by SCOR, in collaboration with the Department of Agriculture. In pot irrigation, the interval between two irrigations can be lengthened significantly because of the reduced water loss. During dry spells pots can be filled with water brought from elsewhere. The size of pots may vary from about 4 liters to 7. Pots, once filled, will release water slowly through the micro pores, in response to plant needs. Water loss can be further reduced by exposing only the side of the pot facing the plant. The other side can be sealed. Some farmers used a "funnel" made of palmyra leaves to collect rain water.

Eyebrow bunds are runoff collecting devices. A pot can be buried to collect the water "harvested" by the eyebrow terrace, which has been placed facing the upward slope. These devices were proved to be useful as they effectively harvest the water received from intermittent rains during the dry spell (Weerakoon 1998).

The "post-project" status of the spatial distribution of the adoption of the recommended conservation practices, in the three selected sub-watersheds is illustrated in figures A6.10 – A6.12 and tables A6.4 to A6.6 in Annex A6.2 and a comparison is given in table 6.5.

Aggregated Output. As shown in table 6.1, SCOR project expected that 18,202 hectares. would be brought under improved production and conservation practices before the end of the project. The project has achieved 80 percent of its targets by the end of June 1998.

[3] Technical assessment of bunds is beyond the scope of this manuscript and can be found in Weerakoon, 1983 and Somasiri et al. 1990.

In regard to the value of targeted investments by the resource users in environmentally sound production practices, the project has exceeded the target and achieved a 173 percent success. The assessment of SCOR progress by the end of the second quarter, 1998, revealed that the project has achieved a 100 percent success in regard to the adoption of conservation by individual households.

However, it should be noted that this computation does not evaluate the adequacy of the conservation practices being adopted by respective households. For example, all those who are adopting one or more of the recommended conservation practices have been counted, irrespective of the quality and adequacy of resource conservation.

Makin et al. (1998) have conducted an interesting analysis using a composite index, to analyze the results of SCOR efforts in soil and water conservation practices. The index, called the "Conservation Technology Adoption Index" (CTAI), has been computed from a set of indicators designed to measure the adoption of the individual technologies. seven technologies were included: live fencing, mulching, bunds and drains, alley cropping, recycling of residues, and mixed tree component. Based on a set of assumptions related to the expected influence of these individual technologies on favorable field conditions, different weights have been assigned to each one of the technologies. The favorable field conditions considered in the analysis were: reducing soil loss/soil erosion (measured by the indicator, SECI), improving the soil moisture regime (SMRI), improving the soil fertility status (SFII) and contributing to the micro climate of the sub-area (MCII). CTAI has been computed as follows:

$$CTAI \doteq \frac{(SECI + SMRI + SFII + MCII)}{4}$$

The analysis was conducted using field data, both quantitative and qualitative, collected from six sub-watersheds selected from the SCOR Huruluwewa area: *Puwakpitiya, Mahameegaswewa, Padikaramduwa, Kubukwewa* and *Kalanikawewa. The results are summarized below*[4]*:*

- Adoption of live fencing is strong in Mahameegaswewa homestead plots and it was low in Kalanikawewa. Among the reasons for non-adoption were farmers' satisfaction with the existing barb wire fencing, damages caused by wild animals, and drought conditions.
- Mulching has been adopted widely across the sample sites.
- Bunds and drains have been accepted/adopted by a large majority of farmersin Mahameegaswewa in areas under slash-and-burn cultivation. *This can be considered as a positive contribution of SCOR towards the "stabilization of chena."* However, the

[4] Quoting from Makin et al. Pp. 7-8

adoption of this technology in other sample sites has been about 40 percent.[5] According to the authors, the maintenance of bunds (which was rated as 40 %) is poor mainly because of the drought prevailed.

- "Alley cropping was cautiously accepted at all locations.....it was not a popular innovation as farmers feared that the hedges would create too much canopy cover and compete with field crops and further reduce soil fertility" (Makin et al. p.7).
- At all the sample locations, recycling of organic matter was found to be widely accepted.
- "The mixed tree component was generally accepted with over 70 percent of the target area adopting the recommendation" (Makin et al. p.8).
- The analysis of the overall acceptance of the package of conservation measures, measured by CTAI, revealed that it varies across study locations, from very high in Mahameegaswewa to low in Kalanikawewa..

Home Gardens.[6] "A home garden is a piece of land around a dwelling emerging as a result of the interaction between the occupants related to their socioeconomic aspirations and biophysical nature of the land. A home garden often consists of a mixture of annual and perennial crops/trees, sometimes including a few heads of livestock. On account of the vertical structure with vertical canopy depths of various plant species, the home garden is often referred to as a *multi-species* and *multi-storied system* which usually mimics the characters of a natural forest in the area.....Very similar forms of home gardens are found in the wet zone, both in hills and lowland areas in Sri Lanka..... Depending on the availability of moisture, the crops grown in the dry zone are different. For example, coconut, mango, banana, jak, papaya, orange and guava among the most common species found. Indigenous tree species including *halmilla (Berrya cordifolia), satin wood (Chloxylon swietenia), teak (Tectonia grandis) and margosa (Azadiracta indica)* from substantial private planting on farmands. *Gliricidia sepium, Leucocephala, Tespesia populnea and Euphorbia spp. Are commonly planted along homestead boundaries as live fences"* (Weerakoon 1998).

As mentioned earlier, nearly 38 percent of the land in the Nilwala watershed is under homesteads while in Huruluwewa, the corresponding figure is only 10 percent. However, during the recent past tea cultivation has spread to the homesteads of Nilwala and at present over 50 percent of the homesteads have tea. In both watersheds, pre-project surveys revealed that the effective utilization of homesteads is hampered by the small size, inadequacies in soil conservation measures, and unsystematic production. Because of the terrain characteristics, soil conservation and erosion control measures are more important in the homesteads of the wet zone watershed. On the other hand, well-planned and intensive

[5] We argue that an adoption rate of 40 percent by resource poor farmers, for a new conservation technology, should be rated as "very high" (for example refer the popular work on Extension by Roger and Mosher)

[6] This section is based on the findings of research conducted by W.L. Weerakoon, Conservation Farming specialist of SCOR. The results are reported in "Ecological Richness in Home Gardens," Weerakoon, W.L., (unpublished).

measures of moisture conservation are more important in the dry zone watershed where the rainfall is low and its distribution is unfavorable for year-round cropping in the highlands.

Assessment of Project Outputs in Home Gardens. This section presents the results of an assessment of selected conservation measures based on a sample of homesteads. The study, conducted by Weerakoon (1998), included 39, 44, and 36 farms selected randomly from Padikaramaduwa, Puwakpitiya, and Garadiya Ulpotha sub-watersheds, respectively. The study was focused on:

- the floristic composition of the perennial tree crop species
- number of tree crop species and number of individuals
- canopy stratification

Floristic Composition. The analysis showed that there were 31 tree species. Out of these, 17 species are tall and possess a large canopy structure while 5 were of medium scale (in respect of height and canopy) and 9 were small. The study revealed that most of these trees are economically useful to the households and provide, food, fuel, etc. Also, most of them can be classified as "multipurpose trees" (table 6.2). The number of tree species has increased by 37.5 percent, 18.8 percent, and 50 percent in the three sample sub-watersheds (Padikaramaduwa, Puwakpitiya and Garadiya Ulpotha, respectively) due to SCOR interventions.

Table. 6.2 Uses of Home garden trees in Huruluwewa.

Species	Food	Fruit	Timber	Fuel	Others*
	1	2	3	4	5
Coconut	X		X	X	X
Jak	X	X	X		
Cashew		X			X
Mango		X	X		
Wood apple		X			X
Teak			X		
Margosa			X		X
Lime		X			
Tamarind	X				X
Beli		X			X
Anoda		X			
Orange		X			
Satin			X		
Halmilla			X		
Banana	X	X			
Arecunut		X			
Acasia				X	
Pomegranate		X			
Guava		X			
Breadfruit	X				
Grapes		X			
Passion Fruit		X			
Bamboo			X		X
Ketakala			X		
Kottam				X	
Papaya		X			X
Naran		X			
Lunumidella			X		
Moringa	X				
Milla			X		
Damba			X		

* Shade, gums, beverages/medicinal, soil conservation, etc.

Source: Weerakoon, L.W., Ecological Richness of Home Gardens, 1998, Table 4

Tree Density. The pre-project and post project status of the tree density, expressed as the average number of individuals of a given tree species per 100 home gardens (that received species through SCOR interventions)[7] is given in Table 6.3. Project's output in this important area is clear from this simple investigation; the tree population and density has "doubled" as a result of SCOR intervention.

Table: 6.3 - Increase in number of trees and tree density in sample sub-watersheds.

Sub-watershed	Number of trees		Tree density		Percent increased
	Before SCOR	After SCOR	Before SCOR	After SCOR	
Padikaramaduwa	2277	4018	58.4	104.6	79
Puwakpitiya	2048	4736	46.6	107.6	131
Gerandiya Ulpotha	1829	3466	50.2	96.3	90

Source: Weerakoon, L.W., Ecological Richness of Home Gardens, 1998, page 11

Ecological Richness of Plants Community Index (ERPC). In the same study, Weerakoon (1998) has examined several other important aspects of SCOR outputs and impacts. Indicators used to measure and quantify the effects of SCOR efforts included: frequency (and relative frequency) or the chance of finding a species in a particular home garden, "Importance value index" indicating the dominance of a given species over others, and the Environmental Richness of Plant Community (ERPC) Index. The latter is defined as the "success of maintaining the interactive balance among biological and physical processes in an environment as it happens is natural environments" (Weerakoon p.4). The method adopted by Weerakoon in computing the indicator values are given below:

$$\mathbf{ERPC} = \sqrt{S(K_L N_L + K_M N_M + K_N N_N}\ ,$$

where, ERPC is the environmental richness of plant community, Index S is the number of species per unit area and K_L, K_M, and K_N are coefficients to denote strata effect of large, medium, and small trees, respectively, and N_L, N_M, and Ns are the number of plants per unit area under large, medium, and small canopy categories, respectively.

Method of Calculation. Assume the diversity and canopy sizes of the trees at full maturity to be (stratification) as follows:

[7] Density = (Total number of a species in all home gardens/Total number of home gardens) x 100

Large/tall	Medium	small
Coconut	*Murunga*	Lime
Mango	*Aricunut*	*Delum*
Cashew		Orange
Jak		Lemon
Beli		Guava

Giving scores to large as 03, to medium as 02 and to small as 01, and species as mango, *murunga,* and lime and the individuals total as 100 in all three situations, the ERPC index could be calculated as below:

Stratification	3(L)	2(M)	1(S)
Species	Mango	*Murunga*	Lime
Individuals (total 100)	50		50
	25	25	50
	50	25	25

(i) $2 * \sqrt{50X3 + 50X1} = 28.3$

(ii) $3 * \sqrt{25X3 + 25X2 + 50X1} = 39.7$

(ii) $3 * \sqrt{50X3 + 25X2 + 25X1} = 45.0$

This method has been employed in this study to work out ERPC for all 03 selected watersheds.

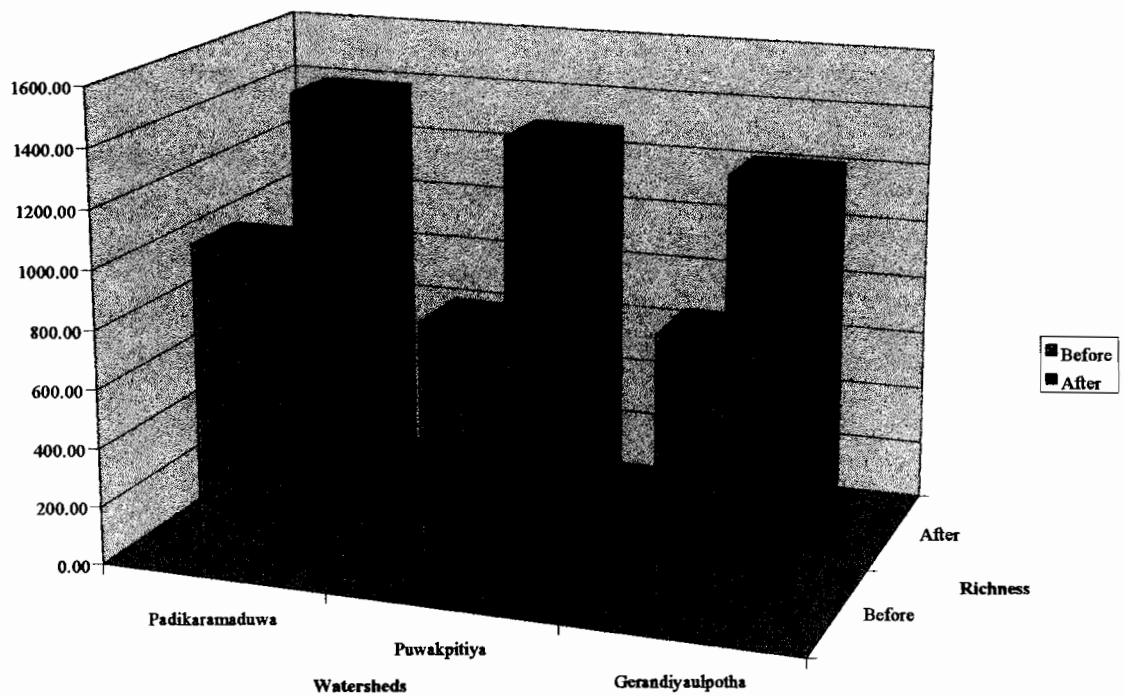
As stated by Weerakoon, in a plant community environmental benefits could come mainly from three major effects: a) mutual benefits and interactive sharing of nutrients among different species. Obviously, in a diverse plant community this effect is more. b) competitive sharing of sunlight as well as other mutual benefits receiving from the micro climate at different strata and, c) the holistic effect of various cyclic processes such as water, carbon dioxide, sulfur etc. This would help maintain optimum ecological balance with optimum biological mass in the system.

It can be argued that such mutual benefits can be more in a diversified plant community or in a multi-strata canopy. In the past, the reforestation efforts had been focused on monocultures (popularly of teak, eucalyptus, pine. etc.). Recently, especially

with the introduction of community and participatory forestry, there is an increased tendency to establish diversified and multi-strata canopies. Also, if people are given usufructuary rights, at least in the form of longer-term access to benefits like fruits, fuel, non-wood extracts, etc., the economic benefits can also be substantial. In home gardens there are added advantages such as the possibility of incorporating plants and livestock to improve household nutrition, collective action by women's groups, etc.

The indicator, ERPC, incorporates plant diversity, canopy coverage, and plant density and gives an indication of the stability of home gardens (Weerakoon 1998). SCOR effects on ecological richness, which includes bio-diversity, for which the government has attached a high priority, and land cover were evident from the results of the analysis. The results are illustrated in figure 6.10.

Figure 6..10 - Ecological richness in home gardens .



Source: Weerakoon, W.L. 1998, Ecological Richness in Home Gardens, p.21

Shared Management of Waterway Reservations[8]

This section examines the shared management approaches experimented by SCOR in managing waterway reservations. Reservations are established for a variety of water bodies such as natural streams and lakes; irrigation and drainage canals; reservoirs and

[8] This section is adopted from Wijayaratna and Seneviratna 1997.

dams used for irrigation, hydropower generation, domestic water supply; flood control ; and ponds used for aquaculture, etc. The available scientific data on land use and environmental conditions of reservations in many developing countries are not adequate. However, in many countries it has been observed that the reservations of those important water bodies are not managed appropriately to optimize production and conservation. Therefore, it is essential to assess the present conditions of the reservations of water bodies and plan for land use as well as related institutional changes necessary to reverse negative environmental and economic trends.

The rights and capacity of local resource users to utilize reservation land for economic gain, without compromising the protection of waterways have been recognized by the SCOR Project. Most of the waterway reservations in Sri Lanka, like in many other countries in the region, are owned by the State. The responsibility for managing these lands is vested with the state agencies. To protect reservations, their unauthorized use is prohibited by law but it is often observed in the breach and reservations are subjected to unsuitable land use and illegal logging. SCOR hypothesized that conservation of waterway reservations could be better addressed in a watershed context. A package of conservation and production interventions such as cultivation of specific types of vegetation/crops, coupled with appropriate soil and water conservation technologies, mobilization of local resources, and acceptable tenurial pattern/usufructuary rights, and, most importantly, marketing and enterprise development is more effective in protecting environmentally fragile land in water basins or watersheds. This package of measures and process es would be applicable elsewhere.

Environmental and Ecological Concerns

- It is assumed (refer chapter 2) that vegetation is the appropriate land cover for waterway corridors if the ecological functions of these corridors are to be performed adequately.

- Identified reservation areas should be demarcated according to a predetermined reservation width (based on scientific reasoning) and protected under special land use standards that will minimize degradation of water quality, soil erosion, and destruction of wildlife habitats.

- Most areas with natural vegetation (e.g., forests) in agricultural watersheds of Sri Lanka are already destroyed. Therefore, the priority is to establish vegetation cover at least within reservations and arrest soil erosion, and related adverse effects.

Economic Objectives

- Resource users of the area should be able to utilize the land in an economically viable manner. Quick profit is the driving force behind the unsatisfactory use of natural resources. A production-oriented land use pattern in agreement with conservation needs

of waterway corridors will optimize the long-term environmental gains as well as the monetary gains to area farmers.

Agricultural Concerns

- A land use pattern, which will cultivate crops suitable for the physical and climatic conditions of the area and at the same time utilize farming techniques that induce minimum amounts of soil disturbance and reduce negative effects on waterway corridors, should be promoted within reservations.

Usufructuary Rights. As a pilot project to test how reservation resources can be utilized by resource users under usufructuary rights, permits were obtained from local authorities until policy decisions are made at the national level regarding usufructuary rights.

Selection of Trees/Plants. Benefits derived from this effort included harvest from fruit trees and other cash crops, harvest of timber, and the environmental benefits of vegetated reservations. Trees were selected so that economic incentives are offered as: a) sources of fruit for the foreign and local markets, e.g., mango (*Mangifera indicia*), orange (*Citrus sinensis*), lime (*Citrus aurantifolia*), pineapple (*Ananas comosus*), and wood apple (*Feronia limonia*), b) sources of supplementary food, e.g., jak (*Artocarpus heterophyllus*) and breadfruit (*Artocarpus comosus*) and sources of timber, e.g., teak (*Tectona grandis*), c) sources of fuelwood, and d) sources of certain raw material/multipurpose species, e.g., cane (*Calamus rotang*).

The Ideal Landscape for Reservation. The ideal species and locations for those species in a reservation, as seen by SCOR specialists, are based on the water availability, economic value or income, ecological needs, preference of resource users, and the operational and maintenance aspects.

Soil moisture content. The land adjacent to a waterway channel can be divided into three zones according to soil moisture availability: hydrophytic zone (channel banks), semi-hydrophytic zone (15-20 ft. from the channel banks), and the mesophytic zone (beyond 20 ft. from the channel banks). Species should be selected separately for these different hydrological zones.

Bio-diversity and production. A mixed crop culture was preferred by SCOR specialists to a monocrop culture, since having several species enhances canopy stratification, promotes bio-diversity, and provides income throughout the year. In a multi-species cultivation, canopies should not overlap. The main species should be pruned as necessary. Species should be mixed according to the density ratio: large canopy (two trees), medium canopy (three trees), and small canopy (five trees).

Root system of species. The nature of the root system of species is a critical factor when selecting trees for irrigation reservations. Therefore, deep, spreading rooted trees were

discouraged to be planted too close to irrigation structures. Deep roots could spread and grow into the structures and cause detrimental effects by disturbing the structural stability of the irrigation system.

Maintenance of irrigation systems. The maintenance of irrigation systems requires easy accessibility of heavy equipment as well as personnel to the channel and related structures. If trees are planted in undesirable locations (too close to maintenance areas) removal of vegetation might be necessary for maintenance purposes.

User Groups (Farmer Organizations). As mentioned at the outset, SCOR interventions were aimed at increasing farmer's share of control of reservation resources by introducing a new land tenure pattern and by providing the opportunity for resource users to function in a group mode, for example as farmer organizations, thus exerting a stronger and sustainable influence on the manner in which area resources should be allocated and utilized. This was the driving force in this intervention.

Interventions

Nilwala Watershed. Interventions related to conservation of natural resources of the area, including reservation management, have been conducted in eight micro watersheds of the Nilwala watershed, specifically in the upper catchment areas. Several planting campaigns for reservations have been conducted with usufructuary rights granted for forest products. About 72.5 km of land along streams were enriched by planting 12,300 forest and fruit plants during Phase 1 (October 1993 to October 1995) of the SCOR Project (IIMI-SCOR Progress Reports 1996).

In addition, "stream gardens" have been established in several places to stabilize the banks. These gardens contained valuable trees and limited amount of physical structures such as retention walls made of locally available stones. The following sections focus on selected activities carried out in one pilot micro watershed namely, Kiriwanadola in the Aninkanda sub-watershed in the Nilwala watershed.

The Kiriwanadola Micro-Watershed Conservation and Development Mini Project was implemented in 1996 by SCOR to encourage farmers to adopt appropriate conservation and production techniques. The project was supported by relevant line agencies of the government including the Department of Agriculture, Tea Small Holdings Authority, Tea Research Institute (TRI), Health Department, Coconut Development Board (CDB), Department of Export Agriculture, Agrarian Centre (formerly the Department of Agrarian Services), and the Pasgoda Divisional Secretariat office.

Kiriwandola micro-watershed is located in the Aninkanda sub-watershed in the Matara District. There are about 149 families in the area. Their primary source of income is tea cultivation (cultivated on 166 ha of land—about 53 % of the total land). Other economic crops are also cultivated at the homestead level (37 ha) and about 75 hectares of land are under rice. Kiriwanadola and its branches Galbokkadola and Elladola flow across this micro-watershed.

Among the problems identified by SCOR staff for the Kiriwanadola micro-watershed is the degraded condition existing in the source areas and along stream banks due to the lack of protection provided for the reservations. At the time the project was conducted, reservations were used for the cultivation of tea and rice. Area residents have understood the negative impacts that could result from the unsuitable land use patterns that exist in the areas. One of the factors attributed for the lower yield levels for tea and rice recorded for this area is the extensive erosion that takes place, primarily due to deterioration of stream banks. Other factors for low yield levels include lack of proper seedlings, technical advice, insecticides, and tenurial problems.

Establishing Appropriate Vegetative Cover in Reservations. Officials of line agencies, facilitated by SCOR, have been instrumental in presenting conservation-based production techniques as a solution to watershed problems. The growth of tree species of economic and environmental value in reservations (agro-forestry) is one of the options presented as a method of maintaining good ground cover and protecting the stream reservations. It is hoped that such a strategy, in addition to farm profits, would help moisture conservation in uplands, reduce erosion, and help control flooding in downstream areas. As part of the Kiriwandola Micro-Watershed Development Project, SCOR initiated the rehabilitation of land along 6.2 km of streams, including Kiriwandola (3.2 km), Galbokkadola (1 km), and Elladola (2 km) through the planting of annuals, semiannuals, and perennials. During 1996, approximately 350 plants of different species such as pineapple (*Ananas comosus*), mango *(Mangifera indicia*), mahogany (*Switenia macrophylla*), *pihimbiya* (*Filicium decipiens*), coconut (*cocus nucifera*), nadum (*Pericopsis mooniana*), arecanut (*Areca catechu*), bamboo (*Bambusa spp.*), and teak (*Tectona Grandis*) were distributed among 42 farmers who occupied plots along this waterways.

Marketing of annual, semiannual, and perennial products. The planting of species in reservations will not be successful if the farmers are unable to market the yield in an economically sustainable manner. Market failures mean low and/or unstable income to the farmers. Hence, the inability of farmers to find markets for their products will lead to lower enthusiasm levels among them, and the shared management system/state-user partnerships that SCOR is trying to promote within reservations, conservation through the profit approach, would fail.

Even though there is a high demand for products of these species, farmers of the area run into problems when trying to find buyers. For example, there is a high demand for quality "*kithul* treacle" and desiccated fruits and vegetables (e.g., desiccated jak) and other foods (e.g., desiccated arecanut, papaya, and ginger), especially from Colombo hotels, and also in certain other countries. The main shortcomings encountered by the farmers when trying to find buyers are the lack of market information and links, lack of processing and value-addition to meet consumer demand/export standards, and unsatisfactory sanitary conditions. SCOR has addressed these issues through interventions such as the following:

1. Improved processing techniques have been promoted for the products of non-timber species such as jak, breadfruit, arecanut, and kithul.

2. Kithul treacle is processed and marketed through the Nilwala People's Agro-Processing Company, which has been established through SCOR interventions. The average monthly turnover is 5,000 kg (27,901 kg during the first 6 months of 1997). A 325 ml bottle is sold at Rs 36.50 (US$0.62).[9]

3. Small-scale farmers (especially those who market spices in small quantities) have been helped by facilitating bulk sales through the provision of a central collection center and storage facilities (refer chapter 10 for details).

Huruluwewa Feeder Canal Area. Earlier, most farmers of the area practiced slash-and-burn cultivation resulting in clearing of large extents of forests. Inadequate nutrient-replenishing time due to continuous cultivation and shortened fallow periods, loss of top soil, and low moisture retention levels, etc., have contributed to the loss of fertility. The availability of Mahaweli water for the area (since 1976) opened more land for cultivation and new cropping patterns thus tempting encroachers into the vacant land not claimed by earlier inhabitants, including the state reservation land (Ariyaratne 1995; and IIMI-SCOR 1993a). Waterway reservations were especially attractive to the newcomers due to free and easy access, abundance of water, and rich, moist soils. These conditions enabled them to obtain high yields and profits within a relatively short period. The high-value crops they cultivated, such as tobacco, chili, and big onion, provided them with a significant income. This is evidenced by the permanent and semipermanent dwellings put up by them.

Reservation land, with free access, is used extensively for cultivation of short-term crops and grazing of cattle. Prior to the SCOR Project interventions in 1993, vast extents of the land adjacent to the moisture-rich right bank (at a higher elevation than the left bank) of the Feeder Canal were used for the cultivation of tobacco. The land was cultivated right up to the banks of the canal, without leaving any type of buffer between cultivation and the waterway. Even basic soil and water conservation farming practices such as contour bunds were almost nonexistent within the area. During a SCOR study done in 1993-94, it was found that some farmers had dug irrigation wells within the Feeder Canal reservation (Ariyaratne 1995). This has led to serious problems of erosion of the canal banks.

As of early 1994, before SCOR interventions, most of the reservation lands in Huruluwewa and Nilwala watersheds were being encroached and subjected to illicit tree felling and clearing of land for cultivating rice and short-term crops in Huruluwewa and primarily for tea in Nilwala. The preparation of land for the cultivation of such crops involves the use of undesirable agronomic practices, such as tilling, which cause erosion in waterway corridors and the subsequent sedimentation of the waterways. This serious

[9] In July, 1997, US$1.00 = Rs 58.45.

natural resource management issue was addressed at length by the Shared Control of Natural Resources (SCOR) Project.

These conditions within reservation areas of the Feeder Canal and Yan Oya have led to the following: (Ariyaratne 1995; IIMI-SCOR 1993a; and Wijayaratna and Widanapathirana 1994):

1. Degradation of valuable forest areas. Virgin riverine forests are almost nonexistent within the area. The original natural vegetation has been replaced by random shrub growth.

2. Overgrazing, land preparation for cultivation (tilling), and other adverse land uses have led to serious erosion of the waterway banks.

3. Sedimentation on the canal bed due to erosion has increased flash floods.

In 1994, SCOR implemented several production and conservation mini projects to promote sustainable land use along the Feeder Canal in the Huruluwewa watershed. The projects were implemented at the micro watershed level. Seven critical components addressed through these mini projects are discussed in the following sections.

Demarcation of Reservation Boundaries. Prior to SCOR activities, boundaries of (waterway) reservations in project areas existed only as legislative definitions and were not demarcated on the ground. SCOR professionals computed the reservation width for the Feeder Canal based on the definitions set forth by the Irrigation Department (ID). Officials of the ID along with those of the Mahaweli Authority of Sri Lanka (MASL), DSs of Dambulla and Naula, Colonization Officers (CO), area farmers, and SCOR officials demarcated the reservation area along the Feeder Canal through the establishment of a tree fence on the operation and maintenance (O&M) roadside (66 ft. from the edge of road) and on the other side (66 ft. from the canal's edge).

However, the appropriate approach would have been to survey the land, prepare plans as necessary, and establish some kind of permanent demarcation (e.g., concrete pillars), according to legal definitions and the needs of the ID. In this manner the reservation area can be gazetted as state land[10] and can be provided with legal protection. Such legal protection is significant, especially for irrigation reservations, since only natural waterway reservations are eligible for automatic recognition as reservation land, not subject to surveying or demarcation.

Also in compliance with the correct standards, reservations should be demarcated according to the width definitions as given under the Land Development Act of Sri Lanka (LDA). It is important to follow the correct legislative guidelines so that the demarcated areas will receive their due protection rights in a court of law. In computing the

[10]However, as argued elsewhere in this report, usufructuary rights should be vested with resource users and they should be motivated to use these reservations for market oriented conservation.

reservation width, the SCOR Project used the specifications of the ID. However, the computed width, even under ID specifications, is inaccurate since:

1. Category (b) of the "main canals" has been referred, but according to the bed width of the Feeder Canal, category (c) should be referred; and

2. In ID width specifications, distances are measured from the center of the canal and not from the edge of the canal or edge of the O&M road, as was done by personnel responsible for the demarcation of the Feeder Canal reservation boundary. The correct reservation width for the Feeder Canal, under ID and LDA specifications, is given in annex table 1 of this report.

The defined width for a reservation should justify as to how the width was established. The scientific rationale for width specifications as given under the Sri Lanka regulations is not clear. International standards and recommendations based on scientific analyses such as the following can be considered for a critical review of the Sri Lankan regulations.

A study by Nieswand et al. (1990) gives scientific bases for establishing and maintaining buffers along waterways and offers a basis for defining reservation width for regulatory purposes. According to Nieswand, the "ecologically correct reservation width" is a function of the ecological functions expected to be performed by a reservation. The suggested guidelines are as follows:

Function	Suggested width range in ft. (measured from the water's edge)		
	minimum		maximum
Sediment control	50	-	200
Erosion control	25	-	213
Nutrient and pollutant removal	50	-	200
Reservoir protection	75	-	300
Temperature control	25	-	200
Aquatic species protection	25	-	50
Wildlife habitat protection	200	-	300

Out of the above functions, given the present conditions in Sri Lanka, sedimentation control, erosion control, and nutrient and pollutant removal can be considered the most critical functions. Hence, a reservation width of the range 50-213 ft. (measured from the water's edge) is appropriate according to the above findings.

It should also be noted that no attempt has been taken by the DSs, MASL, or the ID to remove the existing permanent and semipermanent structures, primarily dwellings of encroachers, from the Feeder Canal reservation area.

Usufructuary Rights. Prior to SCOR interventions, most of the Feeder Canal reservation was used for cultivation of rice and short-term crops by encroachers who were occupying state land without any legal land rights. SCOR formed a "Usufructuary Rights Group"

(composition of the URG is described under *User-Agency Coordination* section of this report) to examine the feasibility of establishing tree cover within reservations by awarding usufructuary rights to local farmers. Under the direction of the URG, planting of trees (of economic value) along the Feeder Canal was organized by SCOR, in collaboration with user groups and line agencies, as a pilot project to test how reservation resources can be utilized by resource users under usufructuary rights (also see *Planting Campaigns*). Temporary permits were obtained from DSs of Dambulla and Naula until such time policy decisions are made at the national level regarding usufructuary rights.

Such an approach, originating at the user organization level, is expected to be stable and accepted by the resource users as well as the authorities. (see chapter 10 for details on follow-up policy interventions at national level).

Planting Campaigns. SCOR catalyzed a planting program and in the 1994/95 maha season, 23,210 plants, primarily fruit species, were distributed through SCOR in collaboration with 11 farmer organizations to farmers in 9 locations along the Feeder Canal (see table 6.4). The campaign was an effort to minimize rice cultivation and short-term crops within reservations and encourage the cultivation of perennials. The recipients of plants were members of the participating farmer organizations whose members were occupying reservation land as encroachers, and other area farmers.

SCOR "catalysts" in collaboration with farmer organizations and line agency officials were responsible for the selection of farmers for receiving plants, plant distribution, and eventually the dissemination of information on plant maintenance. Farmers were instructed to maintain a logbook on the plant growth and maintenance activities such as watering intervals, mulch application, and grilicidia (*Gliricidia sepium)* pruning.

As part of the campaign, information sessions on bank stabilization, the importance of planting trees in reservations, and maintenance instructions were held in schools, facilitated by SCOR specialists. SCOR also assisted the planting programs conducted by the Forest Department and the Coconut Development Board (CDB), sometimes with the participation of school children. For example, in the Walgamwewa, an 8-km stretch along the Feeder Canal was provided with suitable vegetation during 1996 and 1997 by planting 15,500 plants given through the Forest Department. In addition, 6,407 coconut plants have been planted in reservations and homesteads during the period 1994 to June 1997, primarily through the intervention of the CDB.

The identified costs for the SCOR planting campaign (at the "mini-project proposal stage") included labor costs (preparation of land for planting, preparation of organic fertilizer, application of organic fertilizer [for 2 applications], transport of plants, construction of conservation bunds, and maintenance costs), cost of plants, and cost of technical advice/assistance. The participating resource users supplied all the required labor needs. SCOR provided the plants (as a loan), while the necessary technical assistance and other resources were provided in collaboration with line agencies. Farmers were able to obtain the plants as a loan, with 5 percent interest rate with a repayment

period of 6 to 18 months. The farmers are expected to make these payments from the income generated through the sale of seasonal and annual crops of economic importance.

Table 6.4 gives the survival rate for the species, distributed through SCOR. According to this table, mango (*Mangifera indicia*), jak (*Artocarpus heterophyllus*), guava (*Psidium guarjava*), lime (*Citrus aurantifolia*), coconut (*Cocos nucifera*), banana (*Musa sapientum*), and pomegranate (*Punica granatum*) have recorded survival rates above 50 percent in more than half of the locations distributed. The period considered is 1994-95 maha season to June 1996.

Crop failures were reported in some locations. When SCOR catalysts were interviewed the reasons given for the failure of plants included drought conditions prevailing in the lower half of the canal, lack of interest of the people, damage done by cattle, and the inappropriate selection of species.

Table 6.4. The plants distributed through SCOR Project (1994-95 maha season to June 1996).

Location	No. of recipients	No. of plants distributed (1994-95 maha)	No. of plants surviving (as of June 1996)	Survival rate (SR) percent	Species with SR greater than or equal to 50 percent
Serudandapola	27	5,943	5,367	90	king coconut, pomegranate, lime, arecanut, guava, and mango
Atubendiyawa	41	3,861	3,554	92	pomegranate, guava, and mango
Walgamwewa	44	1,947	1,152	59	eggplant, lemon, lime, jak, mango, arecanut, and guava
Aluthyaya	37	453	280	62	lime, arecanut, orange, guava, jak, mango, and coconut
Kalundewa	80	3,882	1,789	46	lemon, lime, guava, mango, and coconut
Pahala Erewala	20	1,170	1,032	88	orange, lemon, Bangkok guava, lime, guava, mango, and coconut
Wellengolla	32	3,021	1,997	66	orange, bamboo, lemon, lime, guava, mango, and coconut
Mahasanagama	52	1,894	920	49	guava, jak, mango, and pomegranate
Sigirimulla	11	1,039	619	60	mango
Total	344	23,210	16,710	72	mango, guava, lime, coconut, banana, jak, and pomegranate

Species. The plants distributed to the farmers through SCOR included mango (*Mangifera indicia*), jak (*Artocarpus heterophyllus*), guava (*Psidium guajava*), beli (*Aegle marmelos*), arecanut (*Areca catechu linn sp.*), lime and lemon (*Citrus aurantifolia*), bamboo (*Bambusa spp.*), eggplant (*Solanum indicum*), orange (*Citrus sinensis*), coconut and king coconut (*Cocus nucifera*), banana (*Musa sapientum*), Bangkok guava (*Psidium spp.*), and pomegranate (*Punica granatum*). Trees were selected for both conservation and economic benefits.

The ideal landscape for reservations. The ideal species and locations for those species in a reservation, as seen by SCOR specialists, is based on the water availability, economic value or income, ecological needs, preference of resource users, and the operational and maintenance aspects.

Soil moisture content. The land adjacent to a waterway channel can be divided into three zones according to soil moisture availability: hydrophytic zone (channel banks), semi-hydrophytic zone (15-20 ft. from the channel banks), and the mesophytic zone (beyond 20 ft. from the channel banks). Species should be selected separately for these different hydrological zones.

Bio diversity and production. A mixed crop culture was preferred by SCOR specialists to a monocrop culture, since having several species enhances canopy stratification, promotes bio-diversity, and provides income throughout the year. In a multi-species cultivation, canopies should not overlap. The main species should be pruned as necessary. Species should be mixed according to the density ratio: large canopy (two trees); medium canopy (three trees); and small canopy (five trees).

Root system of species. The nature of the root system of species is a critical factor when selecting trees for irrigation reservations. Therefore, deep, spreading rooted trees were discouraged to be planted too close to irrigation structures. Deep roots could spread and grow into the structures and cause detrimental effects by disturbing the structural stability of the irrigation system.

Maintenance of irrigation systems. The maintenance of irrigation systems requires easy accessibility of heavy equipment as well as personnel to the channel and related structures. If trees are planted in undesirable locations (too close to maintenance areas) removal of vegetation might be necessary for maintenance purposes.

For example, vetiver (*Vetiveria zizanioides*), arecanut (*Areca catechu Linn spp.*), and bamboo (*Bambusa spp.*) were planted along the banks of the Feeder Canal to control erosion and stabilize the banks . The roots of vetiver grow deep but directly down, thus not harming irrigation structures. The deep roots of vetiver help filter sediments and other pollutants out of runoff. *Watupalu* (*Mikenia cordata*), which helps control erosion of banks, grows naturally within the channel of the Feeder Canal and Yan Oya. Further away from the waterway, *kumbuk* (*Terminalia arjuna*) was planted due to its shallow,

ramifying roots and large canopy. Even further from the waterway, but closer to residences, species of fruit and timber value were planted.

Water Saving and Soil and Water Conservation Technology

As stated earlier, the Feeder Canal reservation was used extensively for the cultivation of rice and short-term crops such as tobacco and big onion prior to SCOR interventions. The Irrigation Management Division (IMD) of the Ministry of Irrigation Power and Energy (coordinating activities of line agencies and the private sector/NGOs for conservation of immediate catchment areas to ensure protection of sources of water supply for irrigation systems) and Forestry and Environment Unit (FEU) of the MASL (involved in conservation efforts of degraded land in the upper catchment of Mahaweli river basin) had conducted awareness programs on conservation farming among irrigation water users in one part of the Feeder Canal. However, the cultivation of perennials and the use of soil and water conservation practices were minimal. Stable crops (perennial, semiperennial, and annual) were introduced through SCOR as the preferred vegetation cover (rather than seasonal crops) for reservations, for the following reasons:

1. Perennial, semiperennial (e.g., banana), and annual crops do not need land preparation as much or often as seasonal crops do and hence impose less land disturbance activities that lead to soil erosion.

2. Unfavorable soil conditions of the dry zone of Sri Lanka, specifically low soil moisture levels make it difficult to establish profitable stable crops, unless factors such as proper timing of planting, watering (if necessary at the initial stages), and soil and water conservation measures are adopted. Moreover, the lack of marketing arrangements or value-added production and low product prices act as disincentives for farmers to actively take up cultivation of stable crops. Therefore, farmers depend extensively on seasonal crops (which can be cultivated only during the rainy season and during other times with adequate irrigation). However, seasonal crops do not provide a stable income. Poverty conditions lead farmers to generate income at any cost to the environment, even by practicing unhealthy farming techniques, which do not take into account the potential environmental consequences, e.g., cultivation through slash-and-burn practices. However, soil conditions of waterway reservation are capable of supporting perennial, semiperennial, and annual crops. Therefore, cultivation of stable crops would be a profitable, yet conservation-based farming system for waterway reservations.

Additional conservation measures. In some areas of reservations, depending on the geographical characteristics, special conservation farming practices were introduced to preserve the integrity of the waterway corridor system. Conservation measures are critical in reservation areas of steep slopes and erodible soils. Farmers were encouraged to construct contour bunds to prevent erosion. Planting of gliricidia (*Gliricidia sepium)*

between the species was done to provide the necessary shade, prevent erosion, provide nutrients to the soils, and as a wind break. Mulching was promoted to yield benefits such as maintaining soil moisture at desirable levels for longer periods, supplying organic material to the soil, and controlling erosion and weeds.

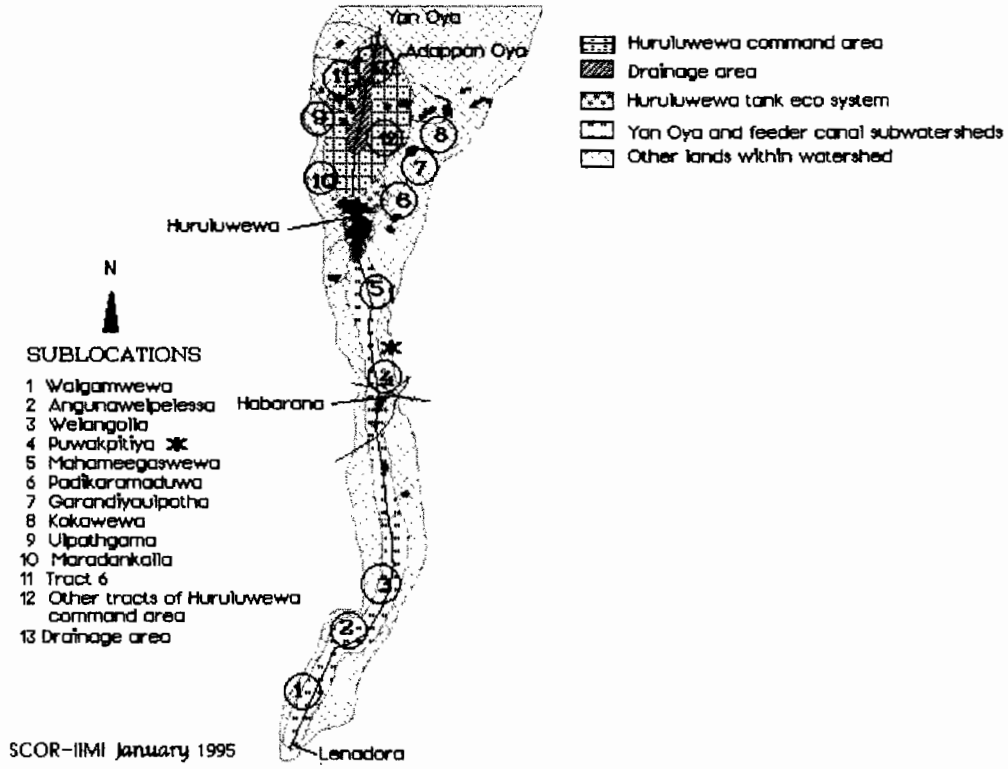
It can be concluded that natural or planted vegetation with adequate conservation measures and minimum disturbance to soil is a desirable protective land cover for waterway reservations. Depending on the usufructuary rights/tenurial patterns and the economic value of this land cover, the state, community, or individuals may, in the long run, benefit by utilizing reservation resources.

Enhancing Sustainable Productivity of Land and Water Resources in Small Tank Systems[11]

This section examines the SCOR process of interdisciplinary research interventions in an important zone or segment of the sub-watersheds in the Huruluwewa watershed. These interventions were aimed at enhancing sustainable productivity of land and water resources. For the present analysis, only one small tank and its irrigated command area, namely, *Puwakpitiya* (PP) is included (figure 6.11). In general, these interventions have formulated with the assumption that maximum utilization of rainfall, tank storage (and in some cases the use of shallow ground water) coupled with soil and moisture conservation techniques will optimize the land and water use in small tank systems. In these tank command areas, a large umber of small farmers cultivate small holdings, in most of the cases less than 0.5ha. therefore in order to achieve the desired goals, appropriate agricultural technologies and conservation measures should be adopted by those small farmers operating on tiny small holdings. Hence, "organization" plays an important role in this process. For example, it is hypothesized that the farmers can and should be motivated to commence cultivation with the onset of monsoon rains and to complete wet season (*"maha"*) season cropping utilizing rainfall to the maximum extent possible. Then the tank water may be saved for dry season cropping.

[11] B.R. Ariyaratna, consultant engineer, SCOR, provided hydrologic data for this analysis.

Figure 6.11 Location of sample sub watershed, SCOR phase I



Important basic data related to storage capacity, extent of the catchment, command area, cropping intensity and number of farm families are given below:

Basic information
(Puwakpitiya sub watershed)

	Puwakpitiya
1. Full storage capacity mcm (acre feet)	0.23(189)
2. Gross catchment (ha)	88
3. Tank command area ha(ac)	21.8(54)
4. Cropping intensity (maha) pre - project	0.8 - 0.9
5. Cropping intensity (yala) – pre project	0.3
6. No of families in 1995	83
7. No of families owned land in the command area	88

Sources:water management in a water-stresses watershed:experience in maha 94/95 (Nihal Fernando, N.U.Hemakumara and B.R.Ariyaratna) and interviewed with farmers

These interventions in small tank systems were included as an integral component of SCOR participatory action-research.

"Hydrological process in micro-watersheds differs due to various reasons such as presence of surface water reservoirs, transbasin canals, streams, and tributaries, geomorphology, vegetation agricultural water use etc. Such differences are important in understanding the potentiality of different sources of water. In this context planning of an agricultural development program for a given watershed has to be based on classification of areas into different hydrological units. Therefore, a watershed can be divided into sub phases consisting of one or more micro-watersheds which would be referred to as land units with same hydrological situation." (Dharmasena, P.B. 1995 page 2) Dharmasena specified the following hydrological situations with respect to Huruluwewa Watershed."

A. Presence of a minor tank, the catchment of which alone provides runoff water as inflow to the storage.
B. Presence of a minor tank, which receives drainage water from fields irrigated by a transbasin canal in addition to the catchment runoff.
C. Presence of a minor tank which receives drainage water from fields irrigated by an upstream tank.
D. Ground water is replenished through a transbasin canal.
E. Ground water level is maintained mostly by direct influence of the Huruluwewa major tank and frequent influence from nearby irrigation canals.
F. Ground water level is influenced frequently from water flow of irrigation canals.
G. Availability of shallow ground water is mainly determined by rainfall. (Dharmasena, P.B. 1995 page 2).

Detailed field investigations and an in-depth analysis based on water balance studies can be used to develop a more realistic classification system for hydrological situations. However, ground water behavior was not considered in this analysis. Instead, it is focussed on the management of one of the small tanks included in SCOR action-research program. This tank system can be classified as type "C."

Planning Interventions

SCOR pilot reserch interventions for small tank systems have been planned on the basis of: a) researchers' experience on dry zone agriculture and farmer behavior, b) consultations with farmers, and c) analysis of earlier experiments and review of literature. As stated earlier, paddy is the main crop grown under irrigation in these small tank command areas. Cultivation of other field crops such as chili, soybean, peas etc., in the dry season in well drain areas, is a recent development. Even in water-short dry seasons, usually, farmers either leave the entire area fallow or cultivate small extent with paddy.

Timing of Cultivation: Based on the monthly totals of rainfall, 75% probability rainfall expectancy in the dry zone is about 30-35 inches (700 - 880 mm) per annum (Panabokke,

1975). However, an analysis of daily actual distribution in the study sites during the reference period showed a high degree of uncertainity and poor distribution.

Traditionally, farmers begin wet season paddy cultivation only when the tank storage is reached an "adequate" or "least risk" level. If this level is reached before the end of the rainy season they "know" that there is considerable potential for enhancing storage further and therefore they would not run into a risk of crop failure. Sometimes farmers wait till the tank is nearly full so that there will be no risk at all[12]. Moreover, it has been observed that this practice is helpful in allocating family labor for slash and burn (*chena*) operations where felling (of jungle) commences in July and sowing usually takes place in late September/early October[13]. However, because of this practice, the advantage of using early rains directly for land preparation (which would otherwise consume about 1/3 of total irrigation supply) as well as for early period of crop growth, is lost. In addition, as the wet season crop would depend entirely on irrigation, they may not save adequate water for the following dry season. This tradition explains the low land use intensity[14]. By this way, land preparation usually commences in November or December.

Early Maturing Varieties: Apart from early planting, a shift from 4 - 4½ month varieties to 3 - 3 ½ varieties would also contribute to water savings in the wet season. Considering these strategies, the Department of Agriculture designed and launched a research activity, under the IRRI cropping systems project, in 1976. This project, popularly known as *Walagambahuwa* experiment adopted the following approach (Sikurajapathy, Mervyn. 1976 page 44).

i. making more effective use of the monsoonal rainfall for paddy cultivation;
ii. conserving the water in the tank to a maximum, which should lead to;
iii. extending the growing season to other short aged crops and;
iv. utilize *yala* rains for growing other short aged crop.

Organizing Process

The Catalysts/Institutional Organizers of SCOR were fielded in these areas in the first quarter of 1994. Each of the catalysts was assigned 1-2 sub-watersheds and therefore,

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[12] If the tank storage does not reach this level, they may not cultivate at all.

[13] It should be noted that SCOR suggests a holistic approach to watershed management and interventions have been planned for both paddy areas in the tank command and catchment areas presently under shifting or *chena* after considering these inter-relations. Stabilized cultivation in the latter areas, especially agro-forestry and the cultivation of other perennials, will reduce unfavorable interactions.

[14] Cropping intensity is about 70-80%.

facilitating interventions in irrigated command area of one tank system was just one component in the task structure of a catalyst[15].

The organizing process involved several steps :

1. sharing of knowledge and experience related to the topic with farmers and initiating discussions within the communities;
2. strengthening existing user organizations and facilitating the formation of new organizations;
3. initiate discussions with relevant government officials at various levels; and
4. facilitating discussions between farmers and government officials, especially the pre-season (cultivation) planning meetings.

Pre-season cultivation meeting were held in all three locations and prior to each of the three crop seasons: 1994/95 wet (**maha),** 1995 dry (**yala**) and 1995/96 wet (**maha**).

Pre-Season Meetings And Cultivation Decisions

Pre-season cultivation meetings were focused on : a) reaching consensus related to agricultural activities between the farmers and relevant government officials and b) taking decisions on the cultivation calendar including irrigation scheduling. After launching SCOR research project, IIMI staff initiated a catalyzing process for strengthening the procedures of cultivation meeting and in integrating **technology** (new crops, cropping patterns, water saving methods etc) **organization** (farmer organizations, farmer-officer and officer-officer relations etc) and **resources** (for example, augmenting the availability of water resources through the conjunctive use of rainfall, tank storage and shallow ground water). Usually, the farmers and government officials such as the Agricultural Instructor (AI), Divisional Officer of the Department of Agrarian Services (DO of DAS), Irrigation Engineer of Technical Assistants of the Irrigation Department (IE or TAs of ID), village level Government Officers (for administration, conflict resolution and extension, namely the *Grama Niladhari*, GN) and the Divisional Secretary participate in the cultivation meetings of village tank systems.

Major decisions reached at the cultivation meetings in the Puwakpitiya are summarized in Table 6.5.

[15] In addition to the organizational activities within a given sub-watershed, SCOR Catalysts and Watershed Management Coordinators, WMCs, **catalyzed a process** of linking upstream and downstream farmers (through their organizations) to reach consensus regarding sharing limited water resources. Accordingly, allocative decisions were made in relation to distribution of water, cropping patterns etc.

Progress.

Wet Season - 1994/95

By 6th October 1994, farmers had completed dry sowing in the paddy fields located at higher elevations. However, because of unexpected rain, they did not go for dry land ploughing in other areas. Consequently there was a delay in land preparation and in sowing operations in such areas. Accordingly harvesting was completed in the upper areas by 15th February while in the lower areas it continued till 1st March 1995.

Except for one farmer who had irrigated his allotment just once on the 24 February 1995 (for eight hours) none of the other farmers had used tank water for cultivation.

1994/95 wet season was the first season of SCOR intervention in the small tank systems. This was attempted only in few tanks. A significant advancement in the date of commencement of cultivation has been observed in many tanks. Moreover the farmers had reduced the use of tank water in the wet season.

Table 6.5 - Comparison of planned and actual crop activities - Puwakpitiya (PP), 1994/95 wet, 1995 dry, 1995/96 wet and 1996/97 wet seasons.

Watershed - Puwakpitiya

Activity	1994/95 Maha		95 Yala		95/96 Maha	
Cultivation - details	Planned	Actual	Planned	Actual	Planned	Actual
1. Date of pre-kanna/ planning meeting/ workshop	-	-	15-Mar-95	15-Mar-95		
2. Date of kanna meeting	24-Sep-94	24-Sep-94	19-Mar-95	19-Mar-95	26-Sep-95	26-Sep-95
3. Last date for cleaning canals	5-Oct-94	15-Oct-94	2-Apr-95	18-Jun-95	15-Oct-95	3-Oct-95
4. Last date for land preparation	14-Oct-94	2-Nov-94	21-Apr-95	19-Jun-95	1-Nov-95	24-Oct-95
5. Last date for crop establishment	15-Oct-94	3-Nov-94	22-Apr-95	23-Jun-95	15-Nov-95	25-Oct-95
6. Type of sowing	Dry	Dry/wet	-	-	Dry	Dry
7. Crops cultivated	Paddy	Paddy	B.Onion-8ac(3.24 ha)	Chilli, B. onion and	Paddy	Paddy
and extents,	4- 4 1/2 month	4- 4 1/2 month	Veg-4 ac (1.62 ha)	veg - 10 ac (4.1 ha)	4 - 4 1/2 month	4 - 4 1/2 month
age and varieties (paddy)	3- 3 1/2 month	3- 3 1/2 month				
8. Last date of harvest	28-Feb-95	1-Mar-95	7-Jun-95	Onion - 25-Sep-95	1-Mar-96	8-Apr-96

9. Extent harvested	21.8 ha	21.8 ha		Chilli - 2.21 ha Onion - 0.77 ha Mung - 0.05 ha	21.8 ha	21.8 ha
10. First rains		9-Sep-94		4-Apr-95		25-Sep-95
11. Irrigation rotation			First - 10 days then 15 days	10 -15 days	-	-
12. First water issues		No water issues	15-Apr-95	2-Jun-95		28-Nov-95
13. Yield kg/ha or mt/ha	Average 2.23 mt/ha	3.12 mt/ha - crop cut		Chilli- 0.63 mt/ha B.Onion- 1.04 mt/ha		0.58 mt/ha

Dry Season - 1995

As this was the second season of SCOR interventions in the watershed, the project team decided to strengthen the catalyzing process further. Consequently a series of **planning workshops** were held with the active participation of relevant government officials, farmers and SCOR staff. In addition to the activities included in 1995/96 strategy, several new activitie were added to the crop and water management plan[16]. The major ones are :

- inclusion of cash crops,
- adoption of "bethma" cultivation[17], and
- more integration of input supplies and technical services.

The **planning** process, implementation and results obtained are discussed below :

A planning workshop, facilitated by SCOR staff, was held on the 26th February and decided to cultivate Other Field Crops (OFCs), mainly big onions on bethma basis in newly developed paddy fields (NF/AW) as well as in old fields (OF/PW) on a **bethma** basis[18]. Farmer representatives, officials of the relevant government agencies and SCOR staff participated in this workshop. A pre-seasonal cultivation meeting was held on 15 March and a calendar was prepared. This was formally ratified at the seasonal cultivation meeting held on 19 March. The major decisions are given in Table 6.5.

Following these collective decisions at the planning sessions, farmers established onion nurseries in March. Heavy rains came in late March and in April and the onion nurseries were completely damaged. Consequently, farmers got together and decided to plant chillies before 20 May. This, too could not be implemented due to heavy rains. Farmers met again on the 29 May and decided not to expand extent under OFC (and to limit it to 4.2 ha.) due to the risk of water shortages during the latter periods of crop growth.

Because of heavy rains, the establishment of crops was delayed and completed on 23 June (Table 6.5). The land preparation was staggered between 20 April to 19 June. Farmers utilized rain and the first issue of tank water was done only on 2 June. Water management was closely supervised by the Farmer Organization[19]. With this arrangement a 10 day rotation of irrigation has been adopted efficiently. However, due to bad weather conditions during nursery and seedling stages, farmers could not obtain higher yields. Nevertheless, an *investigation by a SCOR social scientist revealed that the*

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[16] Most of these are not "new" to the dry zone farmer. However, a "planed group action" has been promoted and the strategies were considered as integral components in a **crop and water management package**.

[17] Bethma is a traditional system used to optimize land and water use and maintain equity in a water short crop season. usually, farmers having land in the head end of the tank irrigation system agree to share their land with tail enders. This means that all the farmers get together and cultivate part of the total area by dividing that land equally among them.

[18] AP / PW

[19] Especially because of bad experience in the previous season where *Vel Vidane* - who was responsible for supervising water management - had violated group decision and handed over the key of sluice to one farmer.

farmers have now realized the importance of water saving techniques such as straw mulching. Moreover, they are aware of the need for planned cultivation and the advantages of cultivating OFCs on bethma basis.

Interviews with farmers revealed that they viewed the **cultivation of OFCs on bethma basis as the preferred strategy to combat water shortages in the dry season.**

Wet Season - 1995/96

During this season major production areas of the country suffered from a severe drought. In fact, the dry spell in many areas, including the Huruluwewa watershed, commenced during the previous dry season[20]. SCOR interventions on small tank systems were confined to few activities in selected areas.

At the end of dry season cultivation (in early September 1995) the tank was empty. Hence it was difficult to organize pre-season planning until the first rains on 23 September. The pre-seasonal cultivation meeting was held on the 26 September. At this time most farmers (as they had given up hopes for early cultivation in paddy fields) were busy with **chena** (slash and burn cultivation) operations. Only 20 farmers attended the meeting but others had promised to the leaders that they would follow the decisions taken at the meeting. The decisions reached at the meeting is given in Table 6.5. With the initial rains alone, farmers completed land preparation activities within a week, and started sowing on 13 October. *Based on the experience of previous wet season, they had plans to cultivate paddy in this wet season by using rain water and to save tank water for high-value cash crop cultivation in the coming dry season.* Having this strategy in mind, farmers met regularly to discuss about water issues. However, after the initial rains on 23 and 24 of September there were no rains for about 10 days. This has affected cultivation operations and crop yields in certain plots.

Farmers used only two water issues from the tank during the whole season. These issues were made to overcome critical dry spells - 28 November to 02 December 1995 and 24 to 26 January 1996. The progress of cultivation activities, fluctuations in tank water levels, rain fall pattern and water issues are illustrated in Figure 6.6. These information substantiates that farmers commenced cultivation with an empty tank and were able to minimize the use of tank water during latter stages of crop growth. They managed to keep tank water level at 135 cm. at the end of the wet season. *This sort of farmer behavior, organized group action to achieve water savings in wet seasons (for future use for cash crops in dry season on bethma basis) is not common in small tank systems in Sri Lanka.* As stated earlier, a country-wide drought prevailed during this

[20] In addition SCOR interventions in the pilot watersheds suffered from shortages of staff inputs due to funding uncertainties.

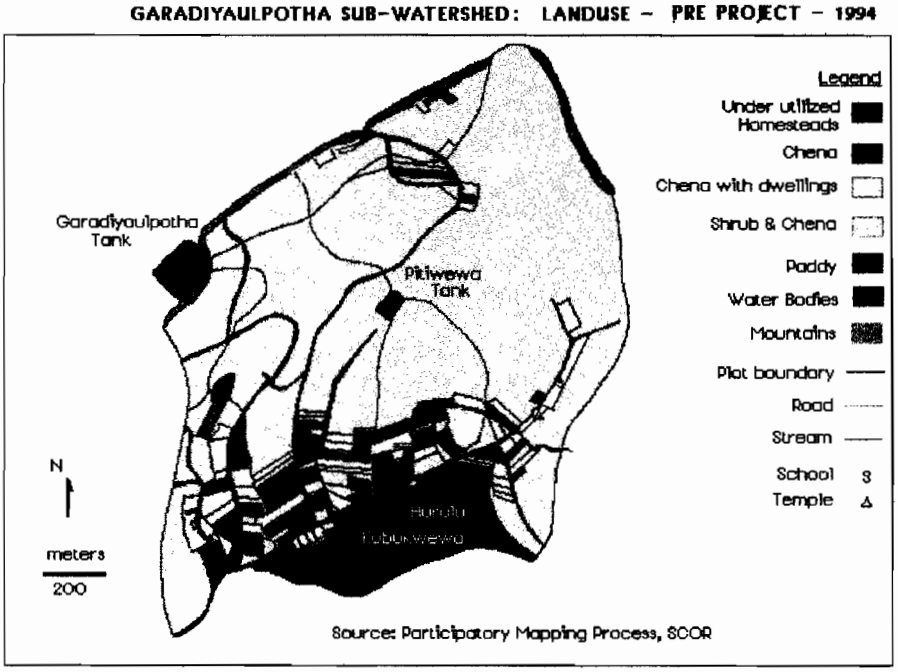
period and lands under most of the small tank systems elsewhere were left fallow or reported a severe crop failure.

Crop yields were affected mainly due to : damage by wild elephants, lack of water (for some areas) during initial period and excessive weed growth (due to water shortages just after sowing).

Table 6.6. Cropping intensity in some small tank command areas included in SCOR action research.

Name of the tank	Ten year average 1983-1993	1994 (1994 Yala and 1994/95 Maha)	1995 (1995 Yala and 1995/96 Maha)[21]
Puwakpitiya	0.40	1.65	1.49

Figure A6.1 Garadiyaulpotha sub watershed, land use, pre project, 1994



[21] Note: Crops were affected by severe drought this year, especially in the **Maha** season.

Figure A6.2 Garadiyaulpotha sub watershed, land use, future vision

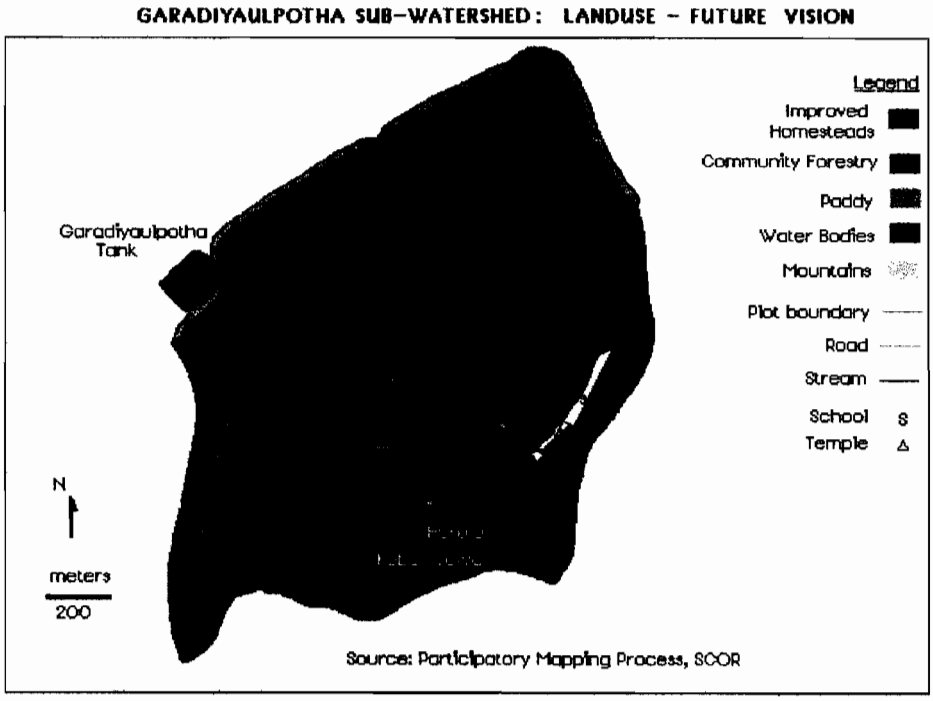


Figure A6.3 Garadiyaulpotha sub watershed, land use, pre project, status in 1997

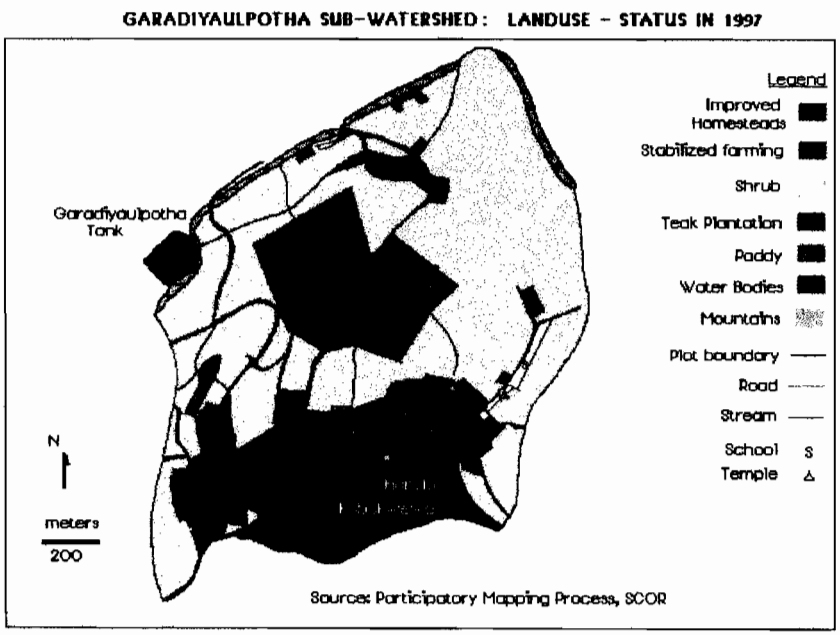


Figure A6.5 Bovitiyadola sub watershed, land use, future vision

Figure A6.6 Bovitiyadola sub watershed, land use, pre project, status in 1997

Figure A6.6 Bovitiyadola sub watershed, land use, pre project, status in 1997

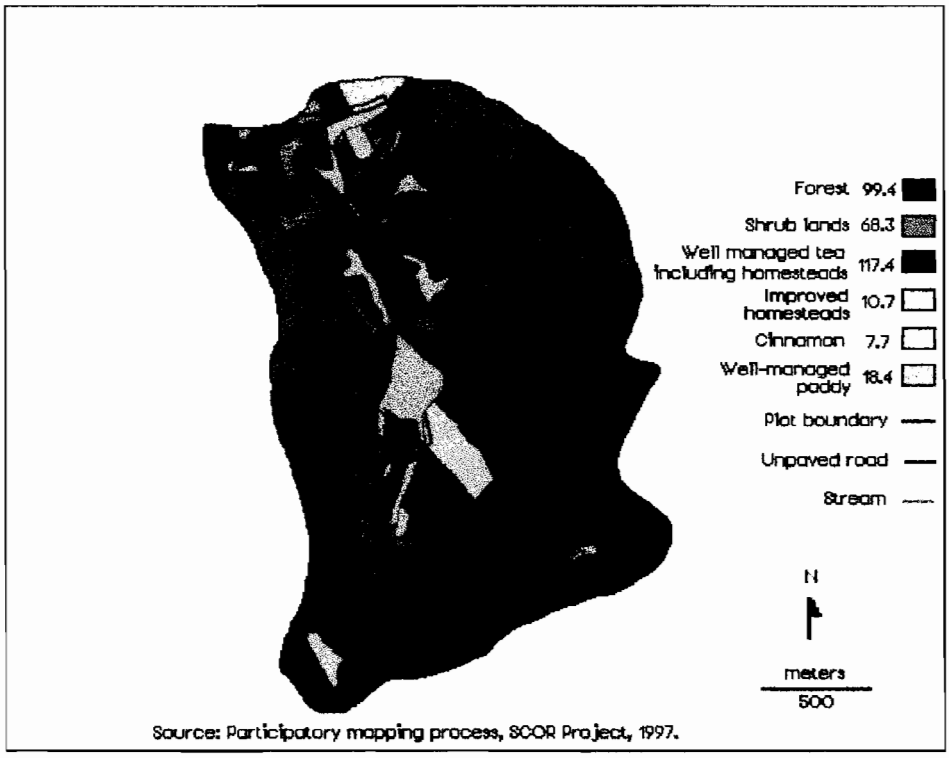


Table A6.1 Land use, Garadiyaulpotha sub watershed

Category	1994	Future	1997
	Extent (ha)		
Forest			
Forest	12.6		12.6
Dense Forest		12.6	
Shrub and Chena			
Shrub and chena	103.8		
Shrub			83.6
Chena	7.0		
Chena with dwellings	15.3		
Stabilized farming			7.0
Well managed Agro-Forestry		90.6	
Teak Plantation		20.0	20.0
Homesteads			
Under utilized Homesteads	5.0		
Improved Homesteads			20.3
Well managed Homesteads		20.3	
Paddy			
Paddy	1.4		1.4
Well managed Paddy		1.4	
Others			
Water Bodies	11.2	11.2	11.2
Pre-school, School & Temple	1.0	1.0	1.0
Roads	6.7	6.7	6.7
Total	163.9	163.8	163.8

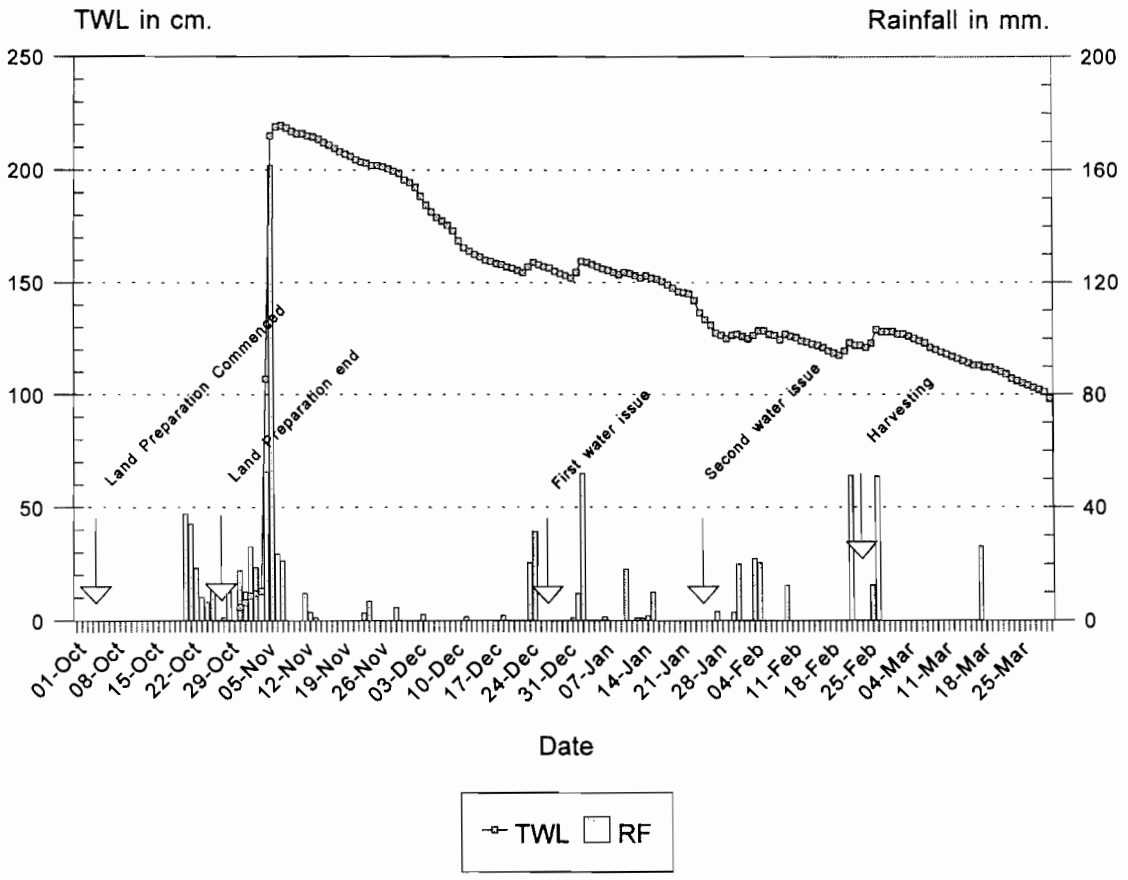
Table A6.2 Land use, Puwakpitiya sub watershed

Category	1994	Future	1997
		Extent (ha)	
Forest			
Forest	39.8		
Reserved forest		39.8	39.8
Shrub and chena			
Shrub and chena	73.6		
Shrub			55.3
Stabilized cultivation			6.3
Newly encroached chena			6.2
Stabilized highland farming		44.1	
Well managed Agro-forestry		17.5	
Homesteads			
Under utilized Homesteads	14.3		
Improved homesteads			14.3
Well managed homesteads		20.6	
Paddy			
Paddy	16.9		
Improved paddy			16.9
Abandoned paddy	0.6		0.56
Well managed paddy		17.5	
Others			
Tanks	8.3	8.3	8.3
Tank reservation	0.9		
Managed tank reservation		6.6	6.6
School, Temple and Cemetry	0.9	0.9	0.9
Yan oya	1.3	1.3	1.3
Roads	1.3	1.3	1.3
Total	157.9	157.9	157.9

Table A6.3 Land use, Bovitiyadola sub watershed

Category	1994	Future	1997
	Extent (ha)		
Homesteads			
Homesteads	8.4		
Improved homesteads			9.1
Tea			
Tea including Homesteads with <50% under tea	3.1		
Tea including Homesteads with >=50% under tea	124.3		
Well - managed Tea including Homesteads with <50% under tea		11.3	1.7
Well - managed Tea including Homesteads with => 50% under tea		100.3	117.2
Forest			
Forest	94.1		
Dense Forest		148.1	94.1
Degraded forest	46		46
Participatory Forestry	5.3		5.3
Well-managed Agro-Forestry		32	
Paddy			
Paddy	18.4		
Well managed paddy		18.4	18.4
Others			
Shrub lands	22.4		22.4
Cinnamon			7.8
Well managed other plantation crops		11.9	
Total	**322**	**322**	**322**

A 6.7 Tank Water levels Rainfall, Water Issues and Cultivation Practices - Puwakpitiya, 1995/96 Maha



CHAPTER 7

HYDROPOWER GENERATION AND WATERSHED MANAGEMENT

This chapter examines a participatory and "market-oriented" natural resources utilization and conservation effort in a watershed context. In this effort, SCOR catalyzed a process of mobilizing resource users, non government organizations (NGOs), and government agencies to *develop a Micro Hydro-electric Power Plant (MHPP)* and to *establish a participatory conservation program in the catchment.*

Hydroelectric Power

In 1988, the world's hydroelectric plants produced 2 million GWh and it constituted 20 percent of the world's total energy production. In Africa, hydropower generated about 16.8 percent of the total electric energy. The installation capacity in the world in 1988 was 549 GW which was expected to increas to 567 GW in 1989 (Mermel 1989, cited in Veltrop 1993). In general, the lower the head of water available for energy generation the less cost effective the system will be. However, the recent developments in low-cost construction material such as advanced polymers and glass reinforced plastic (GRP) have significantly reduced the overall cost of the hydropower systems. This would help transform lower head sources into cost-effective systems (Opie, 1989).

Small-scale hydro power generation. The capacity of a small scale hydroelectric plant is usually less than 15 MW capacity and these plants provide electricity to isolated, sparsely populated communities and agricultural processing units. Many countries, particularly in the third world, are installing small plants at the village level. Small-scale hydropower generation in 1983 was nearly 10,000 MW and it was estimated to reach 29,000 MW by 1991 (Mermel 1991, cited in Veltrop 1993).

Wide spread construction of small hydropower electric plant was very slow during the past due to lack of an inventory of suitable sites, lack of technical expertise, and the continuing bias of engineers and governments towards larger projects. There are evidences to show that, in addition to the economic benefits, these installations have also improved the quality of rural life. Another advantage of small-scale hydropower plants is the utilization of indigenous labor and material.

Small-scale hydropower at village and individual levels. There are over 70,000 micro hydropower stations operating in China with a total capacity of over 10,000 MW. The average size of these stations is over 100 KW. According to the information in 1986, there

were about 50 sites which produced hydropower in the range of 650 W–12 KW in 7 provinces in Southern China (Xuemin 1989).

In China, installation of MHPPs is spreading country-wide as local manufactures are providing easy use systems. Normally, generation of hydropower from a lower head is less cost-effective. The use of advanced polymers and glass reinforced plastic material reduces the overall cost of the system and hence transforms lower head sources into feasible commercial projects. These machineries manufactured in packaged form with the turbine and generator are usually assembled together. The station can be assembled by users in 5–10 days. The weight is not more than 30–50 kg and the cost is around US$300 per KW (Xuemin 1989).[2] A survey carried out in 28 family-run micro-hydro stations in Siquan county revealed that around a quarter of the construction cost came from the owners themselves, 40 percent from bank credit, and the remaining 35 percent from government subsidies.

In Sri Lanka, small MHPPs have been used since the beginning of this century, mainly to generate electrical power for the plantation industry. Even though the national electricity grid has been extended to many parts of the country, it is believed that small hydroelectric plants could still play an important role in meeting electricity needs of the isolated population in various parts of the country particularly in the wet zone.

Within the Nilwala River basin in Sri Lanka there are 22 small/micro power generation sites with capacities ranging from 0.5 to 5 KW. All these hydropower schemes are maintained by electricity consumers societies at village level (Fernando and Perera 1996). The case analyzed in this research report is uniquely characterized by features such as: collaborative efforts of the rural poor, NGOs, scientists, change agents and government agencies; collective mechanisms to integrate catchment conservation with electricity generation, social norms to maintain equity, etc.

Irrigation systems to develop MHPPs. Irrigation channels, sluices of existing irrigation reservoirs, tanks, canal drops and cross regulators, irrigation outlets, and river bed sluices of major and medium irrigation projects can be utilized for small/micro hydropower generation. Jagan and Raj (1993) reported that in Karnata State in India there were 166 potential sites for micro hydroelectric power with a total estimated capacity of 444 MW. In addition, there were 5 small/micro hydro projects with a total capacity of 50.8 MW already in operation. Kamala was one of the schemes using the available head of the Tungabhadra Left Bank Channel(TLBC). It was at the 189 km post of the TLBC and used a head of 3.81

[2] For example, in 1983, 30 families in a village jointly developed a micro-hydro site in the Hanshon county in China. It generated 2 KW and supplied electricity to every home for electric bulbs and for 4 television sets owned by the villagers. However, in this case, television could not be used at the same time the lights were used. This micro power site was built in a week at a cost of some $300 which is much less than the cost of television in China at that time (Xuemin 1989).

m. It generated 1.87 GWh of energy annually with one unit of 400 KW installed capacity (Jagan and Raj 1993)
Since certain hydroelectric power plants are associated with irrigation networks, interaction and close co-ordination with irrigation authorities and users are required at project planning, implementation, and operation stages to function the micro hydropower schemes without affecting the irrigation schemes.

In contrast to MHPP, large-scale hydropower generation, especially when associated with dam-based systems, needs a number of clearances from various departments. For example, to obtain clearance from the Forest Department. In one of the hydropower projects in Karnata State had to pay compensatory afforestation in lieu of the forest land lost to the project. Other environment clearances too are necessary, for example, one of the major projects in Karnata was compelled to conduct catchment area treatment studies for a complete stretch of the water basin (Jagan and Raj 1993). However, MHPPs, including those at existing irrigation channels, may not involve submersion or other negative environmental effects.

Potential for Small-Scale Hydroelectric Power Development in Nilwala Ganga Basin in Sri Lanka

The terrain is steep only in the upper catchment of the Nilwala watershed; the river flows across a flat landscape for most part of its length. Hence, micro hydroelectric power generation is expected to be profitable only in the upper catchment.

The Nilwala River discharges 1,104 cubic meters of water annually into the sea. Three basic types of small-scale hydroelectric power plants are possible in the Nilwala River Basin: MHPPs connected to the national grid (to augment the national supply), the Integrated Irrigation-Hydropower Development, and Stand Alone MHPPs.

Appropriate heads for mini or micro hydroelectric power plants that can be connected to the *national grid* are available only in the upper catchment. Four such sites were identified in the upper catchment and the estimated capacity ranges from 50 to 350 KW (Fernando and Perera 1996).

Integrating Hydropower Development with reservoir- or weir-based irrigation schemes is a potential option in the Nilwala River basin. However, in contrast to the dry zone of Sri Lanka, irrigated agriculture in the wet zone is not a common practice.

Stand Alone

MHPPs in the power range of 2 KW to 20 KW have been successfully practised in the Nilwala River catchment and over 30 such schemes are in operation now. There is a potential for further development of such hydro plants for supplying electricity to the

villages in remote places which are far away from the sub transmission lines of the sub national grid.

The Participatory Development Process of Micro Hydroelectric Power Project[3]

Illukpitiya villagers were the primary beneficiaries of the Micro Hydroelectric Power Project (MHPP). The village is located in the Bovitiya Dola Sub-Watershed of the Nilwala watershed/basin. The village consisted of about 100 families. In January 1994, The SCOR Project facilitated a participatory appraisal of natural resource use in the Bovitiya Dola Sub-Watershed (BSW). In the sub-watershed, participatory appraisal of the characteristics of resource uses and users as well as mapping of *current* resource use were done by groups comprising resource users/farmers, local officials of government agencies such as the Tea Small Holdings Authority, Departments of Agriculture, Forestry and Agrarian Services, and IIMI-SCOR professionals, and catalysts. The SCOR catalysts took the lead role in preparing the resource use maps and recording information. General objectives of this Participatory Rapid Appraisal were the same as those indicated in Chapter 5.

Table 7.1 shows the pre-project land use pattern n the sub-watershed.

Table 7.1 Pre-project land use pattern : Bovitiya Dola Sub-watershed.

Land Use	Area (ha)	Area (%)
Forest		
High forest	18	10.3
Degraded forest	12	7.0
Fern and shrub, etc.	14	8.1
Tea	102	58.5
Homestead	11	6.3
Rice	7	4.0
Other	10	5.8
	174	100.0

Subsequently, a participatory planning exercise was conducted and a resource management plan was formulated for the sub-watershed. This was aimed at changing the

[3] This section is primarily based on: Wijayaratna, C.M. 1995 and 1997, and Edirisinghe, N., D. Wijenayake, O. Amarasinghe and C.M. Wijayaratna, 1996.

land and water use pattern to a more diversified resource use combining production (including hydroelectric power generation) and conservation using appropriate technologies—novel shared control arrangements. This means that the villagers have *action plans* that guide them along a path to the planned future from the current status of resource use. For example, planned change of land use indicated the following:

Forest cover	-	25 percent high forest
	-	05 percent well conserved "stream gardens" (horticultural crops and bamboo, etc., with conservation measures)
Tea and homegardens	-	70 percent (conservation farming)

During the planning sessions itself, the villagers expressed deep interest and concern in harnessing the Bovitiya Dola waterfall for generating electricity for both domestic consumption and small industries. Moreover, the need for protecting the catchment to ensure the sustainability of the hydroelectric power plant too was emphasized. It was noted that the village was located 2.5 km away from the main grid transmission and that the estimated cost of supply was about Rs 3-4 million (about US$ 55,000–75,000). Even the future possibility of grid connection remained doubtful.

On an average a family spent about Rs 145 (US$3) per month for energy use, the main sources being kerosene and car batteries.

Because of its remote location and difficult accessibility, villagers had less contacts with government departments and projects. Even though the villagers were aware of micro hydroelectric power generation, they did not know how to obtain the technical know-how, financial resources, etc. There was no government agency directly responsible for micro hydroelectric power generation.

Formation of the User Organization

As decided during the planning sessions, the villagers were organized into a cohesive group to develop and use the water fall/stream as their source of electricity *without having adverse effects on the existing minor irrigation deliveries*. The IIMI/SCOR catalyst facilitated this process. The organization, among other things, decided and designed action plans to:

- take collective measures to conserve and maintain the catchment
- construct the hydroelectric power plant and supply electricity directly to 48 families

- establish a "battery charging center" and supply electricity indirectly to another 22 families[4]
- invite the Intermediate Technology Development Group, ITDG to provide mainly the technical assistance
- share a considerable portion of capital costs of construction in the form of (limited) capital and offer voluntary and organized labor
- plan and take over the responsibility of post-construction operation and maintenance of the hydroelectric power plant
- undertake necessary post-project rehabilitation

The roles and the responsibilities of the office bearers of the organizations have been defined and a 9 member committee was established as a day-to-day decision-making body to expedite the construction process. Each member in this committee represented a small group of farmers.

A Rights Issue

Rice farmers whose fields were located further downstream had two irrigation lines installed at the point where the weir was constructed. They feared that the construction of the weir and the diversion of part of the Bovitiya Dola through the forebay tank would reduce the flow of irrigation water to their fields. As a compromise, the members of the micro hydroelectric power group, at a negotiation process, agreed to assign priority for irrigation and *fixed two irrigation lines,* 6 inches below the existing levels. After this arrangement, no complaint has been made by the rice farmers downstream concerning irrigation difficulties indicating that the project had not given rise to negative externalities (implying zero external costs).

To maintain equity and also to optimize the limited power generated, the organization *decided to limit the supply to only 100 W per household.*

Resources for the Construction of Micro Hydroelectric Power Plant

Members were requested to contribute Rs1,500 (US$28) each in cash and supply their share of construction material and labor equitably for construction. The organization borrowed Rs11,000 (US$204) at 2 percent annual interest rate from their apex farmer organization.[5] This organization was expected to recover the loan within 2 years of the completion of the power plant.

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[4] The anticipated power supply is limited to 5 KW and consumption will be confined to the period from 5 p.m. to 7 a.m. during week days and from 2 p.m. to 7 p.m. over the weekends and holidays. The battery recharging will be done by using the electricity generated during day time.

[5] This apex organization, namely the Horagala Service Farmer Organization was formed as a result of the SCOR Project intervention.

The proposal for hydroelectric power development was submitted to the Watershed Resources Management Team (WRMT).[6] The forest department official, who had participated in the design of catchment development efforts, commended the users for their motivation on conserving the forest. The representative of the Department of Agrarian Services agreed to the project as it was clear that irrigation water rights had been protected. The WRMT discussed the possibility of linking the proposal with the Matara Integrated Rural Development Project (MIRDP) mainly to obtain funding for electro-mechanical equipment. This proposal was well within the scope of MIRDP and the director of that program, who was also a member of the WRMT, agreed to provide the balance funding.

In addition to the consultancy services, ITDG also volunteered to supply a battery charger free of charge to the project.

Hydrological Considerations and the Design of the Power Plant

The IIMI watershed management coordinator, being an engineer, joined ITDG in providing technical assistance. He assisted the organization in the hydrological analysis.

The discharge of the stream was computed based on the stream flow during the dry months of the year and studying the variations during the rest of the months. The "design flow" of the stream was 35 l/s. Several elders in the area reported that they experienced continuous flow (implying the perennial nature of the stream) before the destruction of forest in the catchment.

The locations of the diversion weir, inlet canals, forebay tank, penstock, and power house were decided collectively by the users, the ITDG, and the IIMI Watershed Management Coordinator. In deference to the users' opinion a low-level spillway, incorporated with a regulating device, was also provided in the diversion weir close to the left bank to protect the right banks from collapsing. The team decided to provide silt exclusion devices at the diversion weir and at the forebay tank to protect turbine vanes from impacts with silt particles. Complying with the requirements laid down by the Central Environmental Authority of Sri Lanka and the Forest Department, the user organization decided to build a stone-terraced leader drain to discharge the outflow of the turbine back to the same stream to minimize damages to the environment.

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[6] The WRMT is a working group established under the SCOR Project to: guide and assist SCOR Project implementation, provide technical assistance, prepare workplans, develop close links with government programs, agencies, and donor-funded projects, and help resolve conflicts. The WRMT consists of IIMI technical experts, heads and experts from key government agencies, user representatives, relevant NGOs and divisional secretaries.

Economic Analysis of the Project

Cost of the Micro Hydroelectric Power Generation Plant

Capital costs. These include the cost of the micro hydropower generation plant, cost of transmission of electricity, and cost of internal wiring.

Labor costs. The Illukpitiya ECS records show that the contribution by the consumers of electricity for the civil construction works, installation of electromechanical equipment and transmission facilities, house wiring, etc., was 647.5 labor days. Out of this, 146 (22.5%) days were Sundays and holidays when no green leaf transactions took place. The labor involvement for house connections of the transmission facilities was 14.7 labor days (per household) in total, with about 2 hours for completion of the connections to each house. For the internal house wiring, skilled labor was used on a contract basis at the rate of Rs 60 to Rs 70 (US$1.1–1.3)[7] per point (Shared Control of Natural Resources, SCOR Project, Survey Data 1995). The total cost of labor was Rs 105,155 (US$ 1915.04).

Material costs. The total material cost for electromechanical equipment, transmission wires, and internal wiring was Rs 780,727 (US$14,218.30) (table A7.1 in the annex).

Operation and maintenance costs. Operation and maintenance costs included the following:

- Cost of desilting the channel bed. Desilting is scheduled to be performed twice a year on a *shramadana* (voluntary group work) basis by the consumers of electricity. For this operation, 96 man days would be required annually.
- Cost of Operation. The electricity consumers' society has agreed to pay Rs 500 (US$9.11) per month for the operation and maintenance of the power house and the battery charging center.
- Cost of replacement of bulbs. The total bulb requirement per year is 288 and the cost of bulb replacement is Rs 7,200 (US$131.12).
- Replacement of the generator and the turbine. Lifetime of the turbine was considered as 10 years and it costed Rs 65,000 (US$1183.76).
- Maintenance cost of the hydropower plant was estimated at Rs 4,000 (US$72.85) per year.
- Credit for loan repayment Rs 2,200 (US$40.07).

[7] Conversion rate US$ 1.00 = Rs 54.91 (for 1995).

Cost of the Battery Charging Center

Capital costs. The total cost of the battery charging center was Rs 30,000 (US$546.35) (table A7.2 in annex).

Operation and maintenance costs of the battery charger. It was estimated at Rs 1,200 (US$22) per year and the lifetime of the battery charger was taken as 10 years.

External costs

Reforestation and "enrichment planting." The electricity consumers planned to protect the catchment to ensure continuous power generation throughout the year and also to reduce soil erosion. With that in view they arranged a reforestation program for 3.5 ha, enrichment planting for 0.5 ha, planting trees along 3 km of stream reservation, and conserving 49 ha of tea lands. The cost of reforestation was Rs 59,500 (US$1083.59) and the maintenance costs for the first three years were Rs 21,000 (US$382.44), Rs 14,000 (US$254.96), and Rs 8,750 (US$159.35), respectively. Enrichment planting has been completed in the degraded forest and the cost involved in the first year was Rs 4,588 (US$83.55); the maintenance cost was Rs 3,000 (US$54.63), Rs 2,000 (US$36.42), and Rs 1,250 (US$22.76) for the second the third, and the fourth years, respectively. The initial cost of enrichment of the stream reservation was Rs 10,750 (US$195.77); the cost of plants was Rs 6,750 (US$122.93); the cost of labor was Rs 4,000 (US$72.85). The maintenance cost was Rs 6,000 (US$109.27), Rs 4,000 (US$72.85), and Rs 2,500 (US$45.53), respectively, for the second, the third, and the fourth years.

Tea land conservation. The total extent of the tea lands in the watershed is 91 ha out of which 49 ha belonged to the smallholders who were the direct and indirect beneficiaries of the micro hydropower project. Therefore, they expected to conserve these 49 ha to arrest soil erosion. Assuming that nearly 5 percent of this land area is undertaken for replanting every year, all the costs were estimated for 46 ha. The cost of planting material for soil conservation was Rs 18,880 (US$343.84) in the first year and Rs 10,000 (US$182.12) during the second year. The labor requirement for maintaining the soil conservation practices was Rs 64,000 (US$1165.54) in the first year and Rs 50,000 (US$910.58) thereafter. The farmers were expected to attend to the infilling annually and to the planting of 10,000 tea plants each year. The cost of infilling is given in table A7.3 in annex.

As a result of the soil conservation practices adopted, the expected yield increment was 6 percent and additional labor cost involved in plucking an assumed annual yield increment of 24,541 kg of green leaves was Rs 110,434 (US$2,011.18) per year. However, this ("expected") benefit was not included in the financial and economic analyses.

Benefits of the Project

Direct Benefits–Cost Savings Accrued by the Introduction of Electricity in Place of Kerosene

The main source for domestic lighting was kerosene and, according to a survey conducted, the average kerosene consumption was 7.9 liters per month per family. The total kerosene consumption by 48 families of the area was 4,550 liters per year and the cost involved was Rs 40,950 (US$745.77). (The subsidized price of kerosene was Rs 9/liter [US$0.16/liter.]) and Rs 48,093 (US$875.85). (The shadow price is Rs 10.57/liter [US$0.19/liter.]). Assuming the people would reduce kerosene consumption by 95 percent after getting electricity, the cost saving was Rs 38,902 (US$708.47). (The subsidized price of 9/liter was used for the financial analysis). Considering the shadow price the saving was Rs 45,688 (US$832.05).

Cost Saving through Reduced Car Battery Utilization for Operating Radios and TVs and Savings of the Battery Recharging Costs

People used car batteries to operate radios and televisions and the batteries were recharged at regular intervals from the facilities available at towns nearby. There are 20 battery owners among the direct micro hydropower consumers. The average battery charging cost was Rs 34 (US$0.62) and the battery charging frequency was 3.5 weeks. After receiving the electricity supply , the batteries may be used only during daytime and therefore re-charging frequency was reduced to 4.5 weeks. The recharging cost therefore was reduced to Rs 20 (US$0.36) through the use of the electricity consumer's battery charging center. The lifetime of a battery is generally 2 years and after the expiry of these batteries, it is presumed that none of them will buy new batteries to operate radio cassette or TVs in the future since they can adjust their television viewing and radio listening times to the hours of power available from the generator. Cost saved per year under different assumptions is illustrated in table A7.4 of the annex. Table A7.5 of annex presents the total annual saving of costs under the assumption that people will not use automobile batteries after the second year of the project. Considering the present number of batteries, the total annual savings would be Rs 35,200 (US$ 641.05).

Cost Saving by Reducing Torch Cell Utilization

Torch cells are another energy source to operate radios and the average consumption was 5 batteries per month (Survey Data 1995). The total cell consumption was 138 cells per month among 28 people. It costs Rs 27,720 (US$504.83) to the community (Rs 16.50 [US$0.30] per cell). Assuming that cell consumption will be reduced by 75 after getting electricity, the cost saving is Rs 20,790 (US$378.62).

External Benefits

Tea yield improvement due to soil conservation practices. Due to improved conservation practices, the tea yield was expected to improve by 6 percent in 46 ha smallholdings. The average annual green leaf yield was 8,892 kg per ha in the area (SCOR survey). Therefore, the annual expected yield increment for 46 ha was 24,541 kg and the incremental income of this is Rs 269,960 (US$4,916.41). (The average green leaf price is Rs 11/kg [US$0.20/kg].)

Value of the Trees Planted

Since the other environmental benefits of trees cannot be measured accurately, only the timber value is considered; hence the values presented in this section are lower than the actual values of benefits.

Returns to Reforestation

Under the reforestation program 3,500 plants have been planted and the value of timber after 20 years (at current prices), assuming only 50 percent will be harvested, is estimated to be Rs 5.55 million (US$ 102,778)(table A7.6).

Returns to the Enrichment Planting of Degraded Forest (0.5 ha)

If 50 percent is harvested, the value after 20 years is Rs 112.6 million (US$229,467)(table A7.7).

Returns from Stream Reservation Conservation

The estimated timber value alone amounted to Rs 12,750,000 (US$236,100). However, in the benefit/cost analysis it was assumed that only half of the trees will be harvested for timber in 20 years (table A7.8).

These computations included only the value of timber and excluded the value of harvest from fruit trees and other minor export crops included in both reforestation and enrichment planting programs, e.g., durian, arecanut, rambutan, mango, kithul (trickle products and kithul flour), coffee, etc.

Financial Analysis

The financial analysis of the project was carried out taking into consideration only direct costs and benefits of the project. In the process of discounting, a discount rate of 6 percent was used. It was assumed that beneficiaries will not use cells after receiving electricity.

The benefit/cost ratio and Internal (Financial) Rate of Return were estimated to be 1.08 and 7 percent, respectively. These can be regarded as "minimum levels" because the values of fruits, other products of agro-forestry, environmental benefits, and half of the value of timber, were not included in the analysis.

Economic Analysis

The economic analysis considered all direct and secondary (including conservation benefits) and true economic price of kerosene and labor, etc. The economic analysis is carried out under four assumptions.

Assumption 1

* the opportunity cost of the labor for de-silting the channel bed is zero
* the opportunity cost of the labor spent during Sundays and holidays to build and establish the micro hydropower plant is zero
* present users of (rechargeable) car batteries will not use them after receiving electricity
* conservation benefits are not included
* the discount rate is 6 percent

Assumption 2

* the opportunity cost of the labor is not zero for any operation. The prevailing market rate is used.
* the present users of car batteries (20) will continue to use them (during day time or for additional power in the night) after receiving electricity. They will purchase new batteries after the expiry of the present ones.
* conservation benefits are included only as 50 percent of timber value
* the discount rate is 6 percent

Assumption 3

* the opportunity cost of the labor is not zero for any operation. The prevailing market rate is used.
* the present users of car batteries will continue to use them but will not purchase new batteries after the expiry of present ones.
* conservation benefits are included only as 50 percent of timber value
* the discount rate is 6 percent

Assumption 4

* the opportunity cost of the labor is not zero for any operation
* present users of car batteries (20) will not use them after receiving electricity
* conservation benefits are included only as 50 percent of timber value

* the discount rate is 8 percent%

The result of the economic analysis is given in table 7.2. As shown in the table, under different assumptions, the benefit/cost ratio and the Internal Rate of Return ranged from 1.3 to 4 and 10 to 21 percent, respectively.

Table 7.2 Economic analysis.

Assumption	NPV(at 6%) Rs (US$)	B/C Ratio (at 6%)	IERR(%)
Assumption 1	311,733 ($5,677)	1.28	10
Assumption 2	5,596,918 ($101,929)	2.30	19
Assumption 3	5,905,497 ($107,549)	2.37	20
Assumption 4	6,115,329* ($111,370)	2.42*	21*

* 8 percent discount rate.
Conversion rate US$ 1.00 = Rs.54.91 (for 1995).

Hence, the analysis revealed that, even if only a few selected benefits of conservation are included such participatory watershed management efforts would be profitable to the individual as well as to the economy. If more of the actual conservation benefits, such as value of fruits, reduced soil erosion, etc., and social benefits like improved education of children, enhanced social cohesiveness and reduced conflicts, etc., are included, a much higher levels of benefit/cost ratio and IRR could be realized. With this preliminary experience the SCOR Project was in the process of catalyzing more MHPPs in suitable sites in the Nilwala Watershed.

Progress after the Project

In September 1996, 9 months after the commencement of MHPP, SCOR Project reviewed the progress using its M&E database and field observations. The findings are summarised below :

- Land use in Bovitiyadola Hydrocatchment:

  Following the MHPP plan, tea smallholdings, degraded forest, and stream reservations are being conserved by the electricity consumers with the assistance of relevant government agencies.

> *Improvement in degraded forest*: Reforestation has been completed in 1 ha by beneficiaries and this forest plantation is being very well maintained by them. Weeding, fertilizer application, and vacancy filling are in progress. They have commenced enrichment planting in 3 ha of sparse forest and 0.5 ha is already completed. They are engaged in tree planting in the remaining 2.5 ha.

> *Improvement in stream reservations*: The beneficiaries of MHPP have involved in tree planting in 4 km of stream reservations in Bovitiyadola hydro catchment, and they have planted trees already. Maintenance of plants, including vacancy filling and weeding, are being done.

> *Improvement in tea small holdings*: Out of the 49 ha of tea smallholdings in the catchment, soil conservation practices have been adopted in 40 ha. The most common practices were filling of vacancies, the establishment of Sloping Agricultural Land Technology, SALT, vetiver hedgerows, and shade trees. During the first 9 months 9,700 tea plants were established in vacant patches of tea lands and the beneficiaries have plans to establish 10,000 tea plants in vacant patches for the next year. Four tea nurseries have been established in the area to supply plants for the above purpose.

- Labor for maintenance of MHPP

  Operation and maintenance of the battery charging center and hydropower plant had been done by an employee of the MHPP, and was paid Rs 500 per month by the Electricity Consumers' Society.

- Organization of maintenance activities

  The Electricity Consumers' Society (ECS) formed by the electricity consumers was vested with the responsibility to manage the MHPP. The membership of the ECS was 48, which consisted of all 48 households that received hydro electric power. The beneficiaries have registered the ECS as a voluntary organization.

  General meetings of the ECS have been held once in 3 months with an average participation of 35 members. In addition, committee meetings have also been held monthly.

  ECS had collected Rs 125 (US$2.2) from each household per month and the collection efficiency is 100%. This has helped the ECS to repay the loan to the Horagala Service Farmer Organization promptly.

In addition, the ECS has done some improvements in the power house, e.g., installation of high voltage cut-off switches.

Other Benefits

After the MHPP the number of households having television sets were doubled (from 8 to 16). The number of radio-cassette recorders was also increased from 16 to 48. For special functions such as weddings, funerals, and religious ceremonies, the ECS has provided beneficiaries with extra supply. For this ECS charged Rs 50 (nearly US$ 1) per day, except for funerals. Electricity was free for funerals. In addition, the study revealed that the children were now keen in spending more time on after-school education such as reading.

Conflicts and Resolution

There were no incidences of damages to the distribution line. The irrigation scheme too was not affected by the project and there were no complaints reported.

A few complaints of overuse of electricity has been recorded. Consequently, the ECS appointed a group of beneficiaries to conduct random checking. Since then no complaints have been recorded.

SUMMARY AND CONCLUSIONS

Summary

This report examines a participatory and "market-oriented" natural resources conservation effort to mobilize resource users, nongovernment organizations (NGOs), and government agencies to *develop a Micro Hydroelectric Power Plant (MHPP),* and to *establish a participatory conservation program in a sub-watershed in the upper catchment of the Nilwala Watershed in southern Sri Lanka.* This was initiated and facilitated by the Shared Control of Natural Resources (SCOR) Project. SCOR is a participatory *watershed management* project aimed at developing and testing a holistic interdisciplinary approach to *integrate environmental and conservation concerns with production goals.*

A participatory planning exercise was conducted and a resource management plan was formulated for the sub-watershed and the villagers were organized into a cohesive group to develop and use the water fall/stream as the source of electricity *without having adverse effects on the existing minor irrigation deliveries.* The discharge of the stream was computed based on the stream flow during the dry months of the year and studying the variations during the rest of the months. The organization, among other things, decided and designed action-plans to: conserve and maintain the catchment, construct the hydroelectric power plant and supply electricity directly to 48 families, establish a "battery charging center" and supply electricity indirectly to another 22 families, share capital costs of construction, take over the responsibility of post-construction operation and maintenance of the hydroelectric power plant, and undertake necessary post-project rehabilitation.

An economic analysis was carried out considering all direct and some selected secondary benefits. Two alternative values for the wage rate (zero opportunity cost and market rate), different assumptions on the post-project number of (rechargeable) battery users, and two discount rates (6% and 8%) were used. Under different assumptions, the benefit/cost ratio and the IRR range from 1.3 to 2.4 and 10 to 21 percent, respectively. These can be regarded as "minimum levels" because only 50 percent of the future timber value of trees planted is included as conservation benefits. The value of fruits, other products of agro-forestry, environmental benefits, and half the value of timber, were not included in the analysis.

Conclusions

The collaborative mode of the MHPP, starting with the design process, in which resources users, government officials, NGOs and catalysts/facilitators played important roles through to implementation, has facilitated the **integration of consumer benefits with environmental concerns in a watershed context**.

The economic analysis of MHPP revealed that even if most of the expected conservation benefits and economic benefits of trees planted in the hydro catchment of the project are

excluded, such participatory watershed management efforts would be profitable to the users as well as to the economy.

A post-project review has found out that the beneficiaries, through their Electricity Consumers Society, are maintaining both the catchment and the electricity generating plant as planned. Additional social benefits such as improved education of children, enhanced social cohesiveness and self-management of conflicts have also been realized.

Hence the analysis revealed that, even if only a few selected conservation benefits are included, such participatory micro hydroelectric power projects proved to be beneficial to individual users as well as to the economy/society.

Table A7.1 Cost of labor and material. Rs. (US$ values are in parenthesis)

a. Labor

Item	Cost Rs. (US$)
Installation and transmission	64,750
House wiring	38,933
Connection from the main line	1,472
Total	105,155 ($1,915)

b. Material

Item	Cost Rs. (US$)
Civil construction	74,551
Electromechanical equipment	295,850
Transmission wires	143,586
House wires	204,690
Connection wire from the main	32,050
Contingencies	30,000
Total	780,727 ($14,218)

Source: SCOR survey data 1995.

Conversion rate US$ 1.00 = Rs.54.91 (for 1995).

Table A7.2 Cost of battery charging center. Rs. (US$ values are in parenthesis)

Item	Cost Rs. (US$)
Labor	5,000
Civil construction	10,000
Battery charger and accessories	15,000
Total	30,000 ($546)

Conversion rate US$1.00 = Rs 54.91 (for 1995).

Table A7.3 Cost of tea land conservation in the first year. Rs. (US$ values are in parenthesis)

Item	Cost-Year 1 Rs. (US$)	Cost-Year 2 Rs. (US$)
Rehabilitation Grass	8,000	
Labor cost	15,000	30,000
Dolomite	3,000	
Fertiliser	2,800	2,800
Tea plants		30,000
Total	28,800	62,800 ($1,144)

Conversion rate US$1.00 = Rs 54.91 (for 1995).

Table A7.4 Cost saving through reduced battery utilization, Rs per year, (US$ values are in parenthesis)

of recharging (Weeks) 1	Frequency	Frequency of recharging battery/Year (Weeks) 2	Recharging cost per battery 3	Total annual recharging cost (Rs) 4	Annual cost for battery replacement 5	(5)+(6)	Cost saving
For 20 batteries (present)							
Before project	3.5	15	34	10,200	25,000*	35,200	
After project							
Assumption 1	4.5	11	20	4400	25,000*	29,400	5,800 ($106)
Assumption 2	4.5	11	20	4,400**	0	4,400	30,800 ($561)
For 48 Batteries (maximum)							
Before project	3.5	15	34	24,480	60,000*	84,480	
After project							
Assumption 1	4.5	11	20	10,560	60,000*	70,560	13,920 ($253)
Assumption 2	4.5	11.	20	10,560**	0	10,560	73,920 ($1,346)

Assumption 1. Beneficiaries keep existing batteries to utilize during the daytime or for additional power at night and buy new batteries after expiry of their batteries.
Assumption 2. Beneficiaries keep existing batteries. However, after expiry of available batteries they will not buy new batteries.
*Assuming a battery life of 2 years and that half of the batteries are replaced each year.
** This cost is reduced by 50 percent in the second year and it is 0.00 from the third year onwards (since people do not replace their batteries under assumption 2).

Note: 20 families were using car batteries prior to the project. Total number of families included in the project is 48. Therefore, two alternatives were considered: 20 batteries and 48 batteries.
Conversion rate US$1.00 = Rs 54.91 (for 1995)

Table A7.5 Total annual saving of costs under assumption 2, Rs (US$ values are in parenthesis)

Year	No. of batteries		Recharging cost		Battery replacement cost		Cost saving	
	Without the project	With the project	Without the project	With the project	Without the project	With the project	On battery recharging	On batter replac ment
Year 1 Actual	20	20	10,200	4,400	25,000	0	5,800	0.00
Potential	48	48	24,480	10,560	60,000	0	13,920	0.00
Year 2 Actual	10	20	10,200	2,200	25,000	0	8,000	25,00 ($455
Potential	24	48	24,480	5,280	60,000	0	19,200	60,00 ($1,09
Year 3 Actual	0	20	10,200	0	25,000	0	10,200	25,00 ($455
Potential	0	48	24,480	0	60,000	0	24,480	60,00 ($1,09

Table A7.6 Returns to reforestation

Plant	Timber value Rs (US$) per tree	Number of tree	Number harvesting	Value after 10 years, Rs US$)	Value after 20 yea Rs million (US$)
Mahogany	15000 (278)	585	250		3.75 (69,445)
Hora	8000 (148)	453	225		1.80 (33,333)
Accasia	2000 (37)	155	75	150,000 (2778)	
Durian	-	500	0		
Total		3500	550	150,000 (2778)	5.55 (102778)

Note: Value of Durian and other fruits are not included in the analysis.

Table A7.7 Returns to enrichment planting.

Plant	Timber value Rs	Number of plants	Value after 10 years Rs	Value after 20 years Rs million (US$)
Jak	20,000	100		2.0 ($364,423)
Arecanut	250	100	25,000 ($455)	
Coffee		50		
Rambutan		100		
Mango		100		
Keena	20,000	200		4.0 ($728,465)
Domba	10,000	200		2.0 ($36,423)
Kithul		200		
Hora	8,000	200		1.6 ($29,139)
Mahogani	15,000	200		3.0 ($54,635)
Other		50		
Total		1,500	25,000 ($455)	12.6 ($229,467)

Table A7.8 Returns to stream reservation planting.

Plant	Value Rs	No. of plants	Value after 10 years Rs	Value after 20 years Rs million (US$)
Arecanut	250	1,000	250,000	
Accasia	2,000	100	200,000	
Mahogany	15,000	850		12.7 (236,100)
Bamboo	100	230	23,000	
Durian		35		
Other		35		
Total		2,250	473,000	12.7 (236,100)

CHAPTER 8

IMPACT OF TENURIAL SECURITY ON NATURAL RESOURCES MANAGENENT IN WATERSHEDS[1]

LAND, WATER, AND TENURE

Land is a dynamic concept: it embodies ecosystems, but it is also a part of these ecosystems. One of its main components, the soil, is itself a complex ecosystem constraining plants and animals of different sizes and activities. Natural processes occurring in the land derive energy from the sun as well as from mineral and biological sources. Relief, which is one source of energy, provided by differences in heights is a specific attribute of the land surface. Although man is an inherent part of the ecosystem where he lives, he places himself to some extent outside the system and tries to manipulate it. Land use is the application of human controls, in a relatively systematic manner, to the key elements within any ecosystem, so as to derive benefit from it. Land, being the carrier of those ecosystems that provide the most benefits to mankind, is the overall natural resource. The land viewed as landscape, as observed today by both visual and other methods of perception, may achieve near stability from certain points of view, but this stability is the result of complex interactions of a multitude of phenomena and processes. We try to use this for our own ends and hope to include those kinds of near stability, which will benefit us most on a long-term basis (Chorley and Kennedy 1971).

"A tract of land is defined geographically as a specific area on earth's surface; its characteristics embrace all stable or predictably all cyclic attributes of the biosphere above and below this area including those of the atmosphere, the soil, the water, the plants, and animal population and the results of past and present human activity, to the extent that these attributes exert a significant influence on present and future use of the land by man" (Ray et al. 1968).

This definition obviously includes all land resources, both natural and man-made, of a clearly cyclic or permanent nature. As stated by Vink (1975), the concept of land as a natural resource does not include the institutional aspects; scientists adhering mainly to this conceptual approach prefer to include institutional aspects with land utilization type. Land as a "tract," i.e., as a geographically defined specific area does not include permanent or cyclic institutional attributes. Thus in general, field pattern and the system of ownership or tenure of a particular tract of land are attributes of the land itself, because they are relatively permanent in nature. The nature or the form of this ownership/tenure varies in different social systems.

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[1] This chapter is based on a study conducted by K. Jayawardene, P. Rajasekera, C. M. Wijayaratna, and G. Batuwitage on "Tenurial security and natural resources management in a watershed context."

In Sri Lanka, land has been legally defined as "any interest in land, the bed of any lake or stream, things attached to the earth or permanently fastened to anything attached to the earth and any interest in crops growing or to be grown on land." Deriving from the above definitions, it is highly apparent that water is a natural resource component of the land. Thus, the ownership/tenure or right to occupy and cultivate land accompanies the right to use water on the land or supplied into the land. As such, the landownership pattern or the tenurial system of land use is directly linked with the right to use water.

As discussed earlier in chapter 3, farmers increasingly make production decisions in relation to the changes of economic environment in which they carry out their agricultural production activities. Furthermore, these decisions or responses are generally influenced by factors such as farmers' accessibility to: sustainable and appropriate technological developments, flow of information on market situations including alternative opportunities for production, input resources, appropriate institutional arrangements, and support services available, etc. Another important factor that influences the farmer in his or her decision making is the existing or perceived degree of control over their means of production, which in turn is assumed to be related to the form/nature of ownership/tenure that farmer is experiencing in natural resource utilization, particularly the land and water.

The degree of control the farmers can exercise over production resources, mainly land and water, relates to the tenurial security under which they utilize specific areas of land and available water over a period of time. The tenure terms on which land is held actually define the user-relation of the land to the farm as an economic unit; the terms of tenure define the price or performance required for the use of land, with stipulations that in turn greatly influence the incentives to energetic effort, the adoption of new technology, and greater care of the soil.

The connection between the expansion of physical, or production opportunities on the land and tenurial security are both direct and complex. The question always arises as to how the benefits as well as the costs are to be distributed. Furthermore, the prospective participation in the benefit of technological improvements in farm operations seems largely to determine the rates of adoption of new technologies; the terms of bearing such benefits are part of the terms related to the form of tenure of the individual farm. It is also argued that the assured security of tenure reduces exploitative land use and increases farmer inclination to long-term investments, both in production and environmental protection activities, which have long cost–recovery periods.

As reported by Broomly and Cenera (1989), in Nepal, the nationalization of village forests by the government, which converted common or community-owned property to a state-owned property. As a result, the villagers' perceived "sense of ownership" with regard to "their" forest was lost and the resource become an open access to squander. In contrast, a case is reported from Thailand where the majority of farmers were of the opinion that, land tenure made no difference to farming practices and did not prevent them from planting tree crops, and some believed that with such long-term investment in land they will be more secure in claiming the ownership of the land they were cultivating. Parson (1956) has pointed out that land tenure relations are social relations, central to which is man's relation to man in the use of land. This relationship is

more than a mere contractual agreement between the owner (sometimes the government) and the tenant. Through ownership of land, property relations define not only the status of the owner by defining the duties with reference to the use of land which all other persons must honor but also the limits within which the owner's will is supreme with reference to the use and disposition of land. Within this property context fall the formal and legally enforceable agreements of owner and tenant. But, beyond these legal sanctions, customary arrangements may have more compelling force; social norms and religious principles may explicitly define tenure and inheritance practices. Parson further added, "it has been suggested that the tenure context in which a farmer or a peasant works influences his performance, or productivity. The issues and problems of land tenure become clearer if we distinguish between the dimensions of opportunity of farming—of which the use of land is the principal item—and the status or degree of freedom of the individual to exercise his abilities. Land tenure problems arise fundamentally from the contests over the control and use of land and related resources."

According to Sharma et al. (1995) the issue on tenancy relations on agricultural production has remained as one of the major focal points of discussion since the days of Adams Smith. A large number of studies have been conducted in India, to quantify the relationships between various ownership/tenurial forms and recourse allocation and production efficiencies but the conclusions of these studies were not consistent to prove any significant relationship.

In Sri Lanka, the conservation of and productive use of natural resources gained its recognition even during the pre-independent era. With the rapid increase in population growth rates, and the international food crisis experienced during the Second World War in the 1940s, the pressure on natural resources, particularly land and water, increased remarkably. Since independence in 1947, the problem was virtually combated by opening up of new agricultural lands, reclamation and reconstruction of ancient major and minor irrigation schemes, and alienation of crown or state land to the landless peasants in various settlement schemes, particularly in the dry zone under different government land ordinances, enactments, and reforms. Yet, it was considered that the tenurial security is vital to conservation of natural resources, especially, land and its productive use in the agricultural section of the country.

There are many tenurial forms that have evolved during the past, partly as a sociocultural inheritance and the others were introduced by the government land policy under various ordinances and enactments. As such, it is a mix of tenurial forms with different socioeconomic and legal values attached to each form. On the other hand state land alienation to landless is still continuing and at the same time "illegal" encroachments on crown land also continue increasing, due to a number of socioeconomic reasons.

The two pilot watersheds, Huruluwewa and Nilwala, that were selected for implementation of the Shared Control of Natural Resources Project (SCOR), too were also characterized by the existence of different tenurial forms, mentioned above. A major assumption of the SCOR project was that land and water should be used efficiently to increase productivity and profits in the interest of both the individual farmer and the country's economy as a whole.

Accordingly, an action research study was designed under the SCOR Project to test the hypothesis, which was conceptualized during the project design process and was spelt out as "that the farmer behavior related to production depends on the degree of tenurial security that, in turn, would depend on ownership of land."

Objectives of the research study and the project interventions were aimed at:

- Identifying the major tenurial forms in the two watersheds selected for SCOR action research.
- Identifying the major characteristics of these different tenurial forms that may influence the production and conservation of natural resources.
- Evaluating the different tenurial forms based on their characteristics identified.
- Assessing the impact of various tenurial forms on land productivity.
- Investigating the possibility of adjusting usufructuary rights and in establishing new state-user partnerships.

This chapter first discusses the research methodology adopted by the action research team in the study to achieve the aforesaid objectives. The procedures adopted and the results obtained are discussed separately under each component, according to the objectives defined. At first, different tenurial forms in the two pilot watersheds were identified and indicators to assess different tenurial forms were agreed upon and are presented. Based on these, a set of tenurial performance indicators (TPIs) were developed and the procedure adopted is discussed. Indicators on different tenurial forms and different tenurial performance indicators were used to identify their relationships, impacts, and outcomes based on the objectives and are presented here. Accordingly, the validity of the corresponding hypotheses was tested, based on the results obtained to address the final objective, by testing new and innovative forms of tenure and state-user partnerships that would promote a sense of security leading to increased production and improved conservation of natural resources in a watershed context. The interventions of the SCOR Project were aimed at integrating both natural resources conservation concerns and production goals.

EXISTING MAJOR TENURIAL FORMS

As indicated earlier in this chapter, SCOR pilot project interventions were in the two watersheds, Huruluwewa in the dry zone and Nilwala in the wet zone of Sri Lanka. Most of the tenurial forms that exist in Sri Lanka at present, were found in the above two watersheds when they were taken together. The following paragraphs of this section will be utilized to briefly indicate major tenurial forms under which land and water resources are utilized and also to indicate the distribution of different tenurial forms in two typical sub-watersheds selected from the above main watersheds.

In Sri Lanka, land is largely state-owned.[2] A recent study conducted by the World Bank on the distribution and ownership pattern revealed that 84 percent of the country's total land area is "state–owned." The details of this study are given in table 8.1. This unique feature of landownership pattern that exists in Sri Lanka contrasts with that of

Table 8.1 Sri Lanka: Land distribution (in million hectares) and ownership (share in %), 1990.

CATEGORY	AREA	SHARE
Total area	6.57	100
State-owned	5.50	84
of which :		
- Large inland waters	1.20	18
- Forests and reserves	2.18	33
- Agricultural land	1.72	27
of which :		
- Under LDO lease	0.82	13
- Under Land Ref. Com.	0.41	6
- Tree crops plantations	0.25	4
- Under Mahaweli (MASL)	0.14	2
- *Swarnabhumi* grants	0.10	2
- Other	0.40	6
Privately owned	1.07	16
Memo Item		
Urban area	0.21	3
of which :		
- Privately owned	0.17	2.5

Sources :
i. Total, Large Inland Waters, Forests and Wild Life Reserves and Urban Area : DSRSL Statistical Yearbook 1991,
ii. LDO (Land Development Ordinance 1935) leases, Land Reform Commission holdings and Swarnabhumi Grants Program; Ministry of Agricultural Development and Research - "A Policy Review of Impacts of Land Tenure in the Food Crop Sector" APAP Report, December 1991.
iii. Tree Crops and Mahaweli areas from various World Bank reports.
iv. Remainder derived arithmetically.

Notes :
a)Assuming the urban area to be largely privately owned (for Colombo the area owned or controlled by the state is estimated as "only 20%," K. H. J. Wijayadasa "Toward Sustainable Growth: The Sri Lanka Experience, Central Environmental Authority of Sri Lanka, 1994, p. 41) and the remainder of privately owned land (0.86 million ha) to be agricultural land, gives a total agricultural land area of 2.58 million hectares.

[2] However, most of the smallholder receipients are fully convinced that the government would not take back the land.

b)Two consultant environmental surveys estimate forests and wildlife reserves at 2.75 million hectares. This could eliminate the other category of state holdings and reduce private holdings to 1.0 million hectares.

Source:
Quoted from Report No. 14564 -CE - Sri Lanka Nonplantation Crop Sector Policy Alternatives (Document of the World Bank - March 20, 1996)

Economically advanced countries, where over 80 percent of the land is privately owned. The roots and the causes for the existing landownership pattern could be traced back to the colonial land policy that was introduced under the British rule. The subsequent land policies too have been evolved from the same bases from past experience.

In this context the land tenurial forms in the country could be classified into two broad categories; and are as follows:

- State-owned lands (which includes forest and forest reserves, large inland waters, rivers, streams, plantations under the jurisdiction of government or provincial councils having the authority to alienate, regulate, reserve for various purposes or to lease).

- Privately owned lands (where the owners have the rights to enjoy and legally transfer, mortgage, or dispose of at their will).

In this study, 12 forms of major tenurial or ownership patterns were identified in the two watersheds where the study was conducted. A sub-classification of these 12 forms under the above two broader categories are indicated below.

i. **State-Owned Lands**:
   - Lands for which permits issued under the Land Development Ordinance (LDO).
   - *Swarnabhumi* land grants under the LDO.
   - *Jayabhumi* land grants under the LDO.
   - Land given on annual permits under the State Land Ordinance.
   - Lands given as long-term leases (99 years) under the State Land Ordinance.
   - Encroachments on State land.
   -

ii. **Privately Owned Lands**:
   - *Paraveni* or inherited lands (settled and with clear titles).
   - Paraveni or inherited lands (Unsettled).
   - Freehold lands with single ownership.
   - Freehold lands with multiple or joint ownership.
   - Paddy land tenancies under the Agrarian Services Law
   - Temple lands.

A descriptive account of the above tenurial forms, is given in annex 8.1, which includes analyses on each sub-tenurial form in relation to its performance-related indicators (TPIs), i.e., tenurial security, bankability, transferability, eligibility to subsidies and access to technology, and are defined and discussed later under the topic on "Evaluation of tenurial forms" in this chapter.

The Distribution of Tenurial Forms in Watersheds

To illustrate the distribution of different tenurial forms identified in the study two sub-watersheds were selected from Huruluwewa (dry zone) and Nilwala (wet zone) watersheds.

Kokawewa is a typical sub-watershed of Huruluwewa and was taken as an example to illustrate the distribution of different tenurial forms in a small minor irrigation tank system. In this illustration, only a few broad categories of resource tenure were used (the 12 tenurial forms[3] were identified at a later stage of this study). Kokawewa is one out of the 30 sub-watersheds selected for SCOR interventions and the identified tenurial forms are shown in figure 8.1. It indicates that encroachment of state-owned lands is highly conspicuous in the watershed, mainly in the catchment areas. The state lands that have been alienated to farmers are also very conspicuous and their homesteads are in the command areas. In addition, there are inherited or paraveni lands which are mainly under the command area of Kokawewa.

With regard to the Nilwala watershed, Anikanda sub-watershed was selected to illustrate different tenurial forms (figure 8.2). It could be considered as a typical sub-watershed, which represents the Upper Nilwala watershed. In contrast to the Kokawewa sub-watershed of Huruluwewa, the major tenure form in the Anikanda sub-watershed is predominantly privately own landholdings with marked encroachments of state-owned lands mainly to cultivate tea on steep slopes, which is an undesirable type of land use where the terrain is considered. In addition, long-term government leases are not present. The figure is indicative of a number of tenurial forms both private and state-owned and the extents are remarkably different from the Kokawewa sub–watershed's tenurial forms. The upper catchment area is under the forest and constitutes 22 percent of the upper catchment. The protected forest, which constitutes two thirds of the above forestland, has been interfered by the farmers, particularly along the boundaries.

During the recent past, farmers have shown greater inclination to cultivate tea and, in most cases, at the expense of protected forestlands. According to the land use data available for the Anikanda sub-watershed, 55 percent of the land is under tea and the forestland has come down to 1 percent. As indicated earlier, lands are largely privately owned, and the extents under state ownership are also substantial. Encroaching into

[3] At the initial stage of the study, only a few broad categories of resource tenure were used. Twelve tenurial forms were identified and characterized at a later stage of the study, through expert consultation and reviews of literature.

state- owned land is a salient feature in this particular catchment, but the relevant authorities have totally failed to prevent it.

Figure 8.1 Land ownership, Kukawewa subwatershed

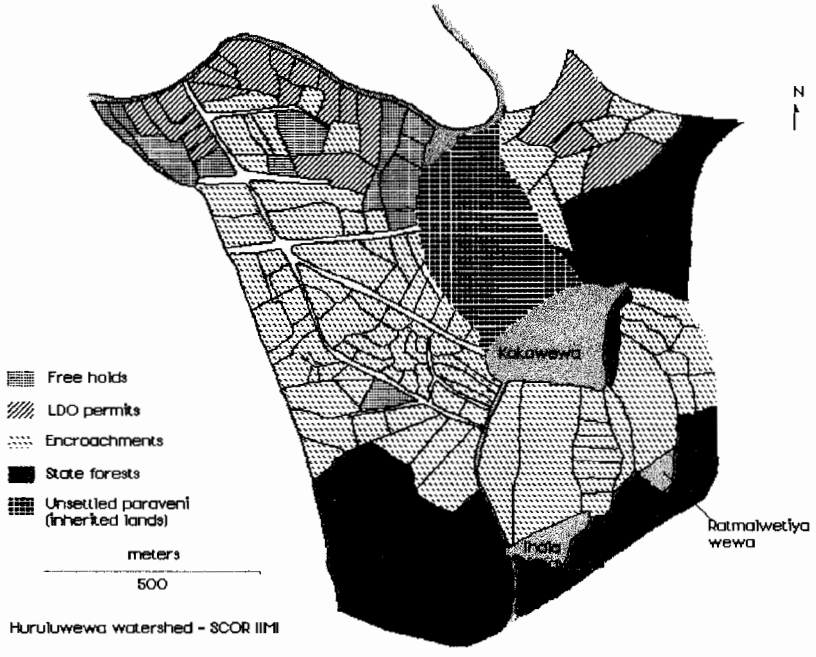
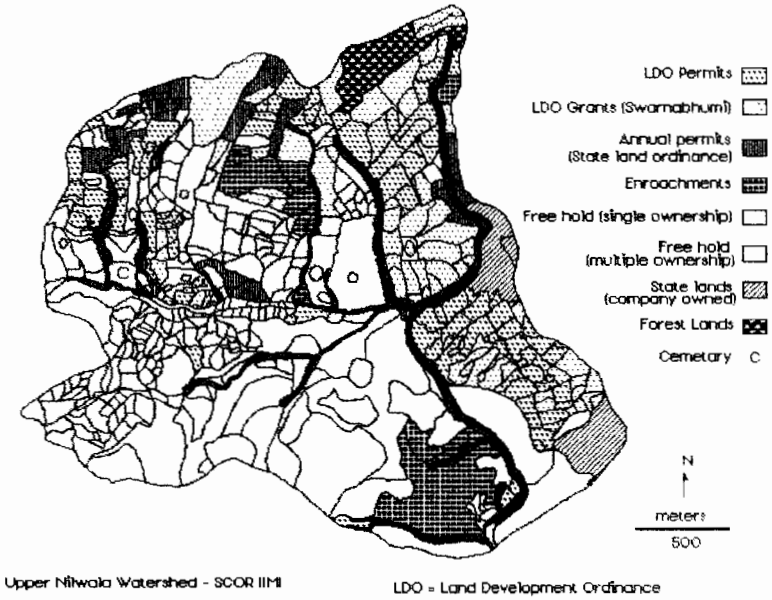


Figure 8.2 Land Ownership, Anninkanda sub watershed



Tenurial Forms Evaluated

The next section discusses the process adopted in the study to characterize and measure different tenurial forms identified, using appropriate indicators agreed upon and the appropriateness of the indicators used were based on their relative importance to production and conservation. The selected indicators to assess different tenurial forms have been defined, ranked, and a weightage given to each indicator.

Methodology Adopted

Information collected from SCOR baseline studies, which included participatory mapping and the data obtained from a farm-level survey, covering approximately 1,600 farm plots conducted in both Huruluwewa and Nilwala watersheds, were used to identify the major tenurial forms and were discussed earlier, under the description of the two sample sub-watersheds, Kokawewa and Anikanda (figures 8.1 and 8.2). Information obtained from official records and authorities was reconciled with the SCOR experience to describe various tenurial forms prevalent in the two watersheds. As indicated earlier in this chapter, several tenurial performance indicators were selected with the objective of characterizing and evaluating already identified tenure forms and were defined and developed accordingly. Then, with the assistance of experts with experience in matters pertaining to land policy and administration in Sri Lanka, the major qualitative aspects of assessing the influence of each tenurial form selected in the study on productivity and conservation of resources were quantified.

It is an accepted fact that applied research methodologies could be easily adopted to find out the economic aspects of land utilization. In contrast to the above, the influence of different tenurial forms on productivity could not be easily quantified. The problem is partly associated with factors such as different perceptions and adjustment of direct users as well as the fact that people belonging to other related organizational systems are also involved. Granting a loan by a bank in addition to prescribed rules, issues of permits, provision of subsidies, and decision on eligibility for material or service support, etc., could be quoted as examples for value judgements/discretions of the other people involved in the production environment. The need to develop and adopt an appropriate approach and methodology that, in turn, could assess and quantify as far as possible, the impact of tenurial forms on natural resources arises as it would be an important prerequisite for effective policy changes. Thus, a consultation process was adopted involving experts in production-related fields, in deciding upon the tenurial performance indicators (TIPs), with the aim of characterizing the various tenurial forms, and also in assessing the impact of those variables on production and conservation of natural resources.[4]

[4] The experts were a representative group drawn from the highest levels of policy makers in the land and agriculture sector, senior executives in the banking and formal credit sectors, who have experience in natural resources land tenure management.

These consultations were useful in deciding on the adequacy of tenurial categories selected, tenurial performance indicators and their relative importance to production and conservation, and developing a system of assigning scores to identified tenurial forms. There was a common agreement on all of the three aspects, which were discussed during the consultation.

Indicators to Assess Tenurial Forms

Before deciding on indicators to assess tenurial forms, the research study team was engaged in reviewing literature on relevant policy documents and prevailing procedures on delivering support services to farmer production, which included credit, formal market, flow and access to technology, provision of subsidies, etc. After an exhaustive exercise, where the main emphasis was to examine any variations existing among different tenure forms, particularly in relation to the above-mentioned production aspects, the research team came out with a list of the most probable or valid indicators for selection by the experts. As some of the indicators were highly related to one another, it was found difficult to select mutually exclusive indicators to serve the purpose. However, in the first consultation, the following four indicators were selected as the most appropriate ones to be utilized in assessing tenurial forms :

i. tenurial security
ii. bankability[5]
iii. transferability
iv. eligibility to subsidies and access to technology.

The respondent-perceived importance with regard to above indicators are summarized in the next five paragraphs:

Tenurial Security. It is considered as the most crucial factor in decision making in regard to short- and long-term investment in production and conservation. If tenure is secured, it acts as an incentive to use maximum efforts to increase productivity. Basically, it is the right or unchallengeable power that a landholder, under a tenurial form, is able to:

i. Make decisions with regard to all development and conservation activities without any external interference.
ii. Occupy his land, and being not dispossessed at any stage by the state or by any other outsider.
iii. Enjoy security in regard to the access to benefit such as crops, livestock, etc.

[5] Acceptability of the land (title) to a bnk, as collateral for lending.

Eligibility to Subsidies. It is the landholders' ability to request and receive various kinds of subsidies provided under government agencies. If the holder is not entitled to receive such subsidies, due to the nature of his tenure form, it may act as a constraint to his production and development. Legal possession of land is usually considered in granting subsidies by different government agencies.

Access to Technology. It is the landholder's right to receive technology/advice/guidance pertaining to new technological developments, and information related to all aspects of crop production, marketing, agro-processing, skill development, etc., for him to utilize his land optimally. It is assumed that tenurial form of the holder should not be a constraint to receive such information and services provided by different agencies.

Bankability. Agricultural credit is considered as an important factor that increases the farmers' ability to invest, either in the short term or the long term, to increase his production and development. The legal status of the land/eligibility/suitability or market value of a land acceptable to the bank is determined by the tenurial form, to be used as a collateral by the holder to obtain a bank loan for his agricultural and conservation efforts. If the tenurial form of the holder's land is not acceptable to the bank to be considered as a collateral it acts as a constraint to obtaining credit. In general, banks (state and private) refrain from extending credit to untransferable lands.

Transferability. It is the right or the ability of the landholder within a particular tenure form to transfer his land to a another person temporarily on agreed upon rent or to dispose/sell the land in the market at his will.

It was assumed that the holder's ability to enter into such land transaction should increase productivity, conservation, and the holder's personal well-being. It was also assumed that, as transferability increases, which in turn increases the possibility of a land market and more land consolidation.

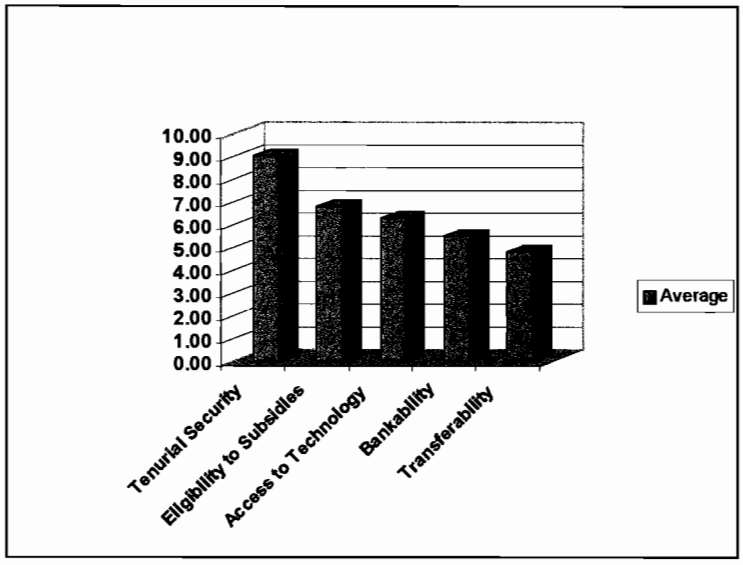
Tenurial Performance Indicators[6] and Ranking. This was also done by a group of experts. Four small groups worked separately in evaluating and ranking the five tenurial performance indicators by giving emphasis to their relative importance to agricultural production and resources conservation. The indicators were also assigned with weighted scores and the experts' responses were then analyzed and utilized in the final evaluation

[6] The initial responses (to the mailed questionnaire) from the 11 respondents were presented, to the 25 participants at the consultation. The experts deliberated that the indicator, eligibility to subsidies and access to technology, should be treated separately for the following reasons: (i) subsidies are not available for certain types of land tenure; and (ii) different factors affect access to technology and subsidies. For example, a technology may be available to an encroacher but not the subsidy. Therefore, they were separated and as a result 5 indicators were considered: bankability, transferability, tenurial security, eligibility to subsidies, and access to technologies.

The large group of experts formed four small groups, and evaluated and ranked the tenurial performance indicators considering their importance to agricultural development and conservation of resources.

of different tenurial forms[7]. The expert groups' average ranking and average weights are given in figure 8.3.

Figure 8.3 Evaluation of Tenurial Performance Indicators



The results are presented in figure 8.4 (and table A8.1 in the annex at the end of this Chapter)[8].

In the next stage of assessing tenurial performance using TPIs, the individual scores (given in figure 8.4 and table A8.1) were adjusted by multiplying by the weighted average values (in 0–10 scale as given in figure 8.3 and also in table A8.2 in the annex) given to TPIs in terms of their relative importance to increase productivity and resource conservation.[9] Figure 8.5 gives the results showing the final values (scores) of different tenurial forms in a 0–100 scale for the five tenurial performance indicators (TPIs). In figure 8.5, tenurial forms are arranged in the descending order of the scores assigned to

[7] Prior to the second expert consultation a questionnaire was mailed to 20 experts and 11 responses were received. The objective was to obtain their responses on:

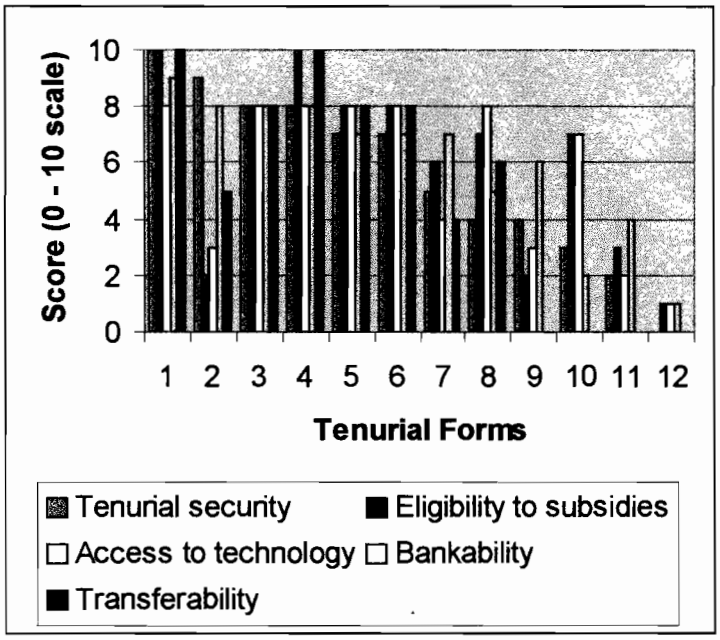
- the ranking, and weightage (on a scale of 0 - 10) they would assign to tenurial performance indicators (selected to measure and characterize tenurial forms), in the order of magnitude of their importance to agricultural development and resources conservation, and also indicate their justification for the ranking and score assigned;
- scores they would assign, on a scale of 0 - 10, to the selected 12 tenurial forms using the indicators considering their importance to agricultural development and give reasons for their considered opinion

[8] This means, in this Table, each cell in the tenurial category versus TPI matrix, contains a score within the range of 0-10.

[9] This was computed simply by multiplying the scores given to tenurial forms (table A9.1) and the weighted average scores of the TPIs. The resulting score sheet is given in table A9.2 in the annex.

tenurial security by the TPIs. It should be noted here that the tenurial forms given in figure 8.4 are not based on the weighted scores of TPIs, but follow the order shown in figure 8.3 and table A8.2. It is evident from this comparison that the individual scores are largely transformed by the weightages assigned to TPIs.

Figure 8.4 Scores assigned to tenurial forms in 0 – 1scale, by indicators.



Land Tenure forms

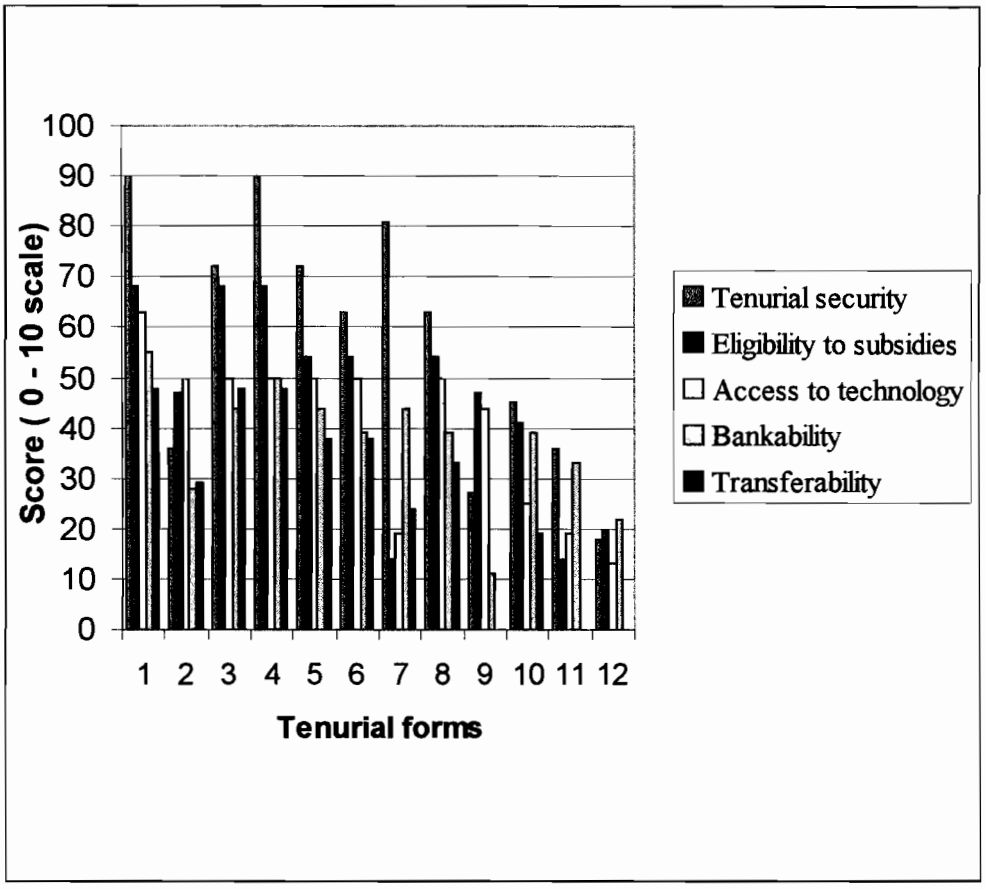
1. Freehold (single ownership)
2. Freehold (multiple ownership)
3. LDO grants (Swarnabhumi)
4. Paraveni lands (settled)
5. LDO grants (Jayabhumi)
6. Long-term lease (30 –50 years) Under state land ordinance
3. LDO permits
8. Paddy lands tenancies under agrarian services law
9. Paraveni Lands (unsettled)
10. Temple lands
11. Annual permits under state ordinance
12. Encroachments on state lands

It is also evident from figure 8.5 that the other tenurial performance indicators do not closely follow the pattern of tenurial security[10]. Figure 8.5 and table A8.3 (page ... in the summary) show that there is a significant variation of scores assigned to various forms of tenure. Furthermore, these variations do exist both within and between groups. It is also observed that within group variations are low, except for some tenurial forms like

[10] The consultations as well as the review of legal and other documents revealed that it is difficult to select TPIs which are mutually exclusive. In order to examine the correlation between TPIs, the scores were transformed using square root transformation and a correlation analysis was conducted. Only two relationships--access to technology and eligibility to subsidies and bankability and tenurial security--reported person correlations of over 0.50 at a significance level of 0.01.

freehold multiple ownership, temple lands, paraveni (inherited), and unsettled. It is noteworthy that these tenurial forms are also ranked low in terms of their aggregate total score. The highest variability observed is between tenure forms and the transferability.

Figure 8.5 Assesing Tenurial forms using tenurial performance indicators, TPI



Land Tenure forms

7.	Freehold (single ownership)	3.	LDO permits
8.	Freehold (multiple ownership)	8.	Paddy lands tenancies under agrarian services law
9.	LDO grants (Swarnabhumi)	9.	Paraveni Lands (unsettled)
10.	Paraveni lands (settled)	10.	Temple lands
11.	LDO grants (Jayabhumi)	11.	Annual permits under state ordinance
12.	Long-term lease (30 –50 years) Under state land ordinance	12.	Encroachments on state lands

Note : Tenurial forms are arranged in the descending order of the scores assigned

As this action research study was primarily based on the review of available legislative documents, experts' knowledge, and experiences and perceptions pertaining to land tenure, some limitations were unavoidable. For example, the tenurial security was defined as legally accepted power or authority that a landholder possesses. At the same

time, transferability in this study was spelt out as the landholder's legal right under a prevailing tenurial form to transfer or dispose his/her land to another person. It is widely accepted that legal land transactions take place in many other countries and, in this context, Sri Lanka is not an exception for such illegal dealings. Under these conditions, it could be confirmed that, other things being equal, a land which does not possess a legally accepted title may be valued at a lower price than the market value of a similar land with a perfect title.

Furthermore, another limitation of this study was that, under the TPI, *access to technologies,* only the government extension services were considered. Similarly under the TPI, *eligibility to subsidies,* only the government sector subsidies to the individual farmer were considered. Subsidies in this study referred only to the government subsidies such as for replanting tea and land conservation in plantation crops, etc., for which only those with legal land rights have access. The other forms of subsidies such as fertilizer subsidy do not relate to the form of tenure and any person can receive it without any discrimination. In the case of irrigation, the state has made large investments to provide water to lands irrespective of tenurial forms. With regard to TPI, *bankability*, only the formal credit systems (both private and state) were taken into account. It is well-known that in rural Sri Lanka, which includes the areas covered by this study, over 90 percent of the farmers are accustomed only to informal credit sources.

In summarized form, the procedures adopted in this study were:

i. Different tenurial forms in the two watersheds were identified and a set of Tenurial Performance Indicators (TPI) were developed based on their relative importance to agricultural development and conservation of natural resources. Values were given in a 0–10 scale.
ii. By assigning a score in a 0–10 scale to TPIs, each tenurial form was evaluated. In the next step, this score (in each cell in the TPIX Tenurial Form Matrix) was multiplied by the TPI value.

Conclusion. Based on the results of this study, it could be easily concluded that, though different land tenurial forms do exist in relation to agricultural production, they should not be classified into two broad categories as state-owned and privately owned, and it may sometimes advocate that negative impacts of land tenure could be solved merely by the removal of state ownership. The results also clearly indicate that the tenurial performance varies significantly among the different forms of private ownership. The difference shown between freehold (single ownership) and paraveni (unsettled) can be quoted as an example. The findings likewise indicate, that the tenurial form, "long-term lease," which is categorized under "state owned" land performs better than most of the privately owned tenurial forms. As such, these provided the premise for SCOR interventions on state-user partnership.

IMPACT OF LAND TENURIAL FORMS ON PRODUCTION

In the previous analyses, it was concluded that different tenurial forms that were identified in the two watersheds significantly differ in relation to tenurial performance indicators (TPI), i.e., sense of security, eligibility to certain government subsidies,[11] access to technology provided by the government extension services, bankability and transferability of land. The twelve tenurial forms varied according to the scores assigned to them based on the above-mentioned TPI criteria and ranged from 306 (for land with perfect freehold title) to 19 (for illegal encroachers in state land). Based on these findings a field study was designed and conducted in the two main watersheds; Huruluwewa and Nilwala. The main objective of this study was to examine relationship between different tenurial forms, seasonal/annual crop yields/production, operational costs of cultivation, and profits. The study covered a sample of farms with two major crops, paddy[12] and tea and two production years. The study did not include relations between landownership pattern and resource conservation or other farmer decisions that involve long cost-recovery periods. As in the previous study, the SCOR action research project addressed this by testing different state-user partnerships and tenurial adjustments and are discussed later in this section.

Selection of Sample and Methodology

A sample comprising 1,623 farmers representing lowland and highland use types of 1993/94 and 1994/95 wet seasons in Huruluwewa and 1,551 farmers representing tea and homestead (with and without tea) land use types in the Nilwala for the calendar years 1994 and 1995, were selected randomly to be included in the study. The selection was based on the data available from the SCOR baseline surveys. As baseline data were not available for Nilwala, additional reconnaissance surveys were conducted for selected areas to complete the sampling procedure. (See figures A_1 and A_2 in annex 2 for sample distribution).

As it was observed in both watersheds, a farmer had several operational holdings/farms/plots. In the Nilwala sample, 582 farmers had been operating on 816 and 735 highland plots in 1994 and 1995, respectively. Likewise in the Huruluwewa sample, 610 farmers operated 787 and 836 lowland and highland plots in 1993/94 and 1994/95 wet seasons, respectively. The tenurial category of a farmer varied with different plots. That means a single farmer operating in different plots belongs to different tenurial form categories. To reduce the influence or interference of this "farmer-related factor" in the study, only a single plot of a specific tenurial form per farmer was taken and included in the study. The sample distribution selected for this study for rice in Huruluwewa and tea in Nilwala are given in tables 8.2 and 8.3, respectively.

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[11] For example, rice fertilizer is available in the open market at a subsidized price and farmers can purchase this input at this price, irrespective of respective tenurial forms. On the other hand, only the legal cultivators have access to various subsidies available for tea cultivation.

[12] Paddy = "Rice (unhusked)". The term "rice" will be used hereafter.

Table 8.2. Distribution of rice farm plots, selected for the analysis of ownership-production relations, classified by ownership patterns, Huruluwewa.

Ownership	1993/1994 Wet	1994/1995 Wet
Freehold	11	17
Paraveni (inherited)	103	110
Swarnabhumi	39	38
Long-term permits	7	10
LDO permits	124	125
Annual permits	12	19
Encroachments	93	102
Total	389	421

Table 8.3. Distribution of tea farm plots, selected for analysis of ownership-production relations, classified by ownership patterns, Nilwala.

Landownership	1994	1995
Clear title	85	84
Paraveni (inherited)	15	14
Swarnabhumi/jayabhumi	38	36
Long-term permits	52	52
LDO permits	48	44
Annual permits	66	59
Encroachments	65	55
Total	369	344

Quantitative and qualitative data pertaining to tenurial forms, water availability for production, labor allocated to agricultural production (inclusive of family labor) crop production levels for the four seasons (1994/95 wet, 1994 dry, 1993/94 wet, and 1993 dry) were gathered by a survey conducted on the sample. A detailed questionnaire was used to collect all the relevant data/information. The analysis of data related to the impact of land tenure forms on production decisions in rice farming was limited to two seasons (1993/94 wet and 1994/95 wet) in the Huruluwewa watershed; for tea it was limited to 1994 and 1995 calendar years in the Nilwala (wet zone) watershed as tea is a perennial crop.

In productivity analysis, the yields were taken in kg/ha/season for rice and green tea leaves/ha/year for tea. In both sample watersheds, operational costs of cultivation and profits from production were analyzed in terms of different tenurial forms. The analyses were extended to investigate any relationship between production-related indicators, operational patterns, and individual farm sizes.

Testing of a Hypothesis

As indicated in the concluding remarks of the previous section of this chapter, it is assumed or highly claimed that the productivity and natural resources conservation will be enhanced if the "state ownership" is completely removed. Accordingly, based on the above perception a hypothesis was formulated for testing in the study. The hypothesis that developed is "Farmer behavior related to sustainable agricultural production and land and water conservation depends on the degree of tenurial security which would in turn depend on the ownership to land."

The above hypothesis could be illustrated as follows :

Perfect private land title
↓
Security of ownership
↓
Adoption of appropriate production and conservation measures
↓
Attitude and behavioral changes
↓
Improved production and conservation

The following was developed as an alternative hypothesis: in the context of the Sri Lankan culture, "sense of security in ownership" (not necessarily the perfect land tittle ownership) is a sufficient condition for motivating uses in the adoption of appropriate production and conservation measures in natural resources management. This is illustrated below :

Sense of ownership
↓
Sense of security
↓
Attribute and behavioral changes
↓
Adoption of appropriate and conservation measures
↓
Improved productivity and conservation.

This study was limited to the seasonal/annual production-related decisions of the farmer respondents of the two watersheds and were based on the data related to cost of production; crop yields, and profits, with regard to rice and tea.

Analysis of Results

Seven major tenurial forms of landownerships were used in this analysis. In contrast, the previous study included twelve tennurial forms. It was assumed that the selected seven tenurial forms vary from one another with regard to tenurial performance indicators (TPIs) identified, defined, and described under the previous study. These included sense of security, bankability or access to credit, transferability (ability to sell or legally dispose) and access to technology; in addition to this ownership or tenurial forms of landholdings, operational pattern of farm plots were also included, defined, and examined in the analysis.

Tenurial Forms and Farm Productivity

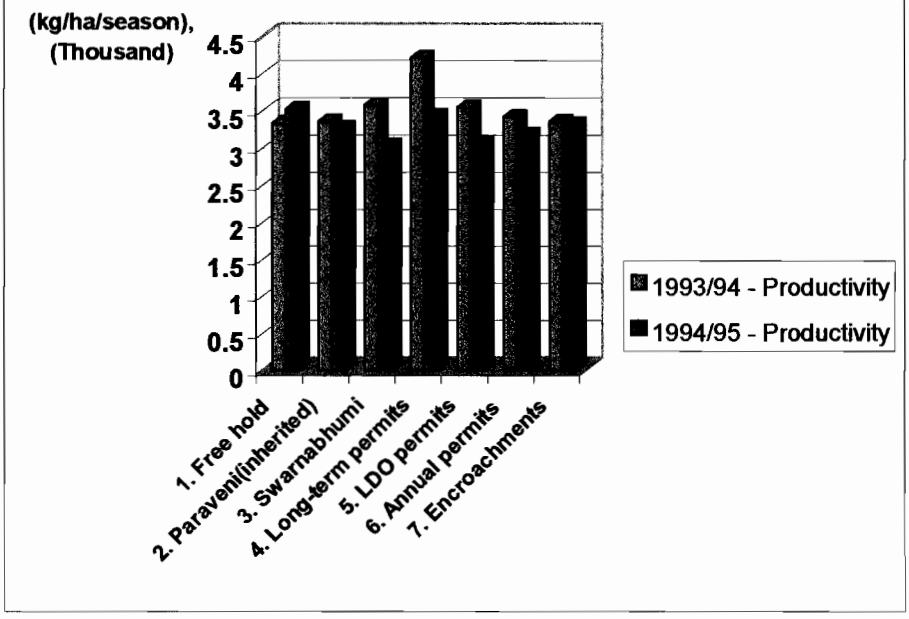
Comprehensive analyses were done using descriptive statistical tools and correlation analyses to examine relationships between different tenurial forms considered and land productivity. For rice, the productivity was measured in terms of kilograms of rice per hectare per season during the two wet season in the Huruluwewa sample. The productivity measurement used for tea in the Nilwala sample was green tea leaves in kilograms per hectare per year.

For Huruluwewa and Nilwala watersheds, the mean levels of productivity under different tenurial forms and the results of Analysis of Variance (ANOVA) are given in figures 8.6 and 8.7.

The analyses clearly revealed that there is no significant relationship between the tenurial forms and their productivity levels, for both Huruluwewa (rice) and Nilwala (tea). In the above figures 8.6 and 8.7, the tenurial forms are arranged in descending order of land security, where lands with clear titles are the best secured, and the encroachments are at the other extreme as they do not have any form of legal recognition. It was also evident that the productivity does not follow the same order as security.

Based on the results of ANOVA the following tested hypothesis was rejected :
"Farmer behaviour related to sustainable production and land and water conservation depends on the degree of tenurial security which would, in turn depend on the ownership to land.

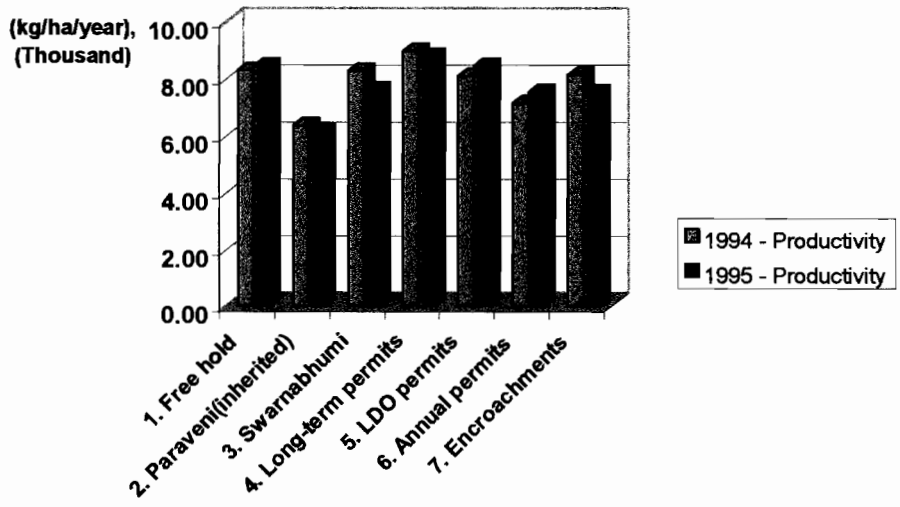
Figure 8.6 -Relationship between farm productivity and ownership pattern, Huruluwewa



Results of Analysis of Variance
1994 – (F = 0.98, P = 0.44)
1995 – (F = 0.77, P = 0.59)

CATEGORY	1	2	3	4	5	6	7
1993/94 -Productivity	3.32	3.34	3.57	4.20	3.53	3.40	3.34
1994/95 - Productivity	3.51	3.25	3.02	3.42	3.05	3.17	3.31
Sample – 1993/94	11	103	39	7	124	12	93
Sample – 1994/95	17	110	38	10	125	19	102

Figure 8.7 -Relationship between farm productivity and ownership pattern, Nilwala



Results of Analysis of Variance
1994 – (F = 1.08, P = 0.38)
1995 – (F = 1.0, P = 0.43)

CATEGORY	1	2	3	4	5	6	7
1994 -Productivity	8.28	6.34	8.26	8.95	8.08	7.13	8.12
1995 – Productivity	8.42	6.15	7.60	8.77	8.42	7.52	7.51
Sample – 1994	85	15	38	52	48	66	65
Sample – 1995	84	14	36	52	44	59	55

Similar results have been observed in previous studies too, which have been undertaken in various regions of the country including lands under minor and major irrigation tank-based systems . According to Wanigarathne (1986), in the Gal Oya project, "the rice yields under encroachments/spontaneous occupation" the ownership systems of high uncertainity did not differ significantly from those in lands owned by farmers." Schikale (1985) affirmed that perfect legal ownership or pre-hold of land is not a necessary condition for full-fledged entrepreneurship for developing efficient production systems.

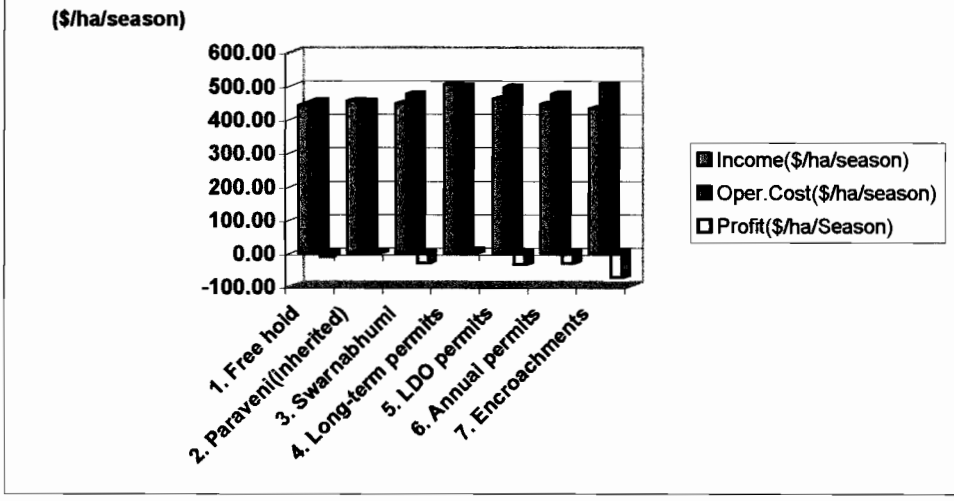
In landownership history of Sri Lanka, some of the important landmarks were the amendments made to the Land Development Ordinance 1935 and subsequent legislations, particularly the Paddy Lands Acts (1953 and1958), the Land Development Ordinance of 1969 and the Land Development Ordinance No.27 of 1981. The Paddy Lands Act, in general, provided a "sense" of security of ownership to farmers who had received land

under the act. The Land Development Ordinance of 1969 also provided greater autonomy in the disposal of the allotments, increasing their transferability value. In addition, the Act made some concessions to the occupant and allowed for mortgaging the land to lending institutions (Ganewatte 1995). The recent development of the *Swarnabhumi* and *Jayabhumi* grant systems further provided better ownership conditions related to transferability and the permit- or lease-holders under these systems are becoming land owners. The changes in the state land policy and the past experience in regularizing encroachments and tenancies, farmers have the ability to develop a sense of ownership.

Tenurial Forms and Operational Costs of Agricultural Production

Information on the operational cost of production for lowland rice were collected from all the respondents from the sample for the same seasons in the Huruluwewa watershed. The costs of production included the cost of inputs, i.e., seed, fertilizer, agro-chemicals, labor, and farm power, etc. Two methods were adopted in computing total operational cost per unit land. In one computation, the family labor incurred for production activities was excluded and in the other, current market wage rate was assigned for the family labor that was utilized for production. The computation was done on a per hectare basis and was classified by different tenurial forms while the analysis of variance was conducted as in the earlier case to find out whether any significant variation exists across different tenurial forms in relation to farmers' operational costs of production in rice. The results obtained for the two cultivation seasons are presented in figures 8.8 – 8.11.

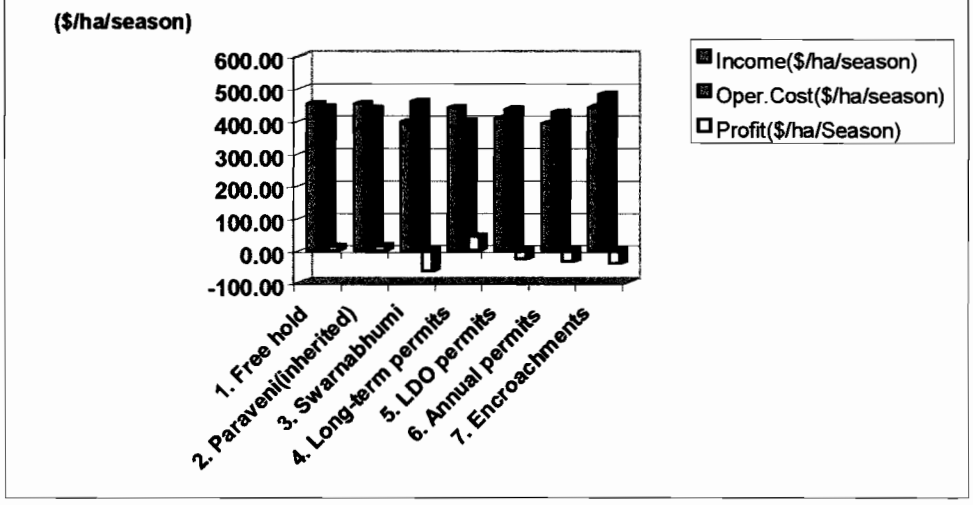
Figure 8.8 -Impact of ownership pattern on farm income, operational costs and profits, Huruluwewa 1993/94



Results of Analysis of Variance
Income – (F = 0.48, P = 0.82)
Oper. Cost – (F = 1.09, P = 0.37)
Profit – (F = 1.13, P = 0.35)

CATEGORY	1	2	3	4	5	6	7
Income (US$/ha/season)	440	453	445	502	459	443	430
Oper.Cost (US$/ha/season)	452	451	474	496	494	474	504
Profit (US$/ha/season)	-12	3	-30	7	-35	-30	-73
Sample	11	103	39	7	124	12	93

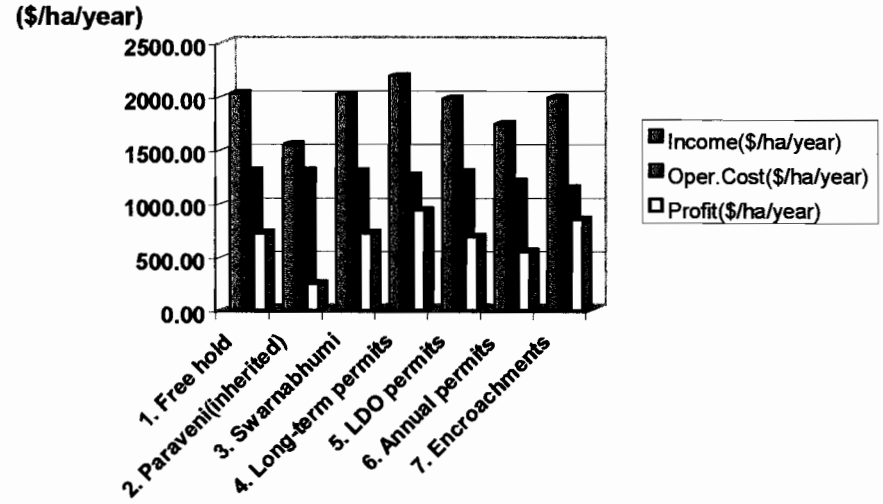
Figure 8.9 -Impact of ownership pattern on farm income, operational costs and profits, Huruluwewa 1994/95



Results of Analysis of Variance
Income – (F = 1.35, P = 0.23)
Oper. Cost – (F = 1.30, P = 0.25)
Profit – (F = 1.33, P = 0.24)

CATEGORY	1	2	3	4	5	6	7
Income (US$/ha/season)	451	450	395	439	406	390	440
Oper.Cost (US$/ha/season)	440	437	459	397	434	425	480
Profit (US$/ha/season)	11	13	-63	43	-27	-35	-40
Sample	17	110	38	10	125	19	102

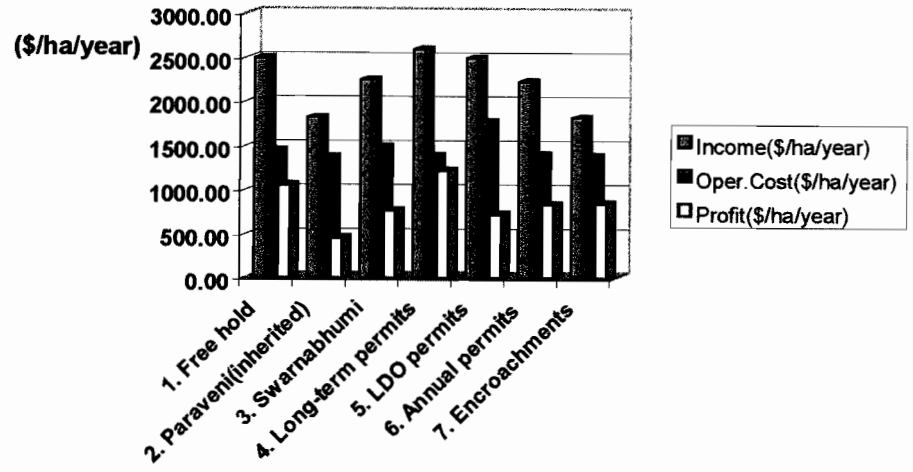
Figure 8.10 -Impact of ownership pattern on farm income, operational costs and profits, Nilwala, 1994



Results of Analysis of Variance
Income – (F = 1.08, P = 0.38)
Oper. Cost – (F = 1.58, P = 0.15)
Profit – (F = 1.26, P = 0.27)

CATEGORY	1	2	3	4	5	6	7
Income (US$/ha/year)	2020	1546	2013	2183	1971	1739	1981
Oper.Cost (US$/ha/year)	1301	1300	1294	1252	1291	1197	1136
Profit (US$/ha/year)	719	246	720	931	680	542	844
Sample	85	15	38	52	48	66	65

Figure 8.11 - Impact of ownership pattern on farm income, operational costs and profits, Nilwala, 1995



Results of Analysis of Variance
Income – (F = 1.08, P = 0.38)
Oper. Cost – (F = 1.58, P = 0.15)
Profit – (F = 1.26, P = 0.27)

CATEGORY	1	2	3	4	5	6	7
Income (US$/ha/year)	2487	1815	2243	2589	2485	2221	1815
Oper.Cost (US$/ha/year)	1436	1363	1481	1377	1769	1392	1379
Profit (US$/ha/year)	1051	452	762	1212	716	830	839
Sample	84	14	36	52	44	59	55

The same exercise was done with the sample in the Nilwala watershed for the calendar years 1994 and 1995, where operational costs per unit area were computed for tea. Medium- and long-term investment costs were not considered when computing the operational costs per year. The results obtained from this exercise are also given in figures 8.8 – 8.11.

Results and Discussion

The results obtained from the analysis of Huruluwewa watershed are indicative that the operational costs of cultivation of rice do not vary with ownership/tenurial forms. Similarly in Nilwala too, it was not significant at the 0.01 level.[13] It indicates that the

[13] However, the differences in operational costs between different ownership categories are significant at the 0 .02 level, for the tea sample in 1995 (figure 9.6). This is mainly due to higher costs of lands under LDO permits. This needs further investigation. Though not statistically significant at the .01 level, the

farmers have perceived a sense of ownership, and does not prevent them in investing in their lands at least on the short run to benefit from their investments. Likewise, it could be concluded that ownership or tenurial form does not affect farmer decisions and expenditure patterns and the two are independent at least in the short run. However, long-term investment decisions which include conservation and rehabilitation measures of degraded soil could be influenced by the legal security attached to the landholdings.

Tenurial Forms and Farm Profiles

In the computation of farm profit per unit land, the figures used under ownership pattern and farm production were used for both Huruluwewa and Nilwala watersheds. Results obtained are presented in figures 8.8-8.11.[14] The correlations between tenurial forms and farm projects and the results of analysis of variance (ANOVA) are also presented in the above figures. It is evident from the results that farm profits per unit of land do not vary with the different tenurial forms; these were arranged according to their legal rights as indicated earlier in this study.

Operational Tenure

"Operational tenure" is defined as the farmers' holding rights to cultivate the land on their own or to transfer the land for temporary cultivation to another person upon an agreed payment of a price, or rent, or free of charge to a family member under different tenure forms. The last mentioned is usually a crop-sharing arrangement. In this study, operational tenure was classified into two categories: self-operators and share operators. The sample plots in both Huruluwewa and Nilwala watersheds were classified by operational tenure pattern in relation to different tenure forms and are presented in tables 8.4 and 8.5, respectively.

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operational cost of 1994 too is apparently "decreasing" toward "less-secured" tenurial categories. This may be because farm sizes of these tenurial categories are low (tables A5 and A6 in appendix) and operational cost is increasing with decreasing farm size (refer figure 9.13). However, this too needs further investigations. In general, as far as the relationship between tenurial type and operational costs are concerened, a clear link is not seen.

[14] It should be noted that in certain cases there is a loss (negative net returns). This is not uncommon for some farmers in the dry zone of Sri Lanka in difficult or drought conditions. If market wage rate is assigned to family labor input, net returns may indicate a negative value. If the market wage rate is not assigned to family labor input, or if much lower ("opportunity cost") is assigned this may convert into positive net returns. However, with the recent price hike for low-grown tea, the tea farmers in Nilwala are enjoying higher profit margins.

Table 8.4. Ownership pattens of sample rice farms classified by operational pattern, Huruluwewa, 1993/94 and 1994/95 wet seasons.

Landownership	Operational patterns					
	Self-operators		Sharecroppers		Total	
	1993/94	1994/95	1993/94	1994/95	1993/94	1994/95
Freehold	9	16	2	1	11	17
Paraveni (Inherited)	94	101	9	9	103	110
Swarnabhumi/jayabhumi	36	34	3	4	39	38
Long-term permits	7	9	0	1	7	10
LDO permits	97	96	27	29	124	125
Annual permits	10	16	2	3	12	19
Encroachments	90	96	3	6	93	102
Total	343	368	46	53	389	421

Table 8.5. Ownership pattern of sample tea farms classified by operational pattern, Nilwala, 1994 and 1995.

Landownership	Operational patterns					
	Owner operators		Sharecroppers		Total	
	1994	1995	1994	1995	1994	1995
Freehold	85	84	0	0	85	84
Paraveni (Inherited)	15	14	0	0	15	14
Swarnabhumi/ jayabhumi	38	36	0	0	38	36
Long-term permits	52	52	0	0	52	52
LDO permits	48	44	0	0	48	44
Annual permits	66	59	0	0	66	59
Encroachments	65	55	0	0	65	55
Total	369	344	0	0	369	344

Impact of Operational Pattern on Farm Productivity, Operational Costs, and Profits

The relationships using the indicators of farm productivity and operational costs of sample farms in the Huruluwewa for the two crop seasons (1993/94 wet and 1994/95 wet) are given in figures 8.12 and 8.13, respectively. Statistical relationships obtained by the analysis of variance (ANOVA) are also given in these figures. As all the sample respondents in the Nilwala watershed (in both 1994 and 1995) fell into the "self-operator" category, the above exercise was not attempted for the wet zone watershed of Nilwala.

In classifying a farmer as a "self-operator" in this study, "the person who is holding the land and operating or cultivating it" was considered as having the legal status of the land while the person who cultivates the land under an agreed upon rent/share is is considered as a "sharecropper." In the sample of the Huruluwewa watershed, 14 percent

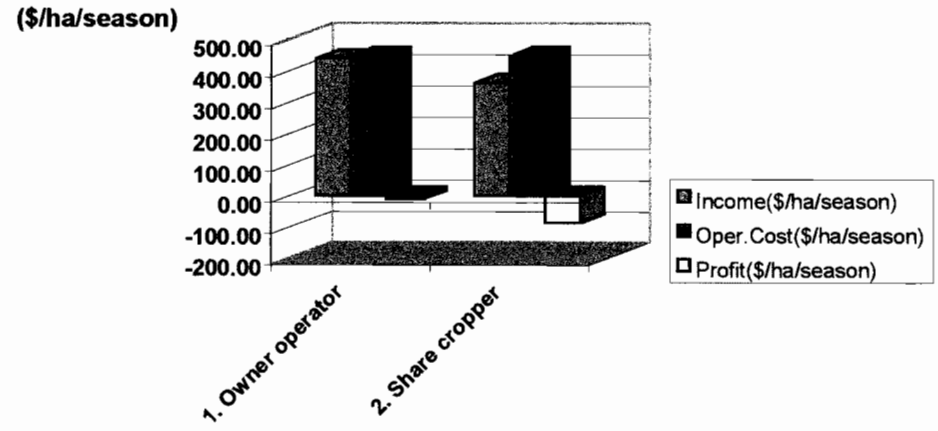
of the farmers were identified as sharecroppers. The statistical analysis of data of the Huruluwewa sample showed that the farm income, operational cost per unit land, as well as farm profits per unit land were higher for "self-operators" than for the sharecroppers.[15] The difference in income for the 1993/94 sample was significant at the 0.05 level and for the 1994/95 sample, the differences in farm income as well as the farm profits of a unit of land was signifivcant at the 0.01 level. The results of the analysis of variance (ANOVA) are given in figures 8.12 and 8.13.

Results of Analysis of Variance
Income – (F = 4.16, P = 0.04)
Oper. Cost – (F = 0.43, P = 0.52)
Profit – (F = 0.91, P = 0.36)

CATEGORY	**1**	**2**
Income (US$/ha/season)	455	406
Oper.Cost (US$/ha/season)	483	466
Profit (US$/ha/season)	-29	-60
Sample	343	46

[15] However, for the 1993/94 sample, the difference in income is significant at the 0.05 level. And, for the 1994/95 sample, the differences in farm income as well as farm profit are significant at the 0.01 level. Results of ANOVA are indicated in the respective figures.

Figure 8.13 - Impact of operational pattern on farm income, operational costs and profits, Huruluwewa, 1994/95



Results of Analysis of Variance
Income – (F = 10.68, P = 0.002)
Oper. Cost – (F = 0.001, P = 0.98)
Profit – (F = 7.13, P = 0.008)

CATEGORY	1	2
Income (US$/ha/season)	437	360
Oper.Cost (US$/ha/season)	447	446
Profit (US$/ha/season)	-11	-86
Sample	368	53

Impact of Farm Size on Farm Productivity, Operational Costs per Unit of Land, and Profitability

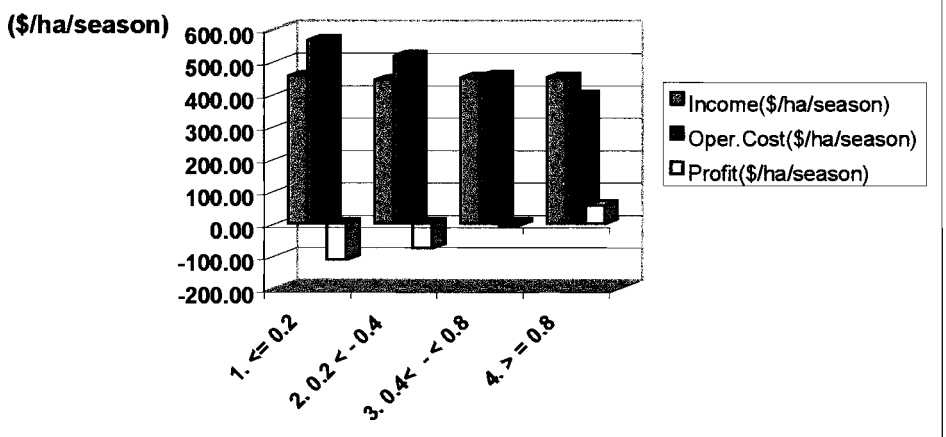
This study has not attempted any detailed analysis of relationships between farm size and productivity and related indicators, and was specifically aimed to examine whether any linear relationship exists between farm size and the three production-related indicators namely, the productivity/income per unit of land, operational costs, and profits. At first, four categories of farm sizes were identified for the two watersheds and are given below.

	Huruluwewa	Nilwala
I.	< or = 0.2 hectare,	< or = 0.1 hectare
II.	0.2 < - 0.4 hectare	0.1 < - 0.2 hectare
III.	0.4 < - <0.8 hectare, and	0.2 < - 0.4 hectare
IV.	> or = 0.8 hectare	> 0.4 hectare

The sample farms were then categorized by ownership pattern and farm size, and the details are given in tables A8.3 and A8.4 in the annex.

The results of analyses of the impact of farm size on farm incomes, operational costs, and profit per unit land area for the sample farms in the Huruluwewa and Nilwala watersheds are presented in figures 8.1.4 – 8.1.7.

Figure 8.14 - Impact of farm size on farm income, operational costs and profits, Huruluwewa, 1993/94



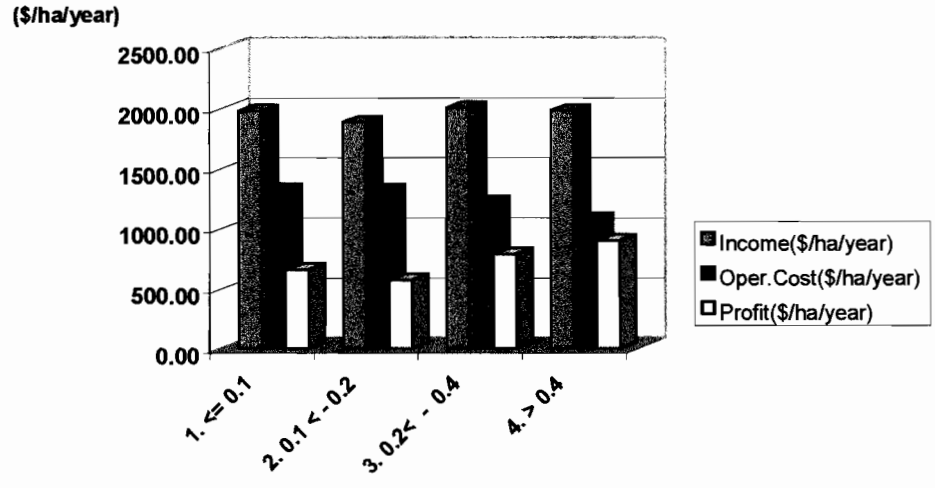
Results of Analysis of Variance
Income – (F = 0.13, P = 0.94)
Oper. Cost – (F = 23.35, P = 0.0)
Profit – (F = 13.56, P = 0.0)

CATEGORY	1	2	3	4
Income (US$/ha/season)	455	443	450	451
Oper.Cost (US$/ha/season)	565	517	456	395
Profit (US$/ha/season)	-110	-75	-6	56
Sample	79	133	61	116

Results of Analysis of Variance
Income – (F = 1.67, P = 0.17)
Oper. Cost – (F = 20.8, P = 0.0)
Profit – (F = 6.45, P = 0.001)

CATEGORY	1	2	3	4
Income (US$/ha/season)	458	431	409	413
Oper.Cost (US$/ha/season)	527	475	432	377
Profit (US$/ha/season)	-69	-44	-23	36
Sample	83	135	70	133

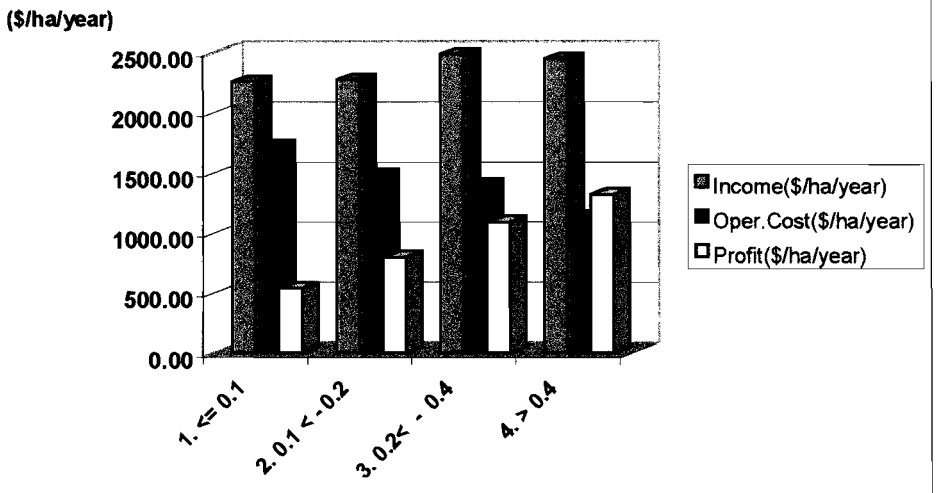
Figure 8.16 - Impact of farm size on farm income, operational costs and profits, Nilwala, 1994



Results of Analysis of Variance
Income – (F = 0.2, P = 0.90)
Oper. Cost – (F = 6.20, P = 0.001)
Profit – (F = 1.42, P = 0.24)

CATEGORY	1	2	3	4
Income (US$/ha/season)	1974	1883	2001	1978
Oper.Cost (US$/ha/season)	1318	1313	1217	1081
Profit (US$/ha/season)	656	570	784	897
Sample	92	97	118	62

Figure 8.17 - Impact of farm size on farm income, operational costs and profits, Nilwala, 1995



Results of Analysis of Variance
Income – (F = 0.64, P = 0.59)
Oper. Cost – (F = 13.8, P = 0.0)
Profit – (F = 5.1, P = 0.002)

CATEGORY	1	2	3	4
Income (US$/ha/season)	2254	2269	2483	2445
Oper.Cost (US$/ha/season)	1720	1477	1398	1129
Profit (US$/ha/season)	534	792	1085	1315
Sample	93	86	102	63

The analyses of the results indicated that there is no significant relationship bb etween farm size and farm income expressed in terms of US$ per hectare per season for rice and US$ per hectare per year for tea. The relationship between farm size and cost of operation is highly significant and negatively correlated, showing a trend to decreasing cost of production with increasing farm size. The results also indicates the existence of a tendency for farm profits per unit land to increase with farm size, and the relationship is significant at the 0.01 level and the only exception was the 1994 sample in the Nilwala watershed for tea.

REMARKS

As a consequence of subdivision and fragmentation of agricultural holdings, proliferation of microholding would continue. As such, the SCOR Project designed a participatory action research as one of its components and implemented an experiment on land consolidation in selected rice growing areas. Under the Land Development Ordinance of 1935, regulations have been included to prevent/restrict the subdivision of the land given to people on short- on long-term bases; similar restrictions are also found on other forms of state lands given on lease. However, in the presence of these restrictions and regulations, illegal subdivisions, and land transactions have become a common feature in such areas.

A study conducted in four irrigation systems in Polonnaruwa district concluded that subdivision of land is a serious problem affecting the well-being of the family, water distribution within field channels, and agricultural productivity. On average, over 60 percent of the allotments in the study areas were "illegally" subdivided. More than half of each of the farms included in the study was found to be less than 0.4 hectare in size (Fowler and Kilkelly 1988). In irrigated agricultural settlements, it has been observed that land fragmentation was concentrated at the head of the canal system where water availability was high (Wijayaratna 1982, Widanapathirana 1986).

Summary and Conclusions

Land (and water) tenurial security is considered to be a major factor that impacts on the conservation and productive use of land and water resources by the farmers. Many tenurial forms which have evolved (both inherited and introduced over time) are in operation in Sri Lankan watersheds. The tenurial system of land directly applies to the right to use water. Water which is a natural endowment is directly related to the land, and hence ownership or right to occupy and cultivate the land accompany the right to use water on the land or diverted into the land.

The SCOR Project conducted research to identify and characterize different forms of natural resources ownership patterns in watersheds and to *evaluate* their *impact on productive use* and *conservation* of watershed natural resources. SCOR action explored the possibility of improving watershed management (through integrating production and conservation concerns) by *adjusting usufructuary rights* and *state-user partnerships*. As a part of its action-research process, SCOR and action-research process, assessed the relationship between tenurial forms and productivity. The study was designed to test the following hypothesis: "farmer behavior related to farm production depends on the degree of tenurial security which, in turn, would depend on the ownership of land."

The major tenurial forms prevalent in the two SCOR watersheds were identified, characterized, and evaluated through a methodological exercise to provide the basis for this study.

The following 12 land tenurial forms were identified as being the major ones operating in the two watersheds:

(a) State lands

1. Permits issued under the land Development Ordinance(LDO)
2. Swarnabhumi Grants under the LDO
3. Jayabhumi Grants under the LDO
4. Annual Permits under the State lands Ordinance
5. Long-term leases (99 Years) under the State Lands Ordinance
6. Encroachments on state land

(b) Private lands:

7. Lands inherited from ancestors (paraveni lands) where the title is settled
8. Lands inherited from ancestors (paraveni lands) where the title is unsettled
9. Freehold (single ownership)
10. Freehold (multiple ownership)
11. Paddy olands tenancies under the Agrarian Services Act
12. Temple lands

It was assumed that these tenurial forms vary significantly from one another in relation to a number of factors, which can be used as Tenurial Performance Indicators, TPI, to characterize and evaluate the varied tenurial forms, in the order of their important to agricultural development and conservation of natural resources.

Three methods have been used to gather information and to evaluate tenurial forms:

a. a review of legislature and procedures related to natural resources tenure, usufruct rights, access to credit, subsidies, and technology by users with varied tenurial rights

b. a mailed questionnaire survey

c. two consultation sessions with experts (agricultural and land policy makers and administrators, bankers, researchers, etc.)

A number of *tenurial performance indicators* such as bankability, transferability, sense of security, constraints to plan and develop projects, resource availability, eligibility to subsidies, access to technology, location of land, etc., were considered. As some of these were found to be significantly related to one another it was difficult to isolate a set of tenurial performance indicators that are mutually exclusive. Considering this factor, only five indicators were selected and defined, and evaluated in terms of their importance to agricultural development and conservation of natural resources. The five indicators were ranked and the weighted scores are given as follows :

Tenurial performance Indicator	Score
1. Tenurial security	9.0
2. Eligibility to subsidies	6.8
3. Access to technology	6.3
4. Bankability	5.5
5. Transferability	4.8

The tenurial forms were then assessed using the TPIs. Based on the final results, the different tenurial forms were ranked in the order of their performance in relation to agricultural development and conservation of natural resources. For this, an average score has been computed for each tenurial form based on the values of TPIs for that particular tenurial form. Summary results are shown in table 8.6 and figure 8.18.

Table 8.6. Assessing tenurial forms using tenurial performance indicators, TPIs.

Indicator (TP1)	Importance of (TP1)	Max attainable**	Weighted total scores assigned to tenurial categories*** (arranged according to ranking)											
	Weighted average*		1	2	3	4	5	6	7	8	9	10	11	12
1 Tenurial security	9	90	90	72	72	63	63	36	81	45	27	36	18	0
2 Eligibility to subsidies	6.8	68	68	68	54	54	54	47	14	41	47	14	20	7
3 Access to technology	6.3	63	50	50	50	50	50	50	19	25	44	19	13	6
4 Bankability	5.5	55	50	44	44	39	39	28	44	39	11	33	22	6
5 Transferability	4.8	48	48	48	38	38	33	29	24	19	0	0	0	0
Total		324	306	282	258	244	239	190	182	169	129	102	73	19

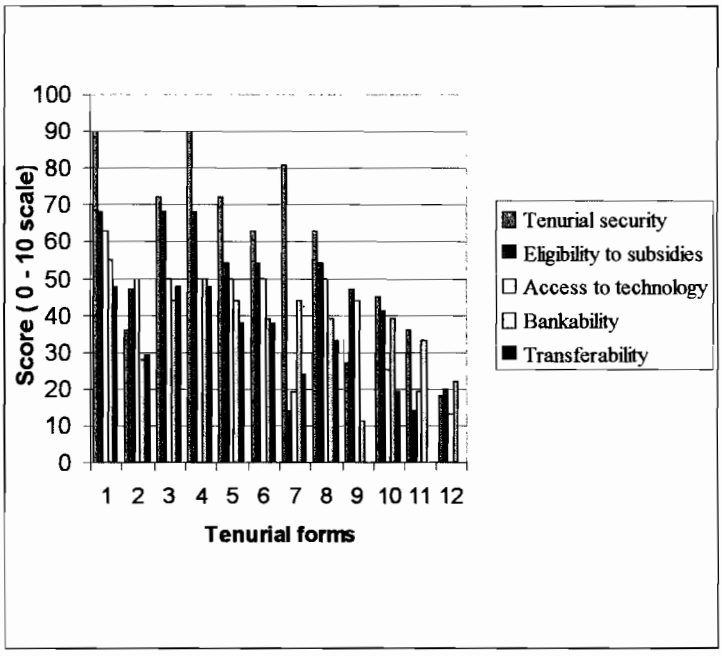
Note: * Importance of indicators was evaluated against their relevance to agricultural development and conservation of natural resources. Values are in a scale of 0 -10.

** Each tenurial form was evaluated first by assigning a score in a 0-10 scale. Next, this score (in each cell) was multiplied by TPI value (weighted average)

*** **Land Tenure Forms**.

1. Freehold (single ownership)
2. *Paraveni* lands (settled)
3. LDO grants (*swarnabhumi)*
4. LDO grants (*jayabhumi*)
5. Long-term lease (30-50 years) under State Lands Ordinance
6. Rice lands tenancies under Agrarian Service Law
7. Freehold (multiple ownership)
8. LDO Permits
9. Temple lands
10. *Paraveni* lands (unsettled)
11. Annual permits under State Lands Ordinance
12. Encroachments

Figure 8.18. Assessing natural resources tenurial forms using tenurial performance indicators.



The study revealed that the land tenurial forms differed from one another on the basis of scores assigned to them using the TPIs. As shown in figure 8.18 these vary from 94.4 percent of maximum attainable to 5.9 percent, with tenurial forms, perfect freehold title, and the encroachments are at the two extremes.

Tenurial security within the limits of this study has been viewed only from the point of view of their relationship to formal aspects of applicability of the tenurial performance indicators identified. However, there exist informal systems and arrangements in relations to all these indicators. For instance, tenurial security and transferability could be ensured through legal acceptance. However, illegal land transactions take place. There are also informal credit sources resorted to by over 90 percent of the farmers in rural areas of Sri Lanka. Access to technology need not necessarily refer only to government extension services, and subsidies are available to farmers through nongovernmental sources. These informal systems and arrangements could impact on agricultural production and conservation of resources, irrespective of the particular tenurial form under which a person holds the land. The TPIs developed by the study can be used to characterize and measure the behavior of tenurial forms in response to these informal arrangements.

Only seven types of landownership were used in the analysis: (1) freehold title, (2) *paraveni* (land inherited from ancestors), (3)*swarnabhumi/jayabhumi* (government) grants, (4) long-term lease by the government, (5) permits issued by the government

under the Land Development Ordinance, (6) annual permits (for occupation and cultivation) by the government, and (7) encroachments or illegal occupation.

Data collected from about 700 farm in the two samples of SCOR pilot watersheds (Huruluwewa and Nilwala) in relation to farm inputs, costs of production, farm profits and farm size over a 2-year period were used for the analysis. These were analyzed in relation to tenurial forms and operational patterns. Four crop seasons of rice in Huruluwewa and 2 years of tea cultivation in Nilwala were included in the analysis. The sample comprised 389 and 421 farms in the wet seasons of 93/94 and 94/95 for rice and 369 and 344 farms for 1994 and 1996 for tea. The results of analysis on the impact of landownership pattern on farm productivity/income, operational costs, and profits are summarized below:

- There is no statistically significant relationship between the ownership pattern of farms and the land productivity levels, in the two watersheds.
- Operational costs of cultivation do not vary with ownership pattern of natural resources.
- Similarly, farm profits, too do not vary significantly with resources land tenure patterns.

i. On this basis, the hypothesis of "farmer behavior related to agricultural production depends on the degree of tenurial security, which would in turn depend on the private ownership, is not accepted. In other words, the study revealed that there is no significant relationship between landownership (and associated rights to water resources) pattern and productivity of farms, and the hypothesis formulated on the basis that "*a perfect private title is a prerequisite for increasing productivity*" is not accepted. This can be explained and interpreted as follows :

"*Sense of security in ownership*" (and not necessarily the legally accepted perfect private title) is a *sufficient condition* for motivating farmers in the adoption of appropriate production and conservation measures in natural resources management. This was suggested as an alternative hypothesis (refer section on "*testing hypotheses*").

ii. As concluded by the study, short-term cultivation decisions and expenditure patterns of farmers are independent of the ownership pattern. Hence, a significant relationship between farm productivity and ownership pattern may not exist. However, longer-term decisions related to production, including natural resources conservation measures, may be influenced by the legal security associated with farmholdings.

iii. As proposed in Section I of the study, relevance of tenurial forms to production (and resources conservation) can be evaluated by using selected Tenurial Performance Indicators: tenurial security, bankability, transferability, access to technology and eligibility for subsidies. In practice, sometimes lack of perfect title to land does not

prevent farmers from access to credit, transferability, access to technology or eligibility for subsidies. For example, most credit transactions in the rural farm sector do not involve (state or private) banks, certain subsidies, such as the one for major fertilizer types, are not linked with land (and water) rights, illegal land transactions are a common phenomenon, and access to many technologies may not depend on land (and water) rights. Moreover, in addition to prescribed rules, certain qualitative considerations such as the different perceptions and adjustments by land administrators, and the discretion of government agencies, and judgment by bank management (in granting loans to farmers with no legal rights to "their lands") etc., are important in land or production-related decisions. Hence, farm productivity and natural resources tenurial forms may not be significantly linked to one another.

iv. Certain "*illegal cultivators*" tend to adopt more appropriate production methods (and take longer-term cultivation/conservation decisions such as planting trees) because they believe they could make a more secure claim to the land.

However, as stated earlier, an analysis of *direct relationships between land tenure and resource conservation* or farmer decisions that involve long cost-recovery periods was not attempted. It was assumed that it is too early to conduct a quantitative analysis of SCOR's experiences with different models of sharing control of natural resources. SCOR Project, in an action research mode, tested new and innovative forms of tenure and state-user partnerships that would promote a sense of security leading to improved production and conservation of natural resources. In a watershed context, these SCOR interventions were aimed at integrating natural resources conservation concerns and production goals. A few selected interventions are described in the next section.

INTERVENTIONS ON NATURAL RESOURCES TENURIAL ARRANGEMENTS

1. State-User Agreements for Long-Term Usufructuary Rights

In the two watersheds where SCOR was being implemented, there were considerable extents of lands reserved by the state for purposes such as:

- Reservations of natural streams and irrigation canals and reservoirs.
- Forestlands under Divisional Secretaries.
- State forests under the Forest Department.

As stated earlier, population pressure, landlessness, inadequate employment opportunities outside agriculture and the prospects for making a living out of the

exploitation of these reserved land have led to widespread encroachment of these lands by various individuals from the adjoining areas and even from outside. In certain areas, the latter group included, not only poor families, but also commercial exploiters of forest. The preventive measures taken by the government, through the enforcement of existing land laws, have proved to be ineffective.

The SCOR strategy was to intervene effectively to arrest the neglect and degradation of the land by adopting measures to combine conservation and profits to users, mainly to "small farmer encroachers."[16] Accordingly, SCOR interventions have been successfully implemented in a number of sample sub-watersheds, working within the existing limits of government land laws. The total extent of land targeted to be brought under such pilot activities (for testing and demonstration purposes) was 500 hectares. However, by the end of the project, in the Huruluwewa watershed alone, over 2,000 farm families obtained regular land titles for their "ecroachments." [17] This process is described in the next section and an account of the longer-term usufructuary agreements, between the government and the users, is presented in this section.

To overcome the constraints to motivating the people to continue to adopt the land use practices promoted by the project and to make the tenurial relationship with the state more acceptable from the point of the governments' objective of reservig the land for protection and other purposes, SCOR proposed to the government a set of changes in the current land laws and regulations as follows:[18]

- Specify and incorporate in lease agreements an appropriate land use pattern whenever the state wishes to give out state land to individuals on lease, or to regularize any current encroachments; such specification should be incorporated in the existing lease agreements, before considering any extension of the lease period.

  The present system with regard to the utilization of the above categories of land is that they are leased out to individuals for cultivation of temporary crops under annual permits. There is no regulation of the type of crops that should be grown that would minimize soil disturbance. SCOR considered that even though there are no accurate land use and evaluation plans yet available for different areas, it would be quite possible to determine a basic land use plan that would take care of the general principles of conservation and desirable land use practices appropriate to a given area.

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[16] It is believed that the organized group action by small farmers would also be helpful in protecting the natural resource base from big-time exploiters such as illegal loggers.

[17] On 27 September 1998 the author was invited to a ceremony by the farmer organizations of Huruluwewa, where over 2000 titles have been granted to the "encroachers" by the local Government authorities.

[18] These proposals have been prepared originally by the author jointly with Paul Rajasekera, SCOR officer dealing with state-user partnerships. Subsequently, proposals have been submitted to a committee convened by Rajasekera and were adjusted slightly.

ANNEX 1

CHARACTERIZATION OF LAND TENURIAL FORMS

LDO Permits

LDO permits are a form of tenure introduced under the Land Development Ordinance of 1935, which was a landmark in the modern history of land tenure in Sri Lanka. The main emphasis in the ordinance was to introduce a methodical distribution of state lands among the landless peasants with a view to creating a peasant proprietary system. The target group was the rural landless peasants whose ancestral and community-owned lands were taken away from them under the Crown Lands Encroachment Ordinance of 1840 and the Waste Lands Ordinance of 1897 *(see note 1 in annex 1).* The LDO permits are issued under Section 19(2) of the Land Development Ordinance of 1935.

This form of tenure was designed to pass a restricted title to the alienees (the LDO refers to them as allottees) in two stages. In the first stage, an allottee was issued with a permit giving him/her the right to occupy and develop the land. After the land was developed the alienee received a grant in the form of a perpetual lease. The alienees and their successors had to make an annual payment to the state, in perpetuity.

The extent of land alienated to an individual /family has declined over time due to increase in demand for agricultural land. During the initial stages, 3 acres of highland and 5 acres of rice land were given to a family. Then the extent was reduced to 2 acres of highland and 3 acres of rice land, and today, it has come down to half an acre of highland and two acres of rice land in irrigated settlements. In the case of highlands only 2 acres, subject to certain minimum fractions of subdivision of land among the family members.

The government retains considerable control over the permit holders by stipulating a number of conditions, which the permit holders have to observe. These *restrict transferability* of the land to any person other than a nominated heir/successor and subdivision of land beyond a minimum fraction. The permit holder can mortgage his land only to a cooperative society of which he is a member. The permit holder is *eligible to any government subsidy* and has access to technology. There are also *restrictions on the crops* the permit holder could grow on the land and the proper use of the land. The permit holder enjoys security of tenure limited only to his ability to fulfill the conditions stipulated by the government.

LDO Grants (*Swarnabhumi*)

While the LDO permit is an intermediate tenurial document which conferred on the recipient of land the authority to occupy and develop the land, the s*warnabhumi* grant is a conversion of the LDO permit to a grant once the land is fully developed and the recipient has complied with the conditions embodied in the permit.

The grant is a more *permanent document* that confers a tenure *close to that of a freehold title*. However, the grant is subject to certain regulatory state controls, which are claimed to be formulated in the best interests of both the grantee and the land. The grant document is issued under the seal of the President of Sri Lanka, and contains a number of important components that make the title to the land absolutely clear and strong.

First, it refers to a clearly identified and well-defined parcel of land. Preparatory to the issue of grant, the land is surveyed and land-marked by the Surveyor General with a clear definition of boundaries. The exact extent of land and the location are depicted in the plan prepared by the Surveyor General.

Second, the grant refers to a clearly identified ownership. The title is specified in absolutely clear terms by the Government Agent after necessary inquiries. The document also provides for the *nomination of a successor* to the land by the grantee in terms of the provisions of the Land Development Ordinance.

Third, the grant is required to be registered in the local Land Registry as is done in respect of any deed on private land and any changes in ownership in the event of a transfer of the land can be registered like any private land.

However, the s*warnabhumi* grant could be considered as a conditional grant and not an absolute freehold; but it represents a tenurial status, which is closer to a freehold than the perpetual lease type grants issued previously under the principal enactment. However, steps have been taken by the government to further amend the LDO to include legal provision to make the s*warnabhumi* grant *more acceptable to banking institutions* if the holder wishes to use the land as collateral to obtain bank loans to invest in agricultural pursuits on his land. The land or part thereof *subject to a minimum fraction is transferable* with government permission, but only to a landholder of his class, provided the buyer's present landholdings will not exceed the farm maximums established for the area and only if the transfer would not jeopardize the livelihoods of his family. The grantee is entitled to receive any government subsidy and there are no restrictions in gaining access to technology *(see note 2 in Annex 1).*

LDO Grants (*Jayabhumi*)

The jayabhumi grants are similar to swarnabhumi grants except for the fact that the grant is issued without a survey plan approved by the Surveyor General. However, the land

boundaries and other requirements are cleared through investigations and checking by land officials.

This program was launched by the government in 1995 to overcome the delays in the issue of survey plans and landmarking of boundaries. It was estimated that if the swarnabhumi procedures of surveying had to be followed, it would take over 15 years to clear the present backlog of over 700,000 grants to be issued with the technical resources and manpower available as at present.

Transferability and bankability of the land are usually restricted by the absence of a legally surveyed plan of the land. However, the owner, in case of need, could meet these requirements at his own expense. The grantee is entitled to receive any government subsidies and technological services.

Annual Permits for Use of State Lands under the State Ordinance

The annual permits are a *form of short-term tenure* made available under the State Lands ordinance for various purposes which are temporary in nature (occupation of land/ government buildings on the land, cultivation of crops, removal of clay or sand, etc.). These are renewable annually up to 5 years if the land is not required for the state for any other purpose. The permit holder has no claim to conversion of this permit to any grant such as the permits under the Land Development Ordinance.

The permit holder cannot use his permit as collateral to obtain credit from a bank; but *bank loans can be obtained* on the strength of the viability of his agricultural or any other project on his land supported by guarantors. The permit holder is not *entitled to subsidies*, but can gain access to technological services. The tenure is insecure as the land is held on a short-term basis.

Long-Term Leases under the State Lands Ordinance

This tenurial form enables a lessee to use a state land for any approved agricultural or other commercial enterprise over a longer period. There is no guarantee of conferring permanent ownership, sale, or grant of the land to the lessee. This form of tenure, however, is a more secure title to land. The land is transferable with government approval. The lessee could also use the land as collateral to obtain loans for long-term investment on the land. The lessees' eligibility to subsidies and access to technology are not restricted. As the land is held over long periods ranging from 30 to 99 years, tenurial security is high.

Encroachments

This is a form of landholding by a person or persons for residential, cultivation or commercial purposes through encroachment of state land. The Crown Lands Encroachment Ordinance of 1840 which is still in force in Sri Lanka defines an encroacher/s as a person/persons "who with having, without the permission of the Government, entered upon or taken possession of any land which belongs to, or which immediately prior to such entry or taking possession was in the possession of Her Majesty, Her heirs or Successors." Under the above-mentioned ordinance, all forest, chena, unoccupied, and uncultivated land are presumed to be crown property until the contrary to thereof is proved.

For obvious reasons, the encroacher has no security of land and he/she is not entitled to any benefits such as subsidies and extension services extended to landholders of some other categories of tenure derived from state landholding *(see note 3 in annex 1).*

Paraveni Inherited Lands (Settled)

Paraveni inherited lands (settled) constitute a tenurial category where the lands which were once owned by people under the traditional tenurial systems in the pre-colonial era were settled under the Land Settlement Ordinance of 1901. After the declaration of settlement on behalf of the claimant the title to land becomes absolutely clear and the owner enjoys full security of the land as his/her private property.

The landholder is free to sell, mortgage or dispose of the land. S/he is entitled to all incentives and extension services normally extended by the state for the promotion of agricultural development.

Paraveni Lands (Unsettled)

Paraveni lands (unsettled) too belong to the same category of lands described above. However, the claims on the land have not yet been settled or are in the process of being settled under the provisions of the Land Settlement Ordinance. The holder does not enjoy full security and settlement of his/her claim depends on the acceptance by the settlement authorities on the strength of saunas deeds that s/he could produce. The claimant cannot sell, transfer, or dispose of the land legally as the title to the land is not settled. There is no restriction on the claimant eligibility to subsidies and access to technology.

Freehold (Single Ownership)

Under this form of tenure, the holder has *absolute private ownership* of the land. These lands are subjected to freehold title under the Roman Dutch Law. The predominant tenurial form under the freehold is the owner-operator under which the person who owns the land cultivates the land by himself/herself. Where the owner is not capable or willing to cultivate the land by himself/herself, s/he has the right to sell or lease the land or part thereof to another person for which there are no restrictions. The owner can use the land for any purpose, subject to regulatory control by the government only in cases where the holder's practices affect the common good. For purposes of mortgage of the land to banks as collateral, the banks usually require a clear title or pedigree of 30 to 50 years, or a title insurance. The land is registered in the form of a deed with the Registrar of Lands of his/her district and any transfers are also recorded. The owner is entitled to any subsidies and to receive any technological services.

The Land Reform Law of 1972 has imposed a ceiling on private ownership of 25 acres for rice and 50 acres for other crops including tea, rubber, or coconut, or mixed per person.

Freehold (Multiple Ownership)

Multiple-ownership freehold form of tenure is the same as the freehold (single ownership) described above except for the fact that there are more than one owner of the land. One single owner owns only a share of the land either through the operation of the law of intestate succession or sale or gift by the previous owner of the land. Often, the extent and location of the share of land that a person is entitled to are not identified through a valid survey and the land remains undivided. This poses many constraints on the proper use of the land. These may include disputes among the shareholders, restrictions in the transfer or sale of the land, inability of the shareholders to use land as collateral, inability to make all development decisions by a single shareholder unless all shareholders agree, difficulties in effecting any land use changes, entitlement to any subsidies, or gaining access to technology..

Paddy Lands Tenancies under the Agrarian Services Act

Paddy land tenancies under the Agrarian Services Act are, in fact, an operational form of tenure that has emerged from the leases of private land to individuals. Tenancies and sharecropping were ad hoc arrangements until the tenancies in respect of rice lands were accepted as legitimate perpetual rights on the lands under the Paddy Lands Act of 1958. The practice of sharecropping is predominant not only in rice lands but also in highlands

where the crops are seasonal. However, no rights of sharecroppers are accepted in respect of highlands unless they are supported by tenancy agreements executed by way of notarial deeds, the practice of which is more or less the exception than the rule.

The Paddy Lands Act of 1958 was aimed at providing permanent and heritable rights of tenancy to operators of rice lands (a*nde* cultivators or sharecroppers), limiting the rent payable by a tenant cultivator to his landlord. The maximum limit was fixed at 25 percent of the share of the produce or 15 bushels per acre per person whichever was less, subject to slight differences in different districts (before the operation of the Act, land rents varied between one-quarter to one-half of the produce; half share had been the most prevalent; and in a few areas it was as high as two-thirds of the produce). It was accepted that the concept of social justice and productivity remained the primary objective of the above piece of legislation. However, for a variety of reasons, the old customs between the two groups still operate.

The tenants under this form of tenure enjoy security as far as cultivation of the land and the share of their crop are concerned. They are eligible to receive any subsidies and extension services normally extended by the state. They cannot use the land as collateral to obtain credit, as the ownership of the land remains with the landlord.

Temple Lands

Temple land are class of land that belonged to temples and were managed by the high priest of the temple (v*iharadhipathi bhikkhus*), in accordance with regulations governing temple lands and Buddhist temporalities. These lands were not merely private lands although belonging to the temples, but often treated as common property of the m*aha sangha* and their successors. These comprised rice lands as well as highlands where several types of crops were grown. It has been claimed that nearly 324,000 hectares of lands belonged to temples before the beginning of colonial rule. Some of these lands had been donated by Sinhalese kings on s*annases* (deeds of gifts) and others by devotees as meritorious acts. The ancient custom was not to interfere with these lands except under very exceptional circumstances. In recent decades, however, temple lands have been subject to several legislative enactments such as the Paddy Lands Act, Land Reform Laws and the Mahaweli Authority Act and the temples have lost much of their land and revenue from these lands, due to the above forms of land legislation, encroachments, and neglect by the temple authorities in maintaining records and inventories. As most rural temples depend heavily on land for their sustenance, the above-mentioned factors have virtually pushed the temples into a parlous state of finance.

The v*iharadhipathies* of temples have often requested the government to exempt temple lands from the operation of the Paddy Lands Act. The most recent amendment to the Agrarian Services Act has permitted an exemption of a maximum of two acres from the operation of the tenancy provisions. Through these exceptions, the temples expect an

increase in productivity from these lands, as they can use more efficient tenant cultivators to work in the fields. The temples have not requested that the use and enjoyment of produce of lands should always be with the temples. They can be used by tenants or the government, but the ownership, they claim, should always remain with the temples.
The temple lands are not transferable. There are restrictions in using land as collateral owing to unclear title. Subsidies are not extended to these lands. There are no restrictions in gaining access to technology.

Considerable extents of temple lands are encroached by various persons and organizations, and some are so entrenched that no eviction is now possible.

ANNEX 2

Notes

Note 1.

The British administration in Sri Lanka treated all forests, wastelands, and unoccupied and uncultivated lands as the property of the Crown and on this presumption effectively protected such lands being encroached upon or claimed as private. It was a vast extent of crown estate and the lands were disposed of at the will of the Crown. The lands were sold to interested individuals by public auction under an application system, giving rise to the development of a vast private plantation sector (coffee, tea, rubber and coconut) in Sri Lanka.

In the greater part of the nineteenth century, the interests of the rural peasantry, particularly in the dry zone, were ignored. Not until the middle of the century was there any investments made to restore village tanks of the dry zone or any of the magnificent ancient irrigation systems that had been in existence, or even to build roads to benefit the rural population. After the 1850s, a beginning was made in giving grants-in-aid for the restoration of village tanks and incentives to those who participated in self-help endeavors to restore village tanks by permitting them to acquire holdings under the tank subject to payments to the government in installments. However, the investments to benefit the peasantry were a very small fraction of the investment on the infrastructure for the plantation industry. By the end of the century, a skeleton road system and work on the restoration of some of the major tanks had begun.

By the beginning of the twentieth century there were signs of uneasiness that the land policies that were pursued had not benefited the traditional economy of the country and the peasants who were engaged in subsistence agriculture. There was distress among the peasants in the thickly populated areas. There was unemployment and insufficient land for cultivation. There was acute land hunger. The normal village holdings had been fragmented to uneconomic size by the operation of the law of inheritance. Also improvident villagers

had sold their land to Ceylonese entrepreneurs who were acquiring and consolidating holdings to expand their areas under rubber and coconut. Sir Hugh Clifford, the British Governor of Ceylon at that time while claiming that the plantation sector had provided the resources for the material prosperity of the country had commented that "If the prosperity which had so far been secured is to be adequately maintained, this should be achieved not by the stimulation of large agricultural estates but by devising means for the multiplication of smallholdings and bringing into existence a prosperous, self-supporting and self-respecting multitude of peasant proprietors" (see "Reflections on the Ceylonese Land Question"1927).

The food crisis during the First World War added further social, economic, and political tension in the country and it became politically imperative that a solution had to be found for the growing landlessness among the peasantry in the wet zone and the central regions of the country and to make the dry zone productive to generate food for the nation. Endeavors made to promote rice production on a large scale on Crown land by large commercial enterprises in Minneriya and elsewhere failed and the government granted authority to lease small plots of land to the rural peasants for the production of food and such leases were given in many parts of the Island.

These factors were considered by the first Land Commission of 1927 and a radical change in land policy was adopted. The main instrument through which the land was redistributed to the peasantry and the middle class landless in a systematic manner was the Land Development Ordinance of 1935.

Note 2.

With the opening up of the economy and the new strategies adopted by the government in the late 1970s to accelerate the development process in the country, possession of good title to land was considered to be increasingly relevant. This realization led to the introduction of the Land Development (Amendment) Act No.27 of 1981, which amended the principal enactment to provide a more permanent way of giving title to the allottees, by replacing the perpetual lease with a new kind of grant. However, this grant too embodies certain restrictions and protection against the ill-effects of the law of intestate succession. Under the operation of this law many small agricultural holdings held under the common law of the land, in the course of one or two generations, happened to be owned by many co-owners, which made proper cultivation and management of land impossible.

The amendments provided specific time periods for the promotion of a landholding from the permit stage to a grant. The period is 1 year in the case of highland and 3 years in the case of irrigated land, provided that the Land Commissioner may issue a grant before such period in the interest of development of such land.

The amendments also made provision for a permit holder to pay purchase amount (a price) as determined by the Land Commissioner, within a period of 10 years, in a lump sum or in annual installments. This is extendable by a further period of 2 years, where the permit

holder's failure to pay was due to sickness, crop failure, or other unavoidable cause. The Land Commissioner was empowered to exempt any permit holder belonging to the peasant class from paying the purchase amount, subject to the condition that the Commissioner may, however, recover the cost of improvements to such land, which may have been incurred prior to the alienation of such land.

The overall effect of these provisions was to enable the issue of grant, any time after the alienation of a land if the government is satisfied that the permit holder has taken adequate and meaningful steps to develop the land.

Up to 1990, the Land Commissioner's Department had alienated a total of 1,329,002 acres of land in 734,018 allotments. With the allotments of land alienated under the Mahaweli Systems and under the Land Task Force Program, the total number of allotments alienated up to 1991 is 1,042,829. The number of *swarnabhumi* grants issued up to the end of 1991, is 308,157, thus leaving a balance number of 734,702 s*warnabhumi* grants to be issued under this program (Ref. A Policy Review of impacts of land tenure in the food crop sector - Volume II- Evaluation of the swarnabhumi Program December 1991 - O.C. Jayawardene January 1992).

Note 3.

Government sources reveal that nearly 6 percent of the total land area of the country (over 1 million acres of land) is encroached by half a million persons. The Land Commission Report of 1987 reveals that encroachment has been and is a widespread phenomenon covering both urban and rural areas of the country. A notable feature of this phenomenon is that in recent times (1985 Land Commission surveys) highest incidence of encroachment had been on stream and canal reservations. Encroachments are also often found on ecologically marginal lands. In rural areas, generally, encroached land is mainly used for cultivation or residential purposes; and in the dry zone, specifically, chena form of cultivation is predominant.

There are many factors that have given rise to the large-scale encroachment of state lands in the country. Among these are

- traditional claims of the people on lands that are declared as state land under rigid colonial land laws in which the requirements of proof by the people that land belonged to them were very difficult to be met (such as the production of saunas, customary levies of taxes, evidence of occupation or use for a period of not less than 30 years); It has been argued that for want of proof, people lost their traditional land to the government;
- landlessness, and hunger for more land to find an avenue of employment, to eke out an existence or to increase income (as in the case of encroachment of state land for chena cultivation);
- Availability of state lands to encroach upon for cultivation in some districts;

- Lenient attitude towards encroachers by successive governments (partly due to politicization of the rural electorate after independence, which prevented rough handling of encroachers) that tended to treat the encroacher as a pioneer rather than an offender, which contributed in no small way to encourage increased encroachments;
- Continued regularization of encroachments (other than on lands reserved for various common purposes such as for canal and road protection) thus encouraging encroachment as a regular process for a person to lay claim to a block of land; However, the government policies on regularization of encroachments recognize that "lands developed by individuals without any state assistance may be passed on to the occupants of such lands as far as they will not be in conflict with the long term interests of the region and the country" (Land Commission Report of 1987); According to present rules, at least 1/3 of the land encroached cannot be regularized; but eviction of people even from these lands is a nearly impossible task, particularly in locations where the encroachers are well entrenched due to long periods of occupation of the lands.

Annex 3 - Figures and Tables

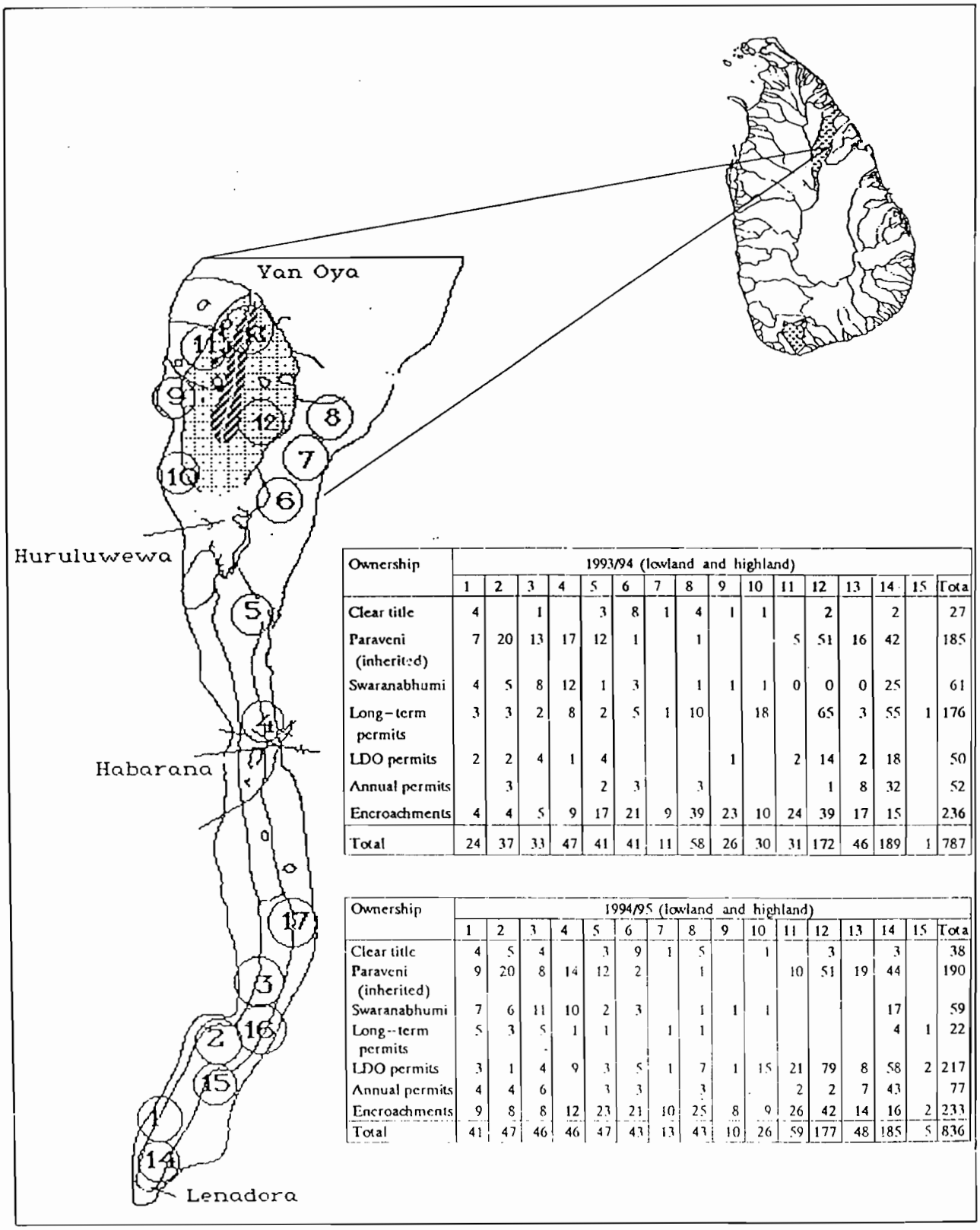
Table A8.1 - Scores assigned to tenurial forms, in a 0-10 scale by indicators.

Tenurial forms / Indicators	1	2	3	4	5	6	7	8	9	10	11	12	CV %
Tenurial	5	8	7	2	7	0	8	4	10	9	4	3	55
Eligibility to	6	8	8	3	8	1	10	2	10	2	7	7	53
Access to technology	4	8	8	2	8	1	8	3	8	3	8	7	50
Bankability	7	8	7	4	7	1	8	6	9	8	5	2	42
Transferability	4	8	8	0	7	0	10	0	10	5	6	0	82
Total	26	40	38	11	37	3	44	15	47	27	30	19	
Coefficient of variation	25	0	7	67	7	91	13	75	10	57	27	82	
Rank	8	3	4	11	5	12	2	10	1	7	6	9	

Land Tenure Forms

1. LDO permits
2. LDO grants (swarnabhumi)
3. LDO grants (jayabhumi)
4. Annual permits under State Lands Ordinance
5. Long-term lease (30-50 years) under Lands Ordinance
6. Encroachments on State Lands Agrarian Service
7. Paraveni lands (settled)
8. Paraveni lands (unsettled)
9. Freehold (single ownership)
10. Freehold (multiple ownership)
11. Paddy lands tenancies under *
12. Temple lands

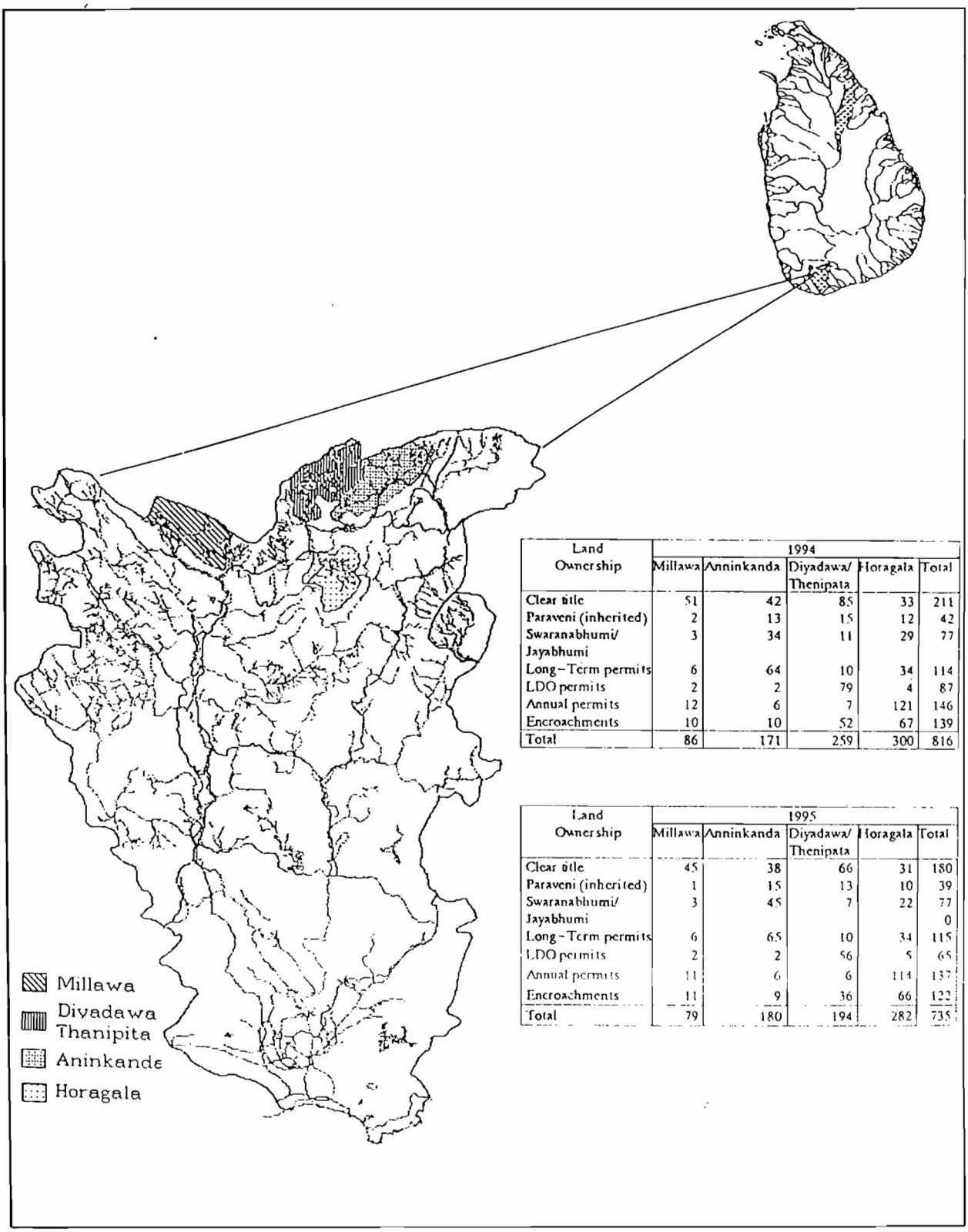
Figure A1. Distribution of sample farms in the Huruluwewa watershed.



Ownership	1993/94 (lowland and highland)															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Tota
Clear title	4		1		3	8	1	4	1	1		2		2		27
Paraveni (inherited)	7	20	13	17	12	1		1			5	51	16	42		185
Swaranabhumi	4	5	8	12	1	3		1	1	1	0	0	0	25		61
Long-term permits	3	3	2	8	2	5	1	10		18		65	3	55	1	176
LDO permits	2	2	4	1	4				1		2	14	2	18		50
Annual permits		3			2	3		3				1	8	32		52
Encroachments	4	4	5	9	17	21	9	39	23	10	24	39	17	15		236
Total	24	37	33	47	41	41	11	58	26	30	31	172	46	189	1	787

Ownership	1994/95 (lowland and highland)															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Tota
Clear title	4	5	4		3	9	1	5		1		3		3		38
Paraveni (inherited)	9	20	8	14	12	2		1			10	51	19	44		190
Swaranabhumi	7	6	11	10	2	3		1	1	1				17		59
Long-term permits	5	3	5	1	1		1	1						4	1	22
LDO permits	3	1	4	9	3	5	1	7	1	15	21	79	8	58	2	217
Annual permits	4	4	6		3	3		3			2	2	7	43		77
Encroachments	9	8	8	12	23	21	10	25	8	9	26	42	14	16	2	233
Total	41	47	46	46	47	43	13	43	10	26	59	177	48	185	5	836

Figure A2. Distribution of sample farms in the Nilwala watershed.



Land Ownership	1994				
	Millawa	Anninkanda	Diyadawa/ Thenipata	Horagala	Total
Clear title	51	42	85	33	211
Paraveni (inherited)	2	13	15	12	42
Swaranabhumi/ Jayabhumi	3	34	11	29	77
Long-Term permits	6	64	10	34	114
LDO permits	2	2	79	4	87
Annual permits	12	6	7	121	146
Encroachments	10	10	52	67	139
Total	86	171	259	300	816

Land Ownership	1995				
	Millawa	Anninkanda	Diyadawa/ Thenipata	Horagala	Total
Clear title	45	38	66	31	180
Paraveni (inherited)	1	15	13	10	39
Swaranabhumi/ Jayabhumi	3	45	7	22	77
					0
Long-Term permits	6	65	10	34	115
LDO permits	2	2	56	5	65
Annual permits	11	6	6	114	137
Encroachments	11	9	36	66	122
Total	79	180	194	282	735

CHAPTER 9

INTERVENTIONS ON NATURAL RESOURCES— TENURIAL ARRANGEMENTS

This chapter presents a brief account of some selected forms of natural resources tenure and *shared control mechanisms (or state-user partnerships)* tested by SCOR. It examines the processes and the outcomes of these efforts, which were aimed at promoting a sense of security leading to improved production and conservation of natural resources. Based on the analysis presented in the previous chapter, it is assumed that, apart from private titles, there exist other tenurial forms—such as longer-term lease—that would provide adequate tenurial security to motivate users to adopt conservation- based production. In a watershed context, these SCOR interventions were aimed at integrating natural resources conservation concerns and production goals. The chapter focuses on four areas of tenurial interventions, specifically:

- establishment of an irrigated agricultural settlement, incorporating encroachments
- long-term usufructuary rights for "encroachers" on "reserved land"
- regularization of encroached land
- state-user partnerships through participatory forestry

In addition, the chapter will include an account of a land consolidation experiment conducted by SCOR in the Nilwala watershed.

1. Establishment of An Agricultural Settlement Incorporating the "Illegal Encroaches of State Land

A trans-basin canal referred to as the "Feeder Canal" diverts Mahaweli water from the Bowatenna reservoir to the Kandalama and Huruluwewa tanks, cutting across the upper parts of the *Dambulu Oya* and *Kala Oya* watersheds. The canal is 33 km long from its point of origin at Lenadora up to the point of its confluence with Sigiri Oya[1] at Sigiriya (figure 9.1). Beyond this point the water flows in the natural stream, *Yan Oya* (the upper part of which is called Sigiri Oya). In the first stretch of this natural stream, water flows through three small tanks, *Pahala Thalkote wewa, Hiriwadunna wewa* and *Habarana wewa,* thus complicating the management of the Feeder Canal, which was constructed to take water to Hurulu wewa. The Feeder Canal has been designed for a carrying capacity of 1,000 cusecs of which 700 cusecs are conveyed to the Kala Oya, diverted at the Lenadora bifurcation, and 350 cusecs are conveyed to the Huruluwewa tank (150 cusecs)

[1] Sigiri Oya is the upper part of Yan Oya, and *oya* means a stream, sometimes as large as a river.

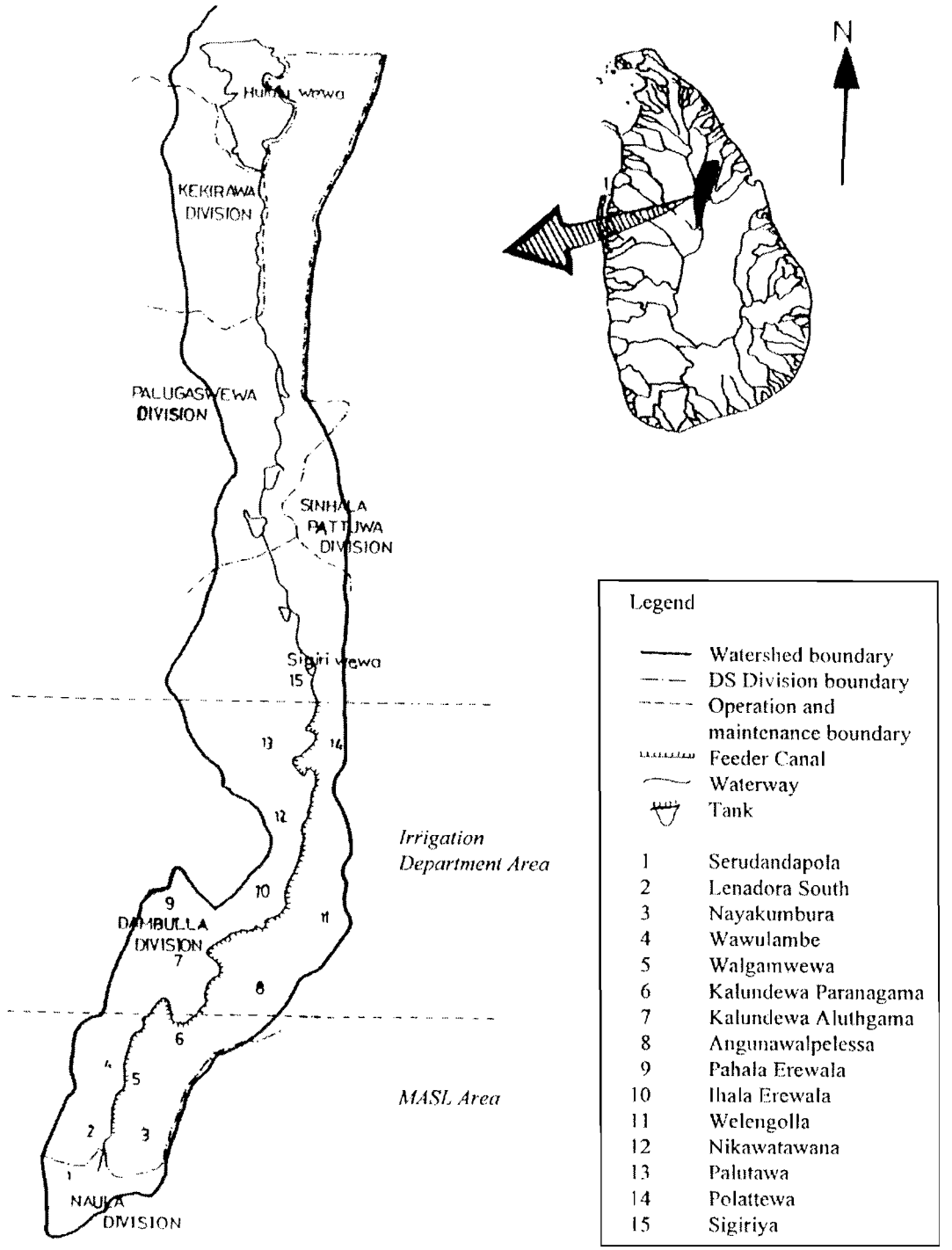
and Kandalama tank (200 cusecs). The Feeder Canal lies within the District Secretariat (DS) Divisions of Naula and Dambulla in the Matale District.

The General Land Use and Operation of the Feeder Canal

The operation and maintenance of the Feeder Canal are the responsibility of two organizations: An 8-kilommeter stretch of the canal, extending from Lenadora to the Kandalama bifurcation, is operated and maintained by the Mahaweli Authority of Sri Lanka (MASL). The lower portion of the canal is under the jurisdiction of the Irrigation Department (ID) and is under the managerial responsibility of the Irrigation Engineer (IE) of Huruluwewa. The land adjacent to the canal is under the control of two DSs thus further complicating the situation.

As of 1993-94, the situation along the Feeder Canal area seemed to be one of anarchy as far as management of the Feeder Canal itself and the reservation were concerned (Ariyaratne 1995). The ID had limited jurisdiction over land use within the reservation. It appeared as if the traditional inhabitants and the encroachers occupied and used the land allotments including the reservation through mutual understanding and agreement. The reservation was used extensively for the cultivation of soil-degrading tobacco. The elevation of the left side of the Feeder Canal is lower than the water supply level and therefore, illicit tappers can easily siphon out water at no cost. Easy access to water, coupled with the cultivation of rice in loose soils, had led to inefficient water usage. Illegal siphoning of water from the canal was at a maximum. As of 1992 according to IMD data, nearly 2,000 siphons were used to illegally extract water from the canal. There is more illicit tapping in the first 8-kilometer stretch of the Feeder Canal than in the other part up to the natural stream. There are about 900 pipes of 2 inch each in this area and the quantity of water tapped illegally by the farmers in the area is estimated at more than 1 cubic meter per second. This can irrigate nearly 1,000 hectares of other field crops (OFCs) despite the fact that the actual irrigated area is reported as 34 hectares (Improvement Project of Huruluwewa Feeder Canal and Irrigation Area, A Proposal, Mahaweli Authority of Sri Lanka 1997). At the initial stretch of the Feeder Canal, the right bank side, which is at a higher elevation, is reserved for forest. However, illicitly encroached farmers, including large-scale commercial cultivators, have already started tapping "free water," using pumps.

Figure 9.1. The Feeder Canal and its surrounding area.



Source: Improvement Project of Huruluwewa Feeder Canal and Irrigation Area – Project Proposal, Mahaweli Authority of Sri Lanka, September, 1997. The original map and the demarcation of watershed boundaries were done by SCOR.

Late in the 1980s a small canal was constructed parallel to the Feeder Canal on a lower contour, to divert some of the water originally assigned to Huruluwewa to protect the traditional water rights of villagers who had been cultivating in the area prior to the construction of the Feeder Canal. Even though this was meant for regularizing the illicit tapping of water, the poor construction of this "parallel canal" too has been observed to have contributed to illegal siphoning from the Feeder Canal (IIMI-SCOR 1993b). In addition to siphoning, farmers have cut trees along either side of the Feeder Canal to block the watercourse and raise its level or divert water to particular allotments. Trees within reservations are also cut to meet fuelwood requirements.

As the land area in many other sections in Dambulla and Palugaswewa Divisions too have high potential for cultivation, the SCOR staff predicted that demand for the Feeder Canal water and illicit tapping will continue to grow with time.

The soil of the area surrounding the Feeder Canal and Yan Oya consists of Low Humic Gley (LHG), favorable for rice cultivation, and Reddish Brown Earths (RBE), suitable for other field crops (OFCs) (Survey Department 1988). OFCs can be grown on this soil with irrigation in the dry season and with or without supplementary irrigation in the wet season. The terrain of the area is undulating with slopes between 0 and 8 percent (Survey Department 1988).

According to the baseline surveys conducted by SCOR, the average size of nearly 50 percent of each of the land parcels in the Feeder Canal area up to the Sigiriya regulator is less than 0.5 hectare. About 35 percent of each of the parcels is between 0.5 and 1.0 hectare. The land area cultivated before construction of the Feeder Canal was 745 hectares. By 1994, it had risen to nearly 3,000 hectares. According to the original proposal for construction of the parallel canal, water was to be provided for an area of 1,200 hectares from 29 offtakes[2]. However, according to the findings of the SCOR working group on the Feeder Canal, by 1996, there was a need to provide at least 37 offtakes along the canal length.

According to the data provided on the Feeder Canal, to the Task Force, by the Project Management Unit of the Mahaweli Authority, the area cultivated within the first 8 kilometers of the Feeder Canal was about 335 hectares belonging to 730 farm families. The area covered by the Feeder Canal beyond the *Kandalama* bifurcation up to the *Sigiriya* regulator was nearly 1,000 hectares, operated by 1,525 farm families. Altogether about 300 hectares operated by 440 farm families were found beyond the Feeder Canal along the natural stream, *Yan Oya.*

The water availability for the Huruluwewa command area, which is about 5,000 hectares in a normal year, assuming that rice is cultivated in the wet season and OFCs in the dry season, is approximately half of the total requirement. This explains why the average cropping intensity of the Huruluwewa command has remained substantially low (close to 1) since its inception. The water supplied to Huruluwewa through the Feeder Canal has been significantly below the agreed amounts.

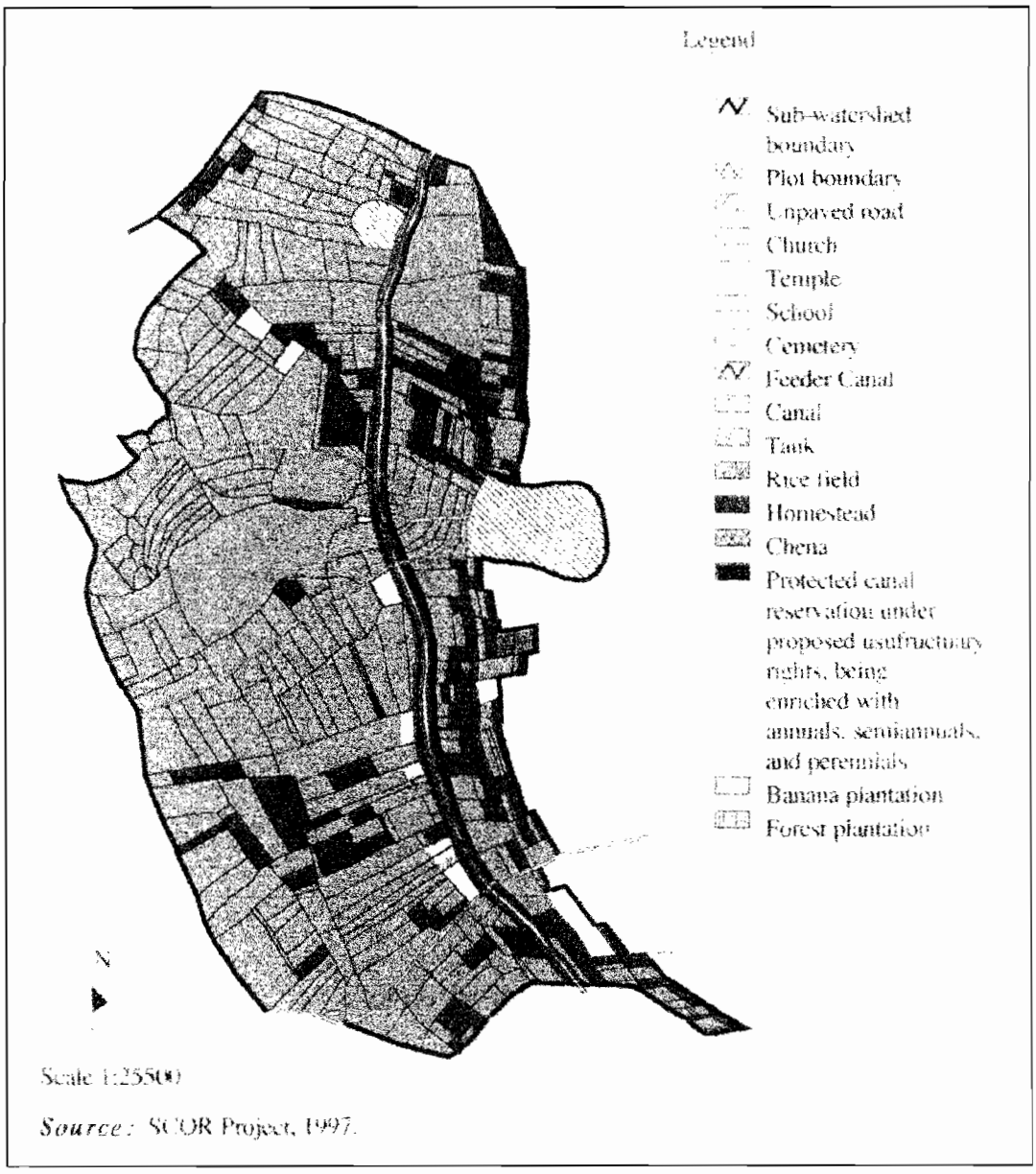
Earlier, most of the farmers in the area practiced slash-and-burn cultivation resulting in clearing of large extents of forests. Inadequate nutrient-replenishing time due to continuous cultivation and shortened fallow periods, loss of top soil and low moisture

[2] Most of these were not in order and were not functional as of 1994.

retention levels, etc., have contributed to the loss of soil fertility. The availability of Mahaweli water for the area (since 1976) has opened more land for cultivation and new cropping patterns thus tempting encroachers into the vacant land not claimed by earlier inhabitants, including the state reservation land (Ariyaratne 1995; and IIMI-SCOR 1993a). Waterway reservations were especially attractive to the newcomers due to free and easy access, abundance of water, and rich moist soils. These conditions enabled them to obtain high yields and profits within a relatively short period. The high-value crops, such as tobacco, chili, and big onion provided them with a significant income. This is evidenced by the permanent and semipermanent dwellings put up by them.

Reservation land, having free access, is used extensively for cultivation of short-term crops and grazing of cattle. Prior to the SCOR Project interventions in 1993, vast extents of the land adjacent to the moisture-rich right bank (at a higher elevation than the left bank) of the Feeder Canal were used for the cultivation of tobacco (figure 9. 2 depicts the land use after SCOR interventions (1997) for Walgamwewa sub-watershed, a bordering area of the Feeder Canal). The land was cultivated all the way to the banks of the canal, without leaving any type of buffer between cultivation and the waterway. Even basic soil and water conservation farming practices such as contour bunds were almost nonexistent within the area. During a SCOR study done in 1993-94, it was found that some farmers had dug irrigation wells within the Feeder Canal reservation (Ariyaratne 1995). This has led to serious problems of erosion of the channel banks.

Figure 9.2 Land use, Walgamwewa sub watershed, 1997



SCOR Interventions

Historic Planning Meetings between Two Rival Groups

After these initial diagnostic reviews, the SCOR team initiated a dialogue between these two rival groups of farmers, the Huruluwewa farmers whose legal right to receive Mahaweli water had been deprived and the illicit tappers/encroachers in the Feeder Canal area. A historic meeting was held in September 1994 between the two groups, with the presence of the Divisional Secretaries of Galenbidunuwewa, Dambulla, Palugaswewa

and Naula and other local officers including those from the Irrigation Department, the Department of Agriculture, the Mahaweli Authority, and the Department of Agrarian Services, etc. "This was a historic meeting[3] in the sense that it was the first time that all stakeholders of a complex land and water use system met under one roof to discuss a common seasonal cropping plan and to exchange opinions on to how the available land and water resources can best be utilized" (Fernando, Nihal 1995 p.32). The seasonal planning meetings between upstream and downstream farmers have resulted in the agreement to limit the number of siphons, used by farmers cultivating along the Feeder Canal, to reduce the level of illegal water use.

Problems faced by the two groups of farmers and the other issues as inefficiencies in water use, uncoordinated cultivation patterns and associated problems, lack of control structures to regulate water, etc. have been discussed at this meeting. SCOR engineers explained the water use pattern and water availability to various parts of Huruluwewa and the Feeder Canal systems and illustrated the technically feasible solutions that might be acceptable to both parties. Subsequently, farmers and officials jointly agreed on the type of crops to be grown, cultivation calendar, schedule of water issues, etc. Following this, a series of meetings were held with farmer organizations and it was decided to reduce the number of siphons. The SCOR staff and the local officers worked closely with the farmers and a significant reduction in the number of siphons has been observed.

Most of the farmers commenced cultivation with the onset of rains, both in the Feeder Canal and Huruluwewa areas and followed the agreed calendar. This exercise resulted in saving a significant amount of water in the Huruluwewa tank (as well as in a few other small tanks) that was used to cultivate cash crops, mainly soybean, in the subsequent dry season. The cultivation of soybean for a forward purchase contract with a private company led to significant profits which in turn resulted in the establishment of Huruluwewa Farmer Company (see chapter 10). In addition, the cropping pattern in the Feeder Canal area has changed. Some farmers converted their rice fields (which had well-drained soils) to crops such as banana that demands less irrigation, and coconut, for which farmers usually do not provide irrigation.

Meantime, as a long-term solution to the problem, the SCOR team, along with a special working group, comprising officials from the Mahaweli Authority of Sri Lanka (MASL), the Irrigation Department (ID), the Department of Agriculture etc., Divisional Secretaries (DSs), and farmers utilizing irrigation through the Feeder Canal, and IIMI professionals evaluated the reasons for the poor management and administrative shortcomings of the Feeder Canal and the adjoining reservation area.

Their findings showed that the following are attributed to the failure in the implementation of efficient management measures for the canal and the canal reservation:

- the long distance of the Feeder Canal and poor irrigation structures
- lack of usufructuary rights

[3] However, as usual, there were "red tapes." For example, a senior bureaucrat in Colombo had questioned the legitimacy of these meetings, because, strictly speaking the government regulations do not allow the Divisional Secretaries to hold cultivation meetings with "encroachers."

- reservation land and water in the canal not being managed by the same authority (water managed by the MASL and ID and the reservation managed by the DSs).
- poor coordination and organization

Problems associated with the Feeder Canal were unique to it and all the other trans-basin canals elsewhere in Mahaweli are functioning satisfactorily. It was noted that farmers in the Feeder Canal area and the Huruluwewa command area are willing to accept the proposal for a takeover by the Mahaweli Authority as they would benefit from an area development work similar to other Mahaweli settlement schemes.

According to the working group findings, some of the negative aspects of takeover by the Mahaweli would be as follows:

- The program may eventually become a high-cost operation while losing the objectives of the Feeder Canal in supporting the Huruluwewa farmers and as such any move by the Mahaweli Authority to expand the area of its authority to include the Feeder Canal area would be infeasible, unless proper management measures are adopted for controlling the illicit tapping of water from the Feeder Canal.
- If the Huruluwewa Feeder Canal area is subjected to a regularization process, it would have major implications on other trans-basin diversion schemes, managed and operated by the Mahaweli Authority.
- Some of the actions to control illegal tapping of water from the Feeder Canal by the Mahaweli Authority would not be practical unless the majority of the farmers do not participate in the decision-making process related to water management.

Alternative Solutions Considered by the Working Group

After examining all aspects of the problems related to farmers who depend on the Feeder Canal area and the Huruluwewa command, the working group recognized the great importance of organizing farmers in to farmer organizations, using the existing institutional framework and to entrust the coordination responsibility to the IMD to ensure equitable distribution of water among the groups of farmers in a justifiable manner.

It was also considered that the establishment of a coordination mechanisms involving all line agencies with their active participation at divisional/district level, and the MASL playing pivotal role, could be helpful in managing the Feeder Canal and the parallel canal in order to solve water problem of the Huruluwewa farmers.

Further, the working group identified the importance of strengthening the activities of the line agencies in the Feeder Canal areas as a prerequisite not only for solving the water problem but also for land regularization, conservation farming, and better water management practices, to increase and sustain the production of already developed landholdings.

Another important consideration was that the MASL should play a key role in an integrated management model because Mahaweli water is fed to other minor tanks too on

its way to Huruluwewa. As such, the MASL could act as a coordination body of the programs of other agencies operating in the Huruluwewa watershed while coupling these programs with farmer organizations as well. It was suggested that this coordination mechanism in strengthening line agency activities should cover both the Feeder Canal area and the Huruluwewa command with the MASL playing the major role.

Major Recommendations of the Working Group on the Feeder Canal

Some of the major recommendations made by the working group could be summarized as follows:

- Assign all the management functions of the cultivated land from the Kandalama bifurcation up to Sigirimulla inclusive of the watershed area to the MASL, under a gazette notification in order to overcome existing multiple managerial constraints. This is considered as the best alternative to improve water supply to the Huruluwewa command area.

- Transfer of managerial responsibility of the ID with regard to the parallel canal to the MASL up to 8 kilometers before 15. 05. 1996. It was also recommended that the balance construction work of the parallel canal and the provision of funds for the work should be provided by the MASL. To restrict or discourage rice cultivation along canal reservations and encroachments, regulatory measures should be strcictly enforced to ensure there is sufficient water supply to the Huruluwewa command area. Taking this measure is expected to increase the water supply at least by 30 percent. It is proposed that the action should be taken by the MASL.

- Further it was recommended that intensive programs of land alienation, land use planning, agricultural extension, and water conservation should be implemented by the MASL in the Feeder Canal area, to ensure water availability to the Huruluwewa farmers; it was also suggested that for this, the MASL and SCOR project should take necessary action. Among the other recommendations are the regularization and distribution of land parcels on an equitable basis in consultation with farmer organizations, preparation of a map indicating the Feeder Canal position including areas of heavy water tapping, cultivated areas along the entire 23 kilometer length, and exploring the possibilities of extracting groundwater for agricultural purposes in the Feeder Canal area to reduce illegal water tapping from the Feeder Canal..

A New Irrigated Agricultural Settlement Incorporating Encroachers?

As stated earlier, the working group recommended that the management of land and water resources—that is the Feeder Canal, parallel canal, other associated water bodies and land included in the watershed— and *Grama Niladhari* (GN) boundaries as demarcated by SCOR, should be handed over to the MASL. It was believed, based on its

management record in other systems, that the MASL could enforce the regulatory mechanisms and ensure increasing water availability to the Huruluwewa command area by at least 30 percent of the current level (Mahaweli Authority 1997).

The above recommendations were presented to the National Steering Committee (NSC), and based on this the NSC proposed a management model to overcome the long-standing institutional problems of the Feeder Canal. Under this proposal, the jurisdiction of a larger part of the Feeder Canal and associated sub-watersheds was proposed to be handed over to the MASL and maintained as an "agriculture zone." The authoritative boundaries have been defined by SCOR staff,[4] according to natural watershed boundaries along with the lowest-level administrative units, namely the GN divisions. The Cabinet of the Government of Sri Lanka approved this proposal in December 1996 and the gazetted that the area will come under MASL. This is a major achievement of SCOR, but it is difficult to attach any monetary value to this output of the project. In addition to the tangible benefits that would come from both the Feeder Canal and the Huruluwewa command areas, this move will reduce or remove the social unrest and conflicts that could even deprive people of their lives. Until the administrative change of handing over is fully operationalized, the Divisional Secretaries in collaboration with relevant line agencies and farmer organizations are urged to closely monitor the encroachment activities.

Recently, the government in collaboration with a donor, had proposed a project, namely, the "Improvement Project of Huruluwewa Feeder Canal and Irrigation Area," in line with the recommendations made by SCOR and the working group. The major components of the proposed project are:

- to carry out the rehabilitation and improvement of the Huruluwewa Feeder Canal, including related structures
- to construct on-farm facilities for saving and equitable distribution of water for approximately 1,600 hectares of the command area from the Feeder Canal inlet up to Huruluwewa
- to establish the most appropriate water management system, irrigation practices, and operation and maintenance system
- to prepare guidelines of institutional reforms and establish and strengthen farmer organizations, especially for encroachers.

2. Long-Term Usufructuary Rights for "Encroachers" on "Reserved Land"

In the two watersheds where SCOR was being implemented, there were considerable extents of land reserved by the state for purposes such as:

- reservations of natural streams and irrigation canals and reservoirs

[4] This was done by SCOR Research Associate, Samarakoon Banda, under the guidance of the author.

- forest land under Divisional Secretaries
- state forest under the Forest Department

Reservations have been established for a variety of waterbodies such as natural streams and lakes, and irrigation works such as reservoirs, tanks, canals and bunds, and tanks and bunds related to domestic water supply. As stated earlier, population pressure, landlessness, inadequate employment opportunities outside agriculture, and the prospects for making a living out of the exploitation of these reserved land have led to widespread encroachment of these lands by various individuals from the adjoining areas and even from outside. In certain areas, the latter group included not only poor families, but also commercial exploiters of forest. The preventive measures taken by the government, through the enforcement of existing land laws have proven to be ineffective. The SCOR strategy was to intervene effectively to arrest the neglect and degradation of the land by adopting measures to combine conservation and profits to users, mainly to "small farmer encroachers."[5]

To overcome the constraints in motivating the people to continue to adopt the land use practices promoted by the project and to make the tenurial relationship with the state more acceptable from the point of the government's objective of reserving the land for protection and other purposes, SCOR proposed to the government a set of changes in the current land laws and regulations as follows: [6]

- *Conservation-Based Productive Use of Land:* Specify and incorporate in lease agreements an appropriate land use pattern whenever the state wishes to give out state land to individuals on lease, or to regularize any current encroachments; such specification should be incorporated in the existing lease agreements, before considering any extension of the lease period.

  The usual practice with regard to the utilization of the above categories of land is to leased the land to individuals for cultivation of temporary crops under annual permits. There is no regulation of the type of crops that should be grown, which would minimize soil disturbance. SCOR considered that even though there are no accurate land use and evaluation plans yet available for different areas, it would be quite possible to determine a basic land use plan that would take care of the general principles of conservation and desirable land use practices appropriate to a given area.

- *Lease State Land on a Longer-Term Basis:* The usual practice is that state lands, except those under the Forest Department, are leased for periods ranging from 1 to 5 years only, implying a guarantee of a short-term tenure. Any extensions beyond one year, according to the terms of the agreement, is at the discretion of government authorities that have the powers to terminate the lease giving notice of one calendar

[5] It is believed that the organized group action by small farmers would also be helpful in protecting the natural resources base from big-time exploiters such as illegal loggers.

[6] These proposals were prepared originally by the author jointly with Paul Rajasekera, SCOR officer dealing with state-user partnerships. Subsequently, these proposals submitted to a committee convened by Rajasekera were adjusted slightly.

month. The lessee also has no right for compensation for any improvements that he or she may have effected on the land. Under these conditions, while some encroachers make long-term investments such as planting of tree crops, constructing permanent houses, etc., others attempt to get the maximum out of the land, which is mostly used for short-term food crops with little or no conservation measures. This has caused soil degradation and consequently the sustainability of the cropping system is also affected. As an incentive to adopt a conservation-oriented production system, SCOR attempted to promote a "sense of ownership." As was revealed in the previous analysis, this could be expected under longer-term usufructuary rights. This means, shared control or state-user partnership was considered as a sufficient tenurial arrangement. For example, if the farmer is given a 30-year lease he/she could be motivated to grow short- and long-term crops that would meet both conservation and production goals. It is important, however, that the state agencies that would come into long-term lease agreements with the resource users should have the right to inspect the land periodically to ascertain whether the resource users are following the terms and conditions of the agreement. The agreement, as suggested earlier, should include conditions that would allow the government to recover the possession of land in the event of a breach of the conditions by the lessee, such as any deviation from the conservation requirements. By this time, Watershed Resource Management Teams, WRMTs, were active in both the watersheds and it was suggested that this responsibility be assign to these teams. This would facilitate a participatory, instead of a bureaucratic approach.

- *Consider Membership in an Active and Recognized Resource User Group or Organization, as a Necessary Condition to Obtain a Lease Permit:* The strategy of resource user involvement through groups/organizations/companies in natural resources management was introduced by SCOR, not only to facilitate the fulfilling of individual needs of crop production and marketing, but also for other important reasons:

  conservation objectives could be met effectively by working through groups rather than through individuals (see chapter 6 for details),
  individuals recognized by groups/organizations/companies are bound by common objective of a group, and
  equity can be maintained by giving tenurial rights to groups/organizations or small farmer companies as against selected individuals.

These suggestions have been debated at several metings of the SCOR National Steering Committee and the NSC appointed a subcommittee (including SCOR staff) to workout the detailed guidelines and to make necessary arrangements to implement them. The committee comprised senior officials of the relevant government departments, including Forestry, Irrigation, Mahaweli, Agriculture, and Land Commissioners who looked further into the feasibility of granting long-term tenure to users. For example, in regard to the irrigation reservations, the committee agreed with the SCOR project proposals provided the following conditions are fulfilled:

the protection of the canal bund should not be threatened by the use of these reservations for cultivation of crops by farmers

soil in the reservations should not be disturbed in a manner that would endanger the protection of the canal

the sections in the reservations which may be required by the Irrigation Department to be used as burrow areas should not be considered for grant of such rights

any constructions such as buildings and wells or living in the area should not be allowed

the cropping pattern along the reservation should be approved by a competent authority on the subject to guarantee the planting of species of trees whose root systems will not be detrimental to the safety of the canal bunds

canal water should not be illicitly utilized for irrigation by siphoning or lifting or by any other means

in the event of seepage water from the canal reappearing in the reservation area such water may be used for cultivation. However, if any drainage is needed, such drainage arrangements should be made in a manner that would not either encourage further seepage or cause damage to the canal bank

if after the granting of rights to the user, any section of the reservation is required by the ID or the MASL for future irrigation system improvements or expansions, such areas should be cleared for those purposes.

The members of the committee visited the Huruluwewa SCOR pilot sites and examined the actual ground situation, especially the conservation-based production activities already in place in some "encroached" lands and the operation of the Watershed Resource Management Teams, WRMTs, where senior local officials of respective government departments played an active role. They recognized the WRMT as an institution where all responsible officials of the agencies dealing with land, water, and related functions and representatives of resource user organizations work together. For example, the irrigation engineer could play a prominent role in this team.

Finally, the committee agreed on the conditions that should be included in an agreement between the user and the state. The key aspects of the proposed agreement are listed below:

the signatories are the user and (on behalf of the government) the Divisional Secretary or his/her representative

a specific initial period of time, i.e., 5 years, is stated in the agreement but there is an additional clause to the effect that it could be extended with mutual agreement. During the first 5-year period (where the progress of conservation and production activities will be monitored closely) the period of tenure will be renewed on an annual basis. After 5 years it could be renewed once every 5 years, up to a total period of 25 years

both production benefits (to the user) and conservation are stated as goals
as long as the user maintains the conditions of the agreement, the government will look after the rights of the user, as per agreement
cultivation is limited only to the trees/crops listed in the agreement
the protection of the high-value timber already in the land is the user's responsibility
the user should not remove any valuable tree, soil or mineral resources without the permission of the Divisional Secretary,
construction of permanent buildings and roads or digging wells is prohibited
The user has the right to use the products including timber, fruits, etc. But to remove timber or trees he/she must obtain approval from the Divisional Secretary
It is user's responsibility to prevent fire damage
the user should not sell, mortgage, or transfer the land to any one else without the prior approval of the Divisional Secretary,
the legal user can nominate a person so that he/she could inherit the land if the death of the user occurs prior to the end of the contract period
this agreement will be subjected to the conditions stipulated in the Irrigation Ordinance. For example, the agreement should not be an obstacle to any improvements in the irrigation infrastructure
the period may be extended further (beyond 25 years) if conservation and production activities are conducted at a satisfactory level, and on mutual consent

The committee submitted the proposal to the National Steering Committee of SCOR and subsequently, it has been sent to the government authorities. Initially, there were delays in the follow-up. For example, claiming that the previous government was involved in illegal land transactions, the government imposed a ban on any transactions related to state land. Hence, there was a delay in the "follow-up" process at the initial stages. Subsequently, it has been approved by the Honorable Ministers of (a) Irrigation, Power and Energy, and (b) Agriculture, Lands and Forest resources. At present, the Attorney General's Department is involved in the finalization of the proposed usufructuary rights model and related land use guidelines. Meantime, the SCOR project has conducted several other experiments successfully. Some selected ones are discussed below.

3. Regularization of "Encroached" Land

While the efforts on a national-level policy change were in progress, several SCOR interventions have been successfully implemented in a number of sample sub-watersheds, working within the existing limits of government land laws. Total extent of land targeted to be brought under such pilot activities (for testing and demonstration purposes) was 500 hectares. However, by the end of the project, in the Huruluwewa

watershed alone, over 2,000 farm families had obtained regular land titles for their "ecroachments." [7] Two such interventions are described below.

Regularization of encroachments on state lands that are not considered as "vulnerable" has become a common phenomenon in rural areas, especially in the dry zone of Sri Lanka. However, it is a slow process. An investigation conducted by the SCOR project in the Huruluwewa area revealed the following as major reasons: lack of regular staff and lack of funds to employ additional staff, inadequate transport and other facilities, and political and other influences. The project organized a task force to design a strategy and process to expedite the regularization process. This task force comprised: the Provincial Land Commissioner of the North Central Province, the Deputy Land Commissioner of the Anuradhapura District, SCOR Team Leader, Huruluwewa, Divisional Secretaries of the three divisions, the Project Manager, Huruluwewa Irrigation Project and a few other local officials.

Based on the recommendations of this task force, the SCOR Provincial Steering Committee agreed on the following:

- to launch a planned and accelerated land regularization program in the Divisional Secretary areas of the Huruluwewa watershed
- Establish three "action committees" for the three areas with a clearly defined work schedule, responsibilities and a time schedule
- Pool, as much as possible, the resources of participating agencies and directe the resources to implement the plan
- SCOR project to provide supplementary funding, document the experience, and share the experience through a workshop

The major steps included the gathering of necessary information about the "encroachers," using a structured questionnaire, analysis of these data/information, re-checking/validating the information, conducting land *"kachcheri"* (meetings and interviews to select potential recipients), selection of recipients, examining objections, and prepare permits/titles.

Formal legal agreements were granted to farm families and the distribution of areas and numbers of farm plots is given below:

Garadiya Ulpotha and Rathmalwetiya.....250
Galenbindunuwewa.....175
Dutuwewa.....295
Tikkanpothana.....150
Kuda Galenbindunuwewa.....300
Kataranpura..... 200
Olugollawa..... 300
Upathgama..... 285
Tract 06..... 180

[7] On 27 September 1998, the author was invited to a ceremony by the farmer organizations of Huruluwewa, when over 2,000 titles were granted to the "encroachers" by the local government authorities.

Padikaramaduwa..... 195
Methgama..... 90
Maradakalla..... 270
Gomarankalla..... 375
Walana..... 190
Telabugaswewa-Ihalagama..... 200
Diwulwewa 215
Karuwalagaswewa..... 265
Meegaswewa..... 165

Total.....4,020

Mainly as a result of this collaborative team effort by the participating agencies and the high degree of "transparency" maintained, the process was a success. The outside influences were at minimum levels and the peoples' awareness and enthusiasm about the program as well as the level of participation were high.

4. State-User Partnerships through Participatory Forestry

SCOR worked collaboratively with the Forest Department, mainly with the Participatory Forestry Project, PFP, and utilized the 30-year lease rule, organized users for production, conservation and marketing, and motivated them to grow a combination of short-term field crops and trees of timber value. The PFP of the Forest Department began in the latter part of 1993 and was aimed at increasing the tree cover in the country through four models of participatory reforestation. The models are as follows: home garden development, establishment of "farmers' wood lots," protective wood lots, and planting trees along reservations of roads, streams, etc.

The reforestation strategy under PFP was different from many of the previous approaches. For example, reforestation was done in a participatory way, with the support of the people. The Department provided technical inputs and a subsidy but field activities were carried out by people themselves. Except for home gardens, the land is owned by the state. Nevertheless, the "de facto" control has been with local people and the land was used mainly for shifting cultivation. Each of the participants/resource users received "food coupons" worth of about US$425 per hectare, over a period of 4 years.[8] Another unique feature is that the farmers had the option of obtaining commodities such as tools, cement, fertilizer, clothes, books, etc., in addition to food, by producing the "food coupons" from the designated village cooperative shop. Also, the crops and trees they had established with the assistance of the project belong to themselves. They have the full right to claim all fruits, fodder, fuelwood as well as the timber. However, the trees established for protective purposes are not allowed to be felled or removed. The tree tenancy is secured signing an agreement between the project and respective farmers. The

[8] This is at current rates and was calculated at the rate of about Rs. 100(or US$1.5, at current rates) per working day.

agreement indicated the boundaries of individual blocks and contained clauses to protect farmer's usufructuary rights.

The PFP too deployed several catalysts. They performed a vital role in winning the confidence of the farming community and attempted to bridge the gap between departmental officials and the farmers. Their primary role was to motivate the farmers to plant and manage trees properly. In short, the PFP can be considered as a "social forestry" effort and it was a successful effort in sustaining forestry interventions. SCOR catalysts worked collaboratively with the PFP catalysts. The SCOR-PFP collaboration is described below, using a case, Garadiya Ulpotha (GU) sub-watershed.

Settlers in GU were organized and introduced to the PFP by the SCOR catalyst, with the assistance of agency officials and the PFP motivator. The program started in 1994 with 9 families who had been engaged in "illegal" cultivation earlier. Initially, they planted trees in their home gardens. This was followed by a participatory reforestation in a 10-hectare block of land. This block comprised degraded land with shrubs. First, the valuable timber had been removed illegally and subsequently the land was put under slash and burn cultivation, and eventually, people had abandoned cultivation due to fertility problems. The SCOR catalyst had organized people into a "farmer organization" and the organization agreed to divide the area into 26 blocks for 26 families, 9 from GU and 17 from neighboring villages. The PFP supplied teak seedlings and distributed food coupons. In addition, officials of the Forest Department provided advice on land clearing, planting, and maintenance work. SCOR played a major role in organizing the users.

By this time, the SCOR project has facilitated a process of market-oriented cropping in the Huruluwewa area and, as a result, the Huruluwewa Federated Farmer Organization managed to enter into a forward agreement with a private sector company to supply soybean at a fixed price (at a much higher level than the then prevailing farmgate price), which was required for a government-sponsored health program (ref. Chapter 10). Taking advantage of this, farmers participating in the PFP program cultivated soybean as an inter-crop with teak. At the time of harvest, the organization opened up a collection and purchasing center to purchase farmers' produce. The SCOR project assisted the program in organizing, monitoring during the production process, providing a small grant of Rs 21,875 (nearly US$400 at 1994 prices), and in marketing and quality control.

The initial success of the program motivated the PFP, SCOR and farmers to expand such collaborative work.

5. Land Consolidation in Minor Irrigation Systems

Small irrigation systems with less than 200 acres (80hectares) of command area are classified as "minor irrigation systems." There are over 20,000 minor/village tanks in Sri Lanka, but only about 11,200 are functional today. In the aggregate, they command nearly 13,000 hectares of irrigated land. Most of these are small tanks are located in the dry and intermediate zones of Sri Lanka, mainly in the Anuradhapura, Polonnaruwa, Kurunegala, and Monaragala districts. The Huruluwewa watershed has over 200 minor tanks. Most of the minor irrigation systems in the wet zone are small weir/anicut-based

systems. As mentioned earlier, the degradation of the physical and biological environment due to the exploitation of resources without due consideration to conservation such as removal of vegetation in the catchments, lack of control in the use of chemicals in agriculture, soil erosion, silting of the bed of the water bodies, (consequently) reduced capacity of the water bodies, low cropping intensity, and low productivity are major problems that these systems are confronted with.

Fragmentation of landholdings is a causal factor for low cropping intensity and low productivity. The average farmholding size has been reduced over years mainly due to the increased pressure of population on limited land and water resources and due to inadequate employment opportunities in the nonagriculture sectors. Consequently, family farms had been subdivided among children over generations. Farmers own land parcels of varying sizes and the extent belonging to a particular farmer is not in a contiguous block. Apart from other problems, such a situation leads to logistical problems and associated waste of resources, difficulties in achieving economies of scale, management difficulties, etc. At times, farmers abandon cultivation because it is judged to be uneconomical and difficult to manage.

Fragmentation of rice farms is more acute in the wet zone pilot watershed of SCOR, Nilwala. Each of most rice farm plots is less than 0.1 hectare. The SCOR project, experimented participatory land consolidation in several rice tracts and the experience of one such exercise is described below.

For this experiment,[9] two rice tracts, namely, *Dandenikanda* and *Pothuwila yaya* (named here as DK and PY, respectively, for convenience), in the *Aninkanda* sub-watershed have been selected. These two are in the village called *Thalapela Kanda* in the upper watershed of Nilwala. There were 32 and 29 farmers in DK and PY, respectively. An earlier study conducted by the Department of Agricultural Economics, Ruhuna University, concluded that the system of land tenure found in the rice subsector at *Aninkanda* "appears to be a deterrent to increased paddy production in the area"(Amarasinghe Oscar 1996, p. 31), and recommended to organize the farmers to correct land tenure problems enabling better utilization of resources and achieving increased rice yields.[10]

Two complex operational tenure systems, namely t*hattumaru* and *kattimaru* prevailed in the area.[11] In *kattimaru,* land is subdivided at the death or retirement of its owner, but each heir inherits, instead of permanent ownership, rights to particular plots or portion of the farm and rights to cultivate in turn each of the plots into which the farm is divided. The cycle is repeated annually or seasonally and any number of shareholders (depending on the number of children) may be involved. The logic behind the *kattimaru* principle is the equalization of chances of good or bad harvests in an environment where the relative values of different fields vary from year to year, according to such factors as

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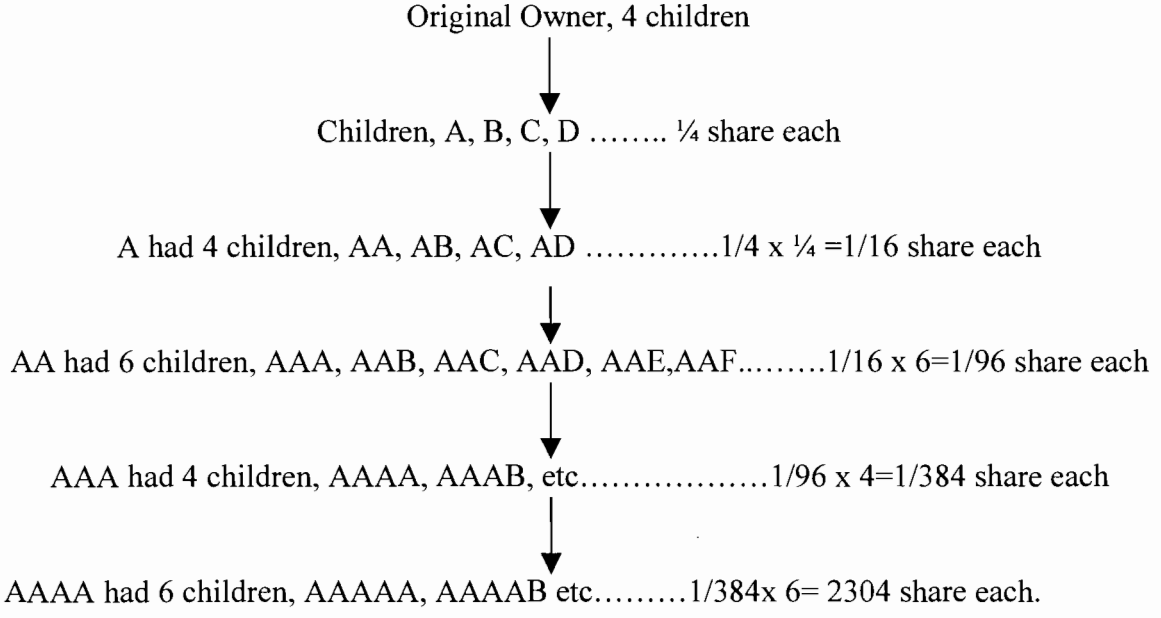
[9] Data on land distribution and the detailed information on the process were extracted from "Re-Organization of Land Tenure and Productivity Improvement in Low Land Paddy Sector" by Wijenayake, D. 1997- unpublished paper. Wijenayaka coordinated this experiment on behalf of SCOR.

[10] This reinforces the findings of the analysis presented in the previous chapter: for farm productivity, operational tenure may be more important than the landownership pattern. What is important is not "who owns the land," but "who operates and how."

[11] These forms are common in many of the paddy areas in the wet zonw of Sri Lanka.

soil quality, water supply, and incidence of attacks by pests and wild animals. The *thattumaru* method, on the other hand, had emerged after the recognition of the ill-effects of fragmentation and physical deterioration of the land. This system gives the right to cultivate the total farm in an annual rotation instead of physically dividing the land. The order of cultivation procedure is normally determined by the age; eldest child having the first opportunity. Thus this system prevents the subdivision of land. Sometimes, plots are given to an outsider for cultivation on the basis of sharing costs and /or profits or on lease (Amarasinghe 1996).

Amarasinghe has traced the pattern of inheritance of land shares in *Pothuwila yaya* and one such case is illustrated below:



However, one of the children of the present generation was enjoying a share of 1/360 of the original, indicating the difficulty in establishing the actual legal pattern of inheritance.

It is argued that a more sustainable solution to the problems prevailing should come from the creation of employment in other sectors. For example, expansion of the plantation crop sector in the wet zone, agriculture-based industries in the rural sector, and developments in the industrial and service sectors would create a "pull force" and consequently, one can expect a more productive land consolidation process in traditional farming areas.[12]

However, within the scope of the project, SCOR experimented the land consolidation process described below.

[12] It should be noted that SCOR was well aware of this fact and the project's experiment on small farmer companies goes far beyond the grouping of a few farmers for the primary production process (see next chapter).

It has been observed that a "shareholder" of a typical rice farm in the experiment area gets an opportunity to cultivate a plot once in 2 or more years. According the survey conducted by SCOR, the major problems faced by the users are as follows:

- Rice tracts and plots are not surveyed, actual extents are not known, and land boundaries are not properly established.
- Inheritance (as shown earlier) does not always follow a set pattern.
- In cases where parents are not legally married, the heirs face difficulties in claiming "ownership," which poses problems in court cases for partitioning.
- Lands cannot be transferred, sold or legally leased because there are no clear deeds.
- Farmer conflicts in "claiming the turn to cultivate" have become a common phenomenon, as a result.
- Irrigation facilities are not properly maintained, and proper amounts of inputs are not applied during cultivation. For example, some farmers think that if they apply fertilizer, the person who cultivates the same plot next would benefit.
- Difficult to apply the correct amounts of inputs without knowing the correct extent of the plot.
- Due to lack of collective behavior it is difficult to synchronize the cultivation activities across farmers, posing problems of optimum utilization of water, etc.
- Due to lack of maintenance of facilities, there is more sedimentation(Wijenayake 1997).

A series of awareness meetings were held with farmers and local officials. Subsequently, several task forces were established. For example, the agricultural task force, consisting of officials from the Departments of Agriculture, Agrarian Services, Export Agriculture, and Animal Husbandry and from the Coconut Development Board attempted to identify the constraints to different land use patterns and explore remedial measures. In addition to the problems listed above, the task force identified other problem areas such as the use of low quality seeds, ion toxicity, and weak farmer organizations and saw the potential for the use of advance farming technologies, establishing a seed farm, and the need for more coordinated production process and synchronizing cultivation practices and collective action towards input and output marketing, etc.

Following this, a general meeting of the farmers was organized by the farmer organizations and the need for and the mechanisms of land consolidation process were discussed when the community reached a consensus. The local officials, together with SCOR catalyst and the Coordinator, facilitated the discussions. Subsequently, the list of owners, extents of farms, distribution pattern, etc., were prepared in a participatory manner. For example, the oldest farmer of the village was the one who clarified the ownership pattern. Some farmers managed to make written submissions and showed the deeds they possessed. A few powerful farmers who did not agree with this process, protested and sent written objections to higher authorities of the Department of Agrarian Services who found that those allegations were baseless and against the wishes of the majority of the farmers.

Alternative ways of consolidating/pooling fragmented plots had been discussed and debated in a participatory and cordial manner, during these meetings. It was a time-consuming and tedious activity, for many reasons. For some farmers, it was very hard to leave the inherited land. Certain others thought there exist differences in productivity across plots in the same portion in a given tract of rice. This was considered and the differences were "assessed" by attaching a value system based on farmers' collective judgement. Such differences depended on factors like the distance from the source of water supply (and therefore the difficulty in access to water), shape of the plot and elevation, soil quality, potential for damage by wild animals, etc. However, in the end, the community reached a consensus on these sensitive issues. In few experiments, according to the farmers' wish, a lottery system was adopted. The complete list of extents of land owned by each and every member in the two tracts of rice together with other details such as the operational patterns, had been updated at every meeting and was finalized at the end. This entire process took seven general meetings.

The seven portions of rice fields in the two rice tracts (4 in P*othuwila yaya* and 3 in *Dandenikanda*) were surveyed during this process. A block out plan was prepared at the end of the survey, which was conducted by a surveyor and the blocking out activities were guided by the SCOR watershed coordinator, who happened to be an engineer. The cash costs of this activity was about US$250 and this was borne by the farmer organizations. The cost included the supply of a copy of plans to each and every farmer. The Divisional Secretary, with the consent of the farmer organization and individual farmers, issued the permits to the farmers. The distribution of plots at *Dandenikande*, before and after the exercise is indicated in table 9.2.

It should be noted that this land consolidation process was not conducted in isolation. It was treated as an integral component of a package of activities, including the establishment of a seed farm that, at a later stage, provided seed paddy even to farmers outside the area, the construction of two protection walls to minimize erosion, a campaign to use straw as organic manure, collective action and synchronization of cultivation practices, integrated pest control, the construction of an access road across the rice *yaya,* etc.

Table 9.1 Distribution of rice plots under old and new systems.

Landowner's no.	Area of land owned by farmers according to old system (perches)				Area of new allotments after the survey (perches)
	D	E	F	Total	
1	7.5	-	02	09.5	05.5
2	-	20	02	22.0	12.3
3	-	20	-	20.0	11.0
4	-	160	-	160.0	89.1
5	10	100	-	110.0	61.2
6	80	160	40	280.0	156.0
7	-	-	10	10.0	05.5
8	-	40	-	40.0	22.3
9	-	-	02	02.0	01.1
10	-	-	05	05.0	03.3
11	-	90	-	90.0	50.2
12	30	40	-	70.0	39.0
13	30	20	20	70.0	39.0
14	30	10	10	50.0	27.8
15	05	04	10	19.0	10.6
16	-	60	-	60.0	33.4
17	-	20	02	22.0	12.3
18	-	30	-	30.0	16.7
19	10	20	-	30.0	16.7
20	-	20	-	20.0	11.0
21	11	-	03	14.0	08.0
22	-	10	-	10.0	05.5
23	-	10	-	10.0	05.5
24	-	20	-	20.0	11.0
25	30	-	-	30.0	16.7
26	20	-	-	20.0	11.0
27	-	04	-	04.0	02.2
28	-	10	-	10.0	05.5
29	-	10	-	10.0	05.5
30	-	40	-	40.0	22.3
31	-	20	02	22.0	12.3
32	-	20	-	20.0	11.0
Total				**1329.5**	**740.5**

Note: D,E,F are three portions of the *Dandenikanda Yaya.*

Source: Wijenayake, D. 1997

CHAPTER 10

POLICY AND INSTITUTIONS: EVOLUTIONS OF FARMER COMPANIES

SCOR, at its design stage, recognized that the users' control over natural resources through group action and their active participation in making management decisions are vital prerequisites to improve 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. SCOR was built on the progress already made in Sri Lanka and elsewhere in irrigation management and social forestry. First, this chapter submits a brief outline of the different stages of the development of user organizations in Sri Lanka in the recent past, related to agriculture in general, and irrigation in particular. Next, it provides an account of the rationale for testing a novel mode of user organization in the context of the overall developments in the economy, especially with the market economic environment. Finally, in light of this discussion, the chapter presents the testing of "small farmer companies" under SCOR. Following the initial success of this strategy, the Government of Sri Lanka has accepted it as a policy and is in the process of facilitating the establishment of small farmer companies in the key production areas of the country.

It should be noted that according to the original SCOR design, the experimentation of user companies was recommended to be commenced in year 3 of project implementation, " with full implementation starting in year 6 in pilot areas" (IIMI/Sri Lanka Field Operations-SCOR Project Design 1992, p. 64). However, the life of the project was shortened and the experimentation on user companies commenced in 1995, the third year of SCOR.

Recent Developments in the User Organizations in the Agriculture Sector

Sri Lanka's experience in user organizations related to land and water, could be traced back to ancient times. However, in the forestry sector, until recently, the efforts have been focused, not on community or group work, but on laws (permissions or prohibitions) for individuals. In the early post-independence era, the institution of *Vel Vidane* (irrigation headman), established during the British colonial period continued to function. The Vel Vidane was appointed by the government and was given power to execute decisions for the operation and maintenance of minor irrigation systems. Late in the 1950s, this institution gave way to an elected committee of farmers known as the Cultivation Committee (CC). It was the Paddy Lands Act of 1958 that paved the way for both landowners and tenants to be members of cultivation committees (CCs), which were confined to irrigated areas. One task of these CCs was to help implement the land and the tenancy reform called for by law and another was to *plan local production including collective action* to use water more

efficiently and to protect the crops. The Irrigation Ordinance, introduced in 1968, was confined to irrigation areas. While defining several rights and responsibilities of the individuals, this ordinance legally recognized the long- standing traditional practice of holding seasonal planning meetings called the *kanna meetings.* Legally, this meeting, where farmers meet with officials of relevant government agencies to decide on a cultivation calendar, should be chaired by the Government Agent of the area or his/her representative (IIMI/SLFO 1992).

This institutional arrangement has been superseded by the Agricultural Productivity Law of 1972. Under this the CC was maintained but modified to deal with nonirrigation (yet agricultural) functions as well. Moreover, a higher level institution called Agricultural Productivity Committee (APC) was established to oversee the work of the CC. The APCs were empowered even to deprive the right of the landowners who did not utilize their lands as efficiently and intensively as possible. The Agricultural Lands Act of 1973 introduced agricultural tribunals. Later on, these were abolished and a new institution known as the Agrarian Service Committees (ASCs) and a cadre of officials called the "Cultivation Officers" were introduced. The ASCs were based in "Agrarian Service Centers." The ASCs included strong representation of officials, in addition to farmer leaders.[1]

Various informal experiments with water user associations, building on traditional community roles and responsibilities, as well as on the experiences in other countries, continued to occur. The USAID-supported Water Management Project begun in 1979 provided for experimental introduction of farmer organizations in the Gal Oya irrigation scheme and used a cadre of "catalysts" called the *Institutional Organizers.* By the end of the project, there were over 500 field channel farmer groups, federated through a structure of distributary canal organizations and area councils up to the irrigation system level, covering over 10,000 hectares with participatory management (Uphoff 1992).[2] The Gal Oya experiment has been quoted as a pioneering experiment on participatory approaches: "the participatory approaches to irrigation development *pioneered by the Philippine National Irrigation Administration and the Gal Oya Project in Sri Lanka helped inspire similar efforts in many countries including Indonesia and Thailand.* Irrigation agencies fielded workers to facilitate farmer involvement in design, construction, operation and maintenance of irrigation systems" (Korten and Siy 1988; Uphoff 1991; Manor, Patamatamkul, and Olin 1990, quoted by Bryan Bruns 1993, p. 1837).

Two other interesting experiments on organizing water users towards participatory irrigation management had been recorded, one by the Deputy Director of Irrigation who was responsible for managing the Minipe irrigation scheme, and the other by a Technical Officer of the same department at *Kimbulwana Oya* irrigation scheme. Even though both these efforts were on a much smaller scale, compared to Gal Oya, and

[1] These centers are being reorganized at present and the Agrarian Development Councils are being established at this level. At the lower level, there are over 10,000 farmer organizations, country-wide.

[2] This author had the privilege of leading the team involved in this pioneering experiment. This was implemented by the Agrarian Research and Training Institute of Sri Lanka in collaboration with the other government agencies. A team of professionals from the Cornell University, led by Norman Uphoff provided technical assistance throughout the experiment.

were not considered to be "action research," they can be considered as unique because they were not supported by external or project funding.

Primarily based on the experience of *Gal Oya, Minipe, and Kimbulwana Oya,* the government accepted participatory water management as a policy and established the Irrigation Management Division (IMD) to promote the same country-wide. The Agrarian Services Act was amended in 1991 to strengthen legal provisions for agricultural user groups. Farmer organizations established in major irrigation schemes can get legal recognition under this act. The amended act also gives farmer organizations, both in irrigated and rain-fed areas, the options of legal registration under the Commissioner of Agrarian Services, under the Cooperative Law as farmer cooperatives, or under the Company Law as farmer companies (IIMI/SLFO 1992).

Water user associations or farmer organizations for irrigation management have been introduced and replicated in Sri Lanka (and in certain other countries in the region) at a time when:

- Irrigation water was considered to be the most important limiting factor in the agricultural production process, and whilst it was considered as the major determinant of the income of the people in irrigated agricultural settlements.
- Large-scale rehabilitation efforts had been implemented for which farmer inputs were required to improve rehabilitation/modernization efficiencies and lower the project costs.
- Most of the irrigation systems, despite their heavy costs (of construction and operation) were operating at low efficiencies.
- As a measure of enhancing management efficiencies, there was a need to create a "sense of ownership" in the farmers' minds, through "shared control" or establishing partnerships between the government and the users.

Based on this past experience, the SCOR field program introduced methods for community participation in the planning for resource use and local management of natural resources available to the community. This included a process for community management of resources, as appropriate, and user group formation and small farmer companies to facilitate joint management and control of resources. In view of the recognized problems with common property management, the field program did not work exclusively with user groups; it also worked with systems of individual control and management within the context of community agreements and understandings.

The major *inputs* at the initial stages of SCOR operation were as follows:

- Surveyed, identified, and assessed the existing local organizations in the target areas to determine their willingness and suitability to work with SCOR.

- Conducted watershed-specific constraints analyses, in collaboration with individuals, user groups, officials, and NGO representatives. These analyses then assessed the current and potential statuses and uses of resources in the area and identified economic,

technical, informational, institutional, or legal factors that prevented resource users from managing and utilizing land and water resources (as well as labor and capital) to their best advantage. Other than some scattered experiences with "social mobilizers" in the provinces and with village irrigation systems, information on incentives and means for organizing farmers and other resource users in upland areas was limited. In such areas, the project helped organize user groups for environmentally sound novel productive enterprises.

- Helped user groups organize, register, and formalize agreements with the government. In some areas, particularly in the catchment areas, a few formally organized groups were already in operation. Working through organizers or "catalysts" and the NGOs, IIMI promoted the organization of groups, oriented them to sustainability considerations and to the benefits of organizing. In addition, IIMI supported them through the process of registration or legalization and obtained for them appropriate legal status and powers for recognition and access to financial and other services. The organizational effort in Nilwala and in the nonirrigated highland areas of Huruluwewa, was substantial and demanded most of the early efforts, whereas in the irigated command area of Huruluwewa linking the organizations with the companies and formal contractual agreements comprised the focus of the effort (see below).

- Trained user group representatives, including appropriate NGOs, in skills such as leadership, group dynamics, resource planning, sustainable practices, resource monitoring and reporting, financial management, assessing local skills and services, enterprise development, and marketing. The representatives trained were expected to take these skills back to their groups. To carry out this training, IIMI also involved currently active NGOs. In addition to this formal training, additional assistance was also provided through regular visits by the catalysts who themselves had been trained in these skills. *It should be stressed here that as suggested by the SCOR design (after careful analysis of past experiences), the project, being an action-reserch effort, relied much on experiential training.*

- Provided small grants for existing and new user groups (see chapter 5 for details).

- Provided a variety of items of information, analyses, linkages, and support services guiding the user groups through the establishment of commercial production ventures. Such assistance included, the provision of information and specialized services and expertise available from private firms, NGOs, or government agencies.

- Organized Watershed Resource Management Teams (WRMTs), comprising relevant government officials and resource users (see the section on WRMTs in this chapter).

However, in the present context, especially for small farmers to be actively involved in the "opened economy" the team, following the directions proposed by the

SCOR design, considered that the project should go one step forward in the evolution process of rural institutions. The team, among other things, considered the following:

a) the ultimate goals or expected impacts of irrigated agricultural settlements of Sri Lanka, mainly, alleviation of poverty, enhancing employment, income, and living standards of settlers, and
b) SCOR proposed market-oriented conservation. In this context, among other things, two issues are relevant to an initiative towards market-oriented conservation:

i. As stated earlier, water is not the only factor that need to be considered in the production process as well as in a holistic approach to natural resource conservation. In such an approach, it is not rational to separate water from soil or from other physical, biological, and socioeconomic factors involved in the production-conservation processes. The underlying argument is not to underestimate the importance of water, but to combine this resource judiciously with other non-water factors such as profitable crops/other enterprises, soil conservation measures, and other complementary inputs.

ii. "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 (TOR).* The project activities (classified under four themes) are aimed at an appropriate mix of TOR.

In light of these past experiences, the SCOR conception was that, organizing users into groups[3] *would facilitate in developing a process of linking users with markets (e.g., through forward contracting between the user group and private sector companies), appropriate technologies, and credit and information (or extension). In addition, providing users or user groups with appropriate legal rights (such as usufructuary) will provide an effective mechanism for "user- and market-oriented conservation."*

The Need for Multi-Purpose, Market-Oriented User Organizations to Promote Commercialization of the Small Farm Sector [4]

Under the present concept, Sri Lanka's future economic development and prosperity of its people demand rapid adoption of more practical approaches and strategies, if they are to be achieved through modernization and industrialization. In the presence of a dominant agriculture sector that still covers more than 50 percent of its population, provides employment to 39 percent of the total workforce, and has contributed 18.8 percent to the Gross National Product, GNP (CBSL 1996). Hence, strategies to achieve

[3] Here, as in the SCOR project proposal/ agreement, the term "group" is used in its broader sense, to include informal grouping of users at lower levels, formal organizations with legal acceptance, user councils, etc.

[4] This section of the chapter is based on one of author's earlier papers on this subject, "Role of Farmer Companies in the Sri Lankan Economy," Journal of Agrarian Studies, 1997

the country's development goals have to take off from its broad-based agriculture. In suppor of this, it should also be noted that nearly 80 percent of the people still live in areas classified as "rural," and which are predominantly agricultural areas. As such, modernization and commercialization of agriculture and agro-based industries could patronize substantially to achieve income and employment goals of the country. It would also help to mitigate any unfavorable rural-urban migration.

Over a period of more than a century under colonial rule, the economy of Sri Lanka was highly transformed. During this period, the development related to agriculture was biased towards an export-oriented large-scale plantations in the wet zone. The new plantation sector made deep inroads into the existing village economy, which became less and less adapted for supplying even the daily needs of the communities. This made Sri Lanka dependent heavily on foreign sources for its basic necessities. Subsequent to independence in 1948, the basic trends of the development policies were towards the development of the domestic sector to achieve goals of food production and employment in the face of an unstable export-oriented plantation economy. By this time, plantation sector had already utilized most of the resources in the wet zone leaving marginal room for further expansion

As such, prime attention was given to reclamation of the dry zone, where the prosperity of ancient Sri Lanka flourished due to its magnificent irrigation network. The activities included mainly the restoration of these ancient irrigation schemes, opening up of large extents of new agricultural areas, with massive investments in new constructions, and associated settlements, in an accelerated form. The objectives were to increase food production, utilizing improved technologies, and to create more employment opportunities. This strategy has remarkably contributed to the achievement of a "near-self-sufficient stage" in rice by the country (Wijayaratna and Hemakeerthi 1992; Barker and Samad 1998) and also to combat the increasing employment rate, at least temporarily.

As indicated in the introductory chapter, despite these massive investments and high cost of constructions in the irrigated agriculture sector during last few decades, the performance of most of the country's irrigated agricultural systems has not reached the anticipated levels. In general, the situation is characterized by low land use intensities, inefficient water distribution and usage, and deterioration of the delivery system due to poor maintenance and managerial/ institutional inadequacies. It has been observed in both irrigated and rain-fed agricultural systems that the pressure for the limited resources has created unfavorable conditions related to degradation of the physical production environments, leading to conflicts in social systems as well as to problems in the organizational/institutional systems.

In irrigated areas in the dry zone, key determinants of rice production such as yield level, areas cultivated, and cropping intensity did not show clear rates of growth (Wijayaratna and Hemakeerthi 1992) and the profitability of major non-rice crops shows a declining trend (Wijayaratna et al. 1996). Nevertheless, when all crops were analyzed as import substitutes, the results clearly showed that rice as well as other major crops had a comparative advantage for local production (Wijayaratna et al. 1996).

While highlighting the above experiences, it can be argued that a need has arisen to adopt an alternative process of diversification and commercialization in both irrigated and rain-fed areas in the dry zone and in the small farm sector of the wet zone. It should also consider that over 75 percent of the extent of each agricultural holding of the country is less than 0.8 hectare.

In contrast to the "pre-independence" period, today, in the plantation sector too smallholders constitute the majority. In light of the above, for efficiency, equity, sociopolitical and cultural reasons, we argue that the rural transformation or dynamic commercialization process should not lead to a status of "marginalized peasants." Therefore, in achieving the development goals, Sri Lanka's agriculture sector should make a substantial progress, particularly with the *active participation of small farmers to shift them from a state of poverty and underdevelopment to one of increasing dignity.* There must be opportunities for them to be actively involved in the market economy. This category of farmers is vital and if a conducive production environment is provided, they can produce food for the increasing population in rural areas and expanding urban centers while earning foreign exchange through exports.

To take off for this transformation, the new agricultural and agro-industrial development policy, in line with the *declared policy of the government to broad-base the benefits accruing from an open economic policy,* recommends to restructure the institutional base of production and related services. It is in this context that SCOR, within the scope of its learning process approach, launched an experiment on farmer companies.

Small Farmer and Market Economy

Within the various sectors in the economy, reforms relating to the agriculture sector are the most important ones. Policy measures concerning domestic prices and related marketing arrangements for agricultural production have often been recommended under various stabilization programs, where administratively fixed prices did not reflect scarcities. In other cases, reduction in government control and interventions was required to make prices more responsive to underline the demand and supply patterns. Where government agencies played an important role in state interventions in the market, institutional reforms of state-owned enterprises to improve their efficiencies, flexibility as well as greater private sector participation have been usually included in adjustment and stabilization programs (FAO 1989). However, this goal would be achieved only if a competitive and non-corrupt environment can be maintained in markets.

When agriculture dominates in a developing country, the performance of the economy would largely depend on the ability of agriculture to move ahead. This, "in turn, is determined by the pace at which the rural people respond and adjust to the growing integration of village economics with the larger national economy. It is necessary to keep in mind this human dimension of agriculture as liberalization would make it even a more critical determinant of agricultural and rural development" (Rao 1996 p.A-52).

In India, despite the fact that agriculture has been diversified and commercialized in the recent past, the number of marginal and small farmers has increased and there is a tendency for new entrants—"gentleman farmers" and the corporate sector—to displace traditional farmers. Commercialization tends to expose marginal farmers to enhanced market risks and it is recommended that these risks be monitored and appropriate institutional and infrastructure supports extended (Nadkarni and Vedini 1996).

In an open market economy, liberalization not only leaves economic activities open to the market forces, but results in a substantial withdrawal of the government interventions. The move to greater participation of the private sector in agriculture has not always been without problems. In a free market economy, every scarce resource is expected to command a price, which is determined by demand and supply forces. It is the profit motive that will guide the operation of this market system. Unjustifiable profits will be eliminated (through *perfectly competitive markets*) and the *resources will be allocated rationally* to produce a particular good at its lowest cost. If a producer fails to do so he/she will find his/her earnings decline, even to a point where he/she will be forced out of business by competitors.

In this context, with regard to the proposals for reducing farm price support levels in the United States, Claudius (1960) argued that perfect competition is neither an adequate model nor an appropriate norm for agriculture, as its assumptions can lead to a conviction that getting the government out of agriculture is an end to be sought as perfection itself. These assumptions insinuate (a) market conduct and performance characteristics such that market prices are equal to cost including normal profit, and (b) the production adjustments within and among agricultural production units through unrestricted entry and exit such that supply and demand become equal at satisfactory prices. It is implied here that any displacement from the equilibrium brings about automatic swift and precise restoration of the equilibrium again at prices covering the costs, including normal profits in the agriculture sector. Eventual equilibria are presumed to be consistent with an optimum allocation of natural resources, most efficient production, and payments to factors in accordance "with what they are worth" (Bandusena 1997).

Related to this issue, the macro economic perspective involves even higher risks. On a review of the liberalization experiences in Argentina, Chile, Brazil, and New Zealand, Valdes (1995) concludes that the highest risk for agriculture comes from the fact that getting inflation under control in most countries takes many years because (i) stabilization programs often lead to very high real interest rates, which adversely affect agriculture, (ii) the exchange rate is often used as a tool of stabilization and the real exchange rate appreciates sharply, thus reducing the competitiveness of agriculture, and (iii) in cutting spending to reduce the government deficit, since governments often cut spending on infrastructure and other public goods required for agricultural growth. Sri Lankan agriculture has little room to avoid this risk.

Assessment of the impacts of economic liberalization on the agriculture and food production sectors have been relatively limited, partly reflecting the particular concern of institutions such as the IMF and the World Bank with monitoring the performance of the economy as a whole. However, as in the case of aggregate growth, the limited evidence

that is available points also to a mixed impact of liberalization on the agriculture sector (FAO 1989).

According to elementary economic principles, it is clear that a set of basic conditions should prevail in the "market economy," if the country is to derive maximum benefit from economic liberalization. These include a) a perfectly competitive production environment, with a large number of producers operating, b) perfect knowledge and the access to an efficient and transparent information system to provide complete knowledge of prices and other related market situations, technology, etc., c) efficient allocation of resources, d) operation of a large number of firms in marketing of inputs and outputs, e) easy mobility of factors, f) no restrictions for exit and entry in production process and in input and output markets, g) homogenous products, etc. Obviously, Sri Lankan markets do not meet some of these basic conditions on which (according to the basic economic theory) the efficiency of markets is determined.

Small Farmer "Survival" through Market Failures

We argue that it is not easy for hundreds and thousands of small farmers to exit from agriculture. An adequate "pull force" is required to provide realistic alternatives and to absorb the displaced. In addition, vast information asymmetries exist in regard to agricultural input/output markets in the country. Manipulations and corruption in markets and difficulties in creating a perfectly competitive environment, etc., are notorious.

Commercialization and diversification of agriculture and agro-industries are necessary for Sri Lanka to achieve its goals of income, employment, and food security. But, as stated earlier, this process should not lead to a dynamic and commercialized agriculture *with stagnating or marginalized* peasants. Instead, the small farmers, who form an overwhelming majority of the country's population, should actively participate in the proposed agricultural transformation. This is in line with the declared policy of the government to broad-base the benefits accruing from an open economy. To maximize the benefits derived from economic liberalization, creating the basic conditions/environment required for a market economy is necessary. Market imperfections—including manipulation and corruption in markets related to small farmer production should be corrected. Exploitation occurs in an environment where perfect conditions for economic liberalization do not exist.

It is argued that farmer companies can tangibly address these issues while capturing economies of scale, producing competitive economic ventures, and harnessing the skills of educated youth in the small farm sector.

Why Farmer Companies ?

Certain farmer organizations established under various legislature and institutional reforms discussed in the previous section have emerged as forceful pressure groups and they have manage to organize water distribution, input supply, and, in a limited way, sale

of production. The fact remains, however, that a major breakthrough was not seen to ensure small farmer's economic and social well-being through profitable economic ventures. The farmer continued to be the victim of the vagaries of weather, as an individual. The absence of a combined set of interventions to promote year-round cropping, crop scheduling, value-added production, and other agro-industries, market links in the form of forward contracts of sufficient scale as profitable business for farmer organizations, the absence of procedures for decision making in the implementation of trade policy sensitive to farmers, promoting partnerships between farmer organizations and the organized private sector as well as between the state and farmer organizations—all these remained obstacles.

On the other hand, farmer companies have better legal power and recognition and are readily accepted by the organized private sector. This is an important condition for business ventures. For example, farmer companies could establish legal contracts with organized private sector companies for forward sale of agricultural products. Moreover, farmer companies are independent business organizations, which could avoid political and other problems. *Investments through farmer companies can produce competitive economic ventures for which a necessary condition will be the partnerships with the organized private sector and the State.* Further, one of the biggest national riddles, for which a sustainable solution has not been found by any government with continued donor assistance, is the inadequacy of income-earning opportunities for the landless rural youth. Farmer companies can tangibly address this issue and also harness the skills of the educated youth in making most of them important actors in profitable business.

Farmer/Resource User Companies, Farmer Organizations, and Cooperatives

Unlike in the Sri Lankan cooperative sector or in farmer organizations (FOs), in farmer companies the shares are marketable and there exists a direct association between equity participation and voting power. Moreover, farmer companies are less susceptible to political, bureaucratic, and other pressures. Based on the experience of the Shared Control of Natural Resources (SCOR) Project in Sri Lanka, it is argued that FOs can justify their existence within the farmer company framework. The FO is a device for collective operation (in the primary production process) rather than an economic or a profit-making organization while the farmer company is a profit-making firm that can afford to invest in capital-intensive market functions while opening equitable opportunities for a given member to benefit. The company can afford to bargain in the market and has the potential of taking the natural resources (chiefly land and water) endowments and technology into consideration in an economically and socially optimal manner.

Cooperatives, on the other hand, are "associations of persons with common needs, who join hands for self-protection, promote social cohesion, encourage individual initiative through collective actions. Cooperatives have an ideological base, economic objects, and a social approach. They are based on social parity and equality" (Dwivedi 1996, p.714). The concept of cooperatives was born in England in 1844, in the environment of a free economy to *protect consumers* against exploitation by the traders.

It can be argued that exploitation occurs in an environment where perfect conditions for economic liberalization do not exist.

"Even today in the highly market-oriented countries like the USA, Scandinavian countries, Japan, etc., cooperatives play a significant role in influencing markets. In the USA, for example, cooperatives annually account for nearly 70 percent of fluid milk, 80 percent of fresh fruit, 35 percent of agricultural credit of all types, 30 percent of grains, oilseeds, and a major share in the rural electrification production, transmission, and distribution; the bulk of fertilizers and petroleum is handled by the cooperatives. Similarly, in Japan, cooperatives are fairly strong in the field of agriculture, consumers, fisheries and forestry" (Dwivedi 1996, p.723).

In companies, shares are marketable. Therefore, shareholders are interested in speculating potential gains from buying or selling stocks. This in turn could provide an incentive for them to monitor the performance of their firm. In cooperatives or farmer organizations, shares, in general, are non-tradable. Moreover, unlike in companies, there is no direct association between equity participation and voting power. Usually, as in the case of Sri Lanka, cooperatives and farmer organizations are comparatively more susceptible to political, bureaucratic, and other pressures.

Farmer organizations and farmer companies are expected to perform different roles at different levels and it is maintained that the farmer organizations can justify their existence within the farmer company framework. The major attributes of farmer organizations and farmer companies, as experienced in the Shared Control of Natural Resources (SCOR) Project (see next section) are:

i. *Farmer organizations.* These are more useful as primary organizations.[5] They are proven to be useful as an initial/preparatory step for collective functioning with conservation-oriented production activities. In SCOR Huruluwewa area, the farmer organizations performed an important role in organizing production, acting as an "agent" between the individual farmer and their company, in regard to input supply and output marketing. A farmer company, having the comparative advantage in bargaining and entering into forward contracting with the organized private sector, offered attractive production (in terms of crops) and marketing opportunities to farmers through their organizations. Members of farmer organizations and informal groups have "one vote for each member." The author's experience in introducing and working closely with both farmer organizations and farmer companies suggests that in the former, specially in irrigation-related ones, the success depends much on the active participation of the majority of the membership (or sometimes the full membership) in day-to-day operations. For example, within a field channel, if one or two "head enders" do not participate, the objectives of the group formation, such as equitable distribution of irrigation water, may not be achieved. However, in farmer companies, it is not necessary for the majority of the shareholders to actively participate in day-to-day operations. They will participate in major decisions, for

[5] Informal farmer groups can operate at a lower level. For example, in irrigation systems it is useful to organize farmers, first at the field channel level. Usually, these groups are federated upwards to from distributary canal level organizations and system level organizations.

example, in annual general meetings where major decisions are taken, the Board of Directors is elected and the "profit and loss account" is presented. Finally, even today, most of the farmer organizations in the country are "dependent" on the government bureaucracy.

ii. *People's companies.* As argued earlier, farmer organizations, in general, have not engaged in large-scale business ventures. On the contrary, in promoting farmer companies, we assumed that they would go for relatively large-scale business ventures/investments. At the same time, small farmer companies are aimed at small farmer development for active participation in production and resources conservation, and can take the natural resource endowments and technology into consideration in an economically and socially optimal manner. Following company principles, they will have votes in proportion to the value of shares owned. It has been proven by the Hurulu and Dambulu farmer companies (see below) that by limiting the volume of shares that can be owned by an individual, and by allowing farmer organizations to invest their savings in farmer companies equity can be maintained according to the membership desire. The experience of SCOR confirmed that the farmer companies are capable of "acquiring" a substantial bargaining power, and would be strong enough to combat corruption and help evolve competitiveness in input and output markets.

Agrarian Value System

The discussion in the previous section leads to the conclusion that the environment necessary for market forces to yield benefits (desired by the market economy) should be considered in designing a path to economic liberalization. A related important issue of concern is the agrarian value system prevailing in rural Sri Lanka. A detailed discussion of this subject is beyond the scope of this chapter. The value system consists of several features that are relevant to those who design/facilitate competitive markets in the agrarian sector. First, a large number of small farmers consider farming as a *way of life* and as a *family enterprise*. They would prefer to minimize "shocks" and risks. Given that farming is the predominant form of employment in rural Sri Lanka, it is quite natural that farmers are reluctant to take risks. But commercialization and modernization are associated with input and output profiles that are widely different from existing patterns and are associated with risks.

Similarly, concerns related to equity and resources conservation can also be quoted as important characteristics of rural agrarian value systems.

Countervailing Power

An important feature of the competitive market is that there are many sellers as well as buyers, each with a small share of the total market. This can be identified as a "check" on the private exercise (or "exploitation") of selling or purchasing power by certain firm(s).

Such a check is provided by other firm(s) on the same side (sellers' side as well as buyers' side). However, at the expense of weak suppliers or customers, a firm or a few of them may establish a strong market position. This in turn may disturb the most efficient operation of the economy. Under such circumstances, it may be healthier if the firms on the other side exert pressure to improve the competitiveness of the market. Introducing *countervailing power,* Galbraith (1962, p. 11) stated, "with the widespread disappearance of competition in its classical form and its replacement by a small group of firms if not in overt, at least in conventional or tacit collusion, it was easy to suppose that since competition had disappeared, all effective restraints on private power had disappeared..... In fact, new restraints on private power did appear..... but they appeared not on the same side of the market but on the opposite side, not with competitors but with customers or suppliers ..... and I shall call it *countervailing power.*"

In the case of agriculture, "the farmer was often made to pay clearly for his lack of market power. It was this that led him to search long and hard for a formula for expressing effective countervailing power" (Galbraith p.155). Instead of trying to destroy the monopolistic or oligopolistic powers of those to whom they sell (or from whom they buy), farmers can build their own market power.

Farmer Companies in Production and Marketing

Production inputs such as credit, seeds, fertilizer, and technical information must be available at reasonable effort and cost to the producers. The total cost to farmers, particularly to smallholders, often includes a high proportion of "transaction costs," monetary and nonmonetary payments associated with obtaining necessary approvals, ensuring timely availability of inputs, etc. Some of these input constraints as well as costs can be reduced through organized group action. Two aspects are important here:

- The ability to organize group action thereby achieving economies of scale.
- The availability of support services and access to inputs.

It is argued that the *integration of the small farmer production process with the process of (value addition and) marketing can be done in a cost-effective and an efficient way if the small farmers are organized into companies.* If the production units/farms are sufficiently large, then direct buying by retail chains and processors from producers could reduce losses, improve market efficiency, increase farm profits, and serve the consumers effectively. However, in a country like Sri Lanka, where a large number of small farmers are operating in tiny holdings dispersed over a large geographical area, the condition is different, and *poses difficulties even to the middlemen in capturing economies of scale or the benefits of specialization.* Difficulties that exist in receiving information on competitive markets, higher transportation and handling costs, inadequate access to credit, and lack of organization (that are preconditions for achieving economies of scale) in collection, handling, storage, transportation, etc., have led small farmers to sell their

products in local markets or to middlemen, immediately after harvest. The difference between the price received by the farmer and the consumer price at distant central markets far exceeds the transfer costs (and justifiable profits). Moreover, the existing process contributes to high post-harvest losses. It is argued that, farmer companies, as a facilitating organization can guide (through forward contracting, maintaining collection/bargaining centers and warehouses, etc.) and participate effectively in the procedures of trading so that competitive pricing results.

There exist a variety of transaction costs. Total transaction costs is an aggregate of the costs of these different forms of transactions incurred by various participants involved in the chain, from cultivation and production through marketing. Because of economies of scale, other things being equal, the average transaction cost decreases as the size of the transaction increases. Let us assume that there are *n* farmers who have now formed a company and become shareholders. The supply function of the company can be obtained by aggregating the individual functions of *n* farmers. Let the transaction cost (at the margin) of a farmer as an individual, before joining the company be α_i. If not for the company, the aggregate cost of all the farmers would be $\sum\alpha_i$. However, as the company could capture economies of scale, the transaction costs of the farmer company (α) would approach $\sum\alpha_i/n$.

Credit for Economic Ventures

An analysis of the credit market of the Indian peasantry revealed that "borrowers' tangible assets and income act as entitlement or vehicle to credit markets." Then the only sustainable means to increase poor farmers' access to the institutional loan market would be to enhance the size of their *"entitlement set."* Given the status of the poor/small farmers, this would only be possible provided they form groups (Basu 1997, p.276). Such group action would also eliminate the problem of economies of scale and reduce transaction costs as well as the risk of credit agencies.

The provision of credit directly to the individual users through state-sponsored programs, which have several dimensions has been a salient feature in the smallholder agriculture sector. First, the practice has proved to be unsustainable since it breeds defaulters with the end result of writing off loans by political processes. Second, it does not lead to recognizing the importance of improving user's creditworthiness that could lead to action, improving credit rating of the individual user. Third, it does not recognize the important transactions with *user organizations* dealing with viable economic ventures in which the individual users are a part. Fourth, it demands certain types of collateral that small-scale users find difficult to produce. Fifth, it involves time-consuming and complex processes of bureaucracy or red tape. Sixth, it incurs heavy administration costs. Because of such costs and high rates of default, the interest rates, if not subsidized, are exorbitantly high. This is true for some existing banking systems as well. The subsidized credit programs of the government take the form of a relief or rescue operation to small farmers but they would be a burden on the government budget. These deficiencies do not

facilitate the emergence of a production environment that would motivate users to engage in profitable economic ventures in an *open market setting*.

The concept and strategy of the Shared Control of Natural Resources (SCOR) Project for integrating conservation and production, recognized that credit to natural resources users should finance/supplement an economic venture. This recognition hypothesizes that a demand would be created for:

- *organization*, such as a farmer company, where small-scale users could collectively plan their individual economic ventures, and use community action on discipline for credit repayment
- *information* on technologies related to crops of comparative advantage, processing/ value-added, markets, transport, legal contracts, banking, etc.
- *mechanisms* among lending institutions to lower transaction costs, and offer better packages of support with relaxed procedures in supply of credit

It is hypothesized that such a demand could activate processes of supplying such support, which itself will generate much complementary activity that would enrich production planning and scheduling, *forward contracts*, exploration of new markets, and other diversified economic activities. Based on such productive activity, the state could provide support where necessary to user organizations or companies to receive loans (or grants at the take-off stage of the company/organization, which will eventually be rotated among organizations or companies, which are at "infant" stages) that would be used as collateral to raise bigger packages of credit from lending sources. SCOR provided such grants to be used as collateral utilizing the project's sub-grant component.

Process of Establishing Small Farmer Companies—SCOR Experience

The SCOR Project assisted farmers of Huruluwewa and Nilwala watersheds to "produce for identified markets" using the methods already discussed. Forming farmer companies as an organizational arrangement has been tested by SCOR to explore the possibility of the small farmers to pool resources through profitable business ventures. In the following section, major steps involved in the formation of small farmer companies are described. Major activities undertaken (or planned, in the case of long-term strategic planning) under each stages of the process of company formation are briefly discussed below, with special reference to the Huruluwewa Farmer Company (HFC) facilitated by SCOR.

Major Steps Involved and the Establishment of the Huruluwewa Farmer Company[6]

[6] Marketing and enterprise specialist of Huruluwewa SCOR team, N.K. Adikaramge coordinated this process of the formation of HFC, with the support of the Team Leader, catalysts, other professional staff of SCOR and the officials of relevant government agencies.

Based on SCOR experience, five broad steps can be identified in the formation of small farmer companies in the rural agriculture sector of Sri Lanka:

- ***Create Awareness, Organize Farmers, and Plan.*** As indicated above, the catalysts and other professionals should first initiate dialogue within the community and discuss with farmers as well as with the relevant local officials about the need and opportunities for establishing a farmer company, the process (who will do what), the potential threats, etc. In this process, the farmers, catalysts, and other important local officials should identify the differences as well as complementary relationships between already existing farmer organizations and the proposed farmer company. This is helpful in identifying the right kind of leaders for the company.

- ***Identify Business Opportunities, Plan, Organize, and Implement Business Venture(s):*** The SCOR experience suggests that it would be difficult to establish a farmer company just by persuading farmers to contribute share capital. A great majority of members of the farming community operate at subsistence level and, therefore, at the outset, the market facilitator, other technical staff, and farmers may select a few enterprises that have a good market potential.

  For example, the Huruluwewa Federated Farmer Organization (HFFO), with assistance from the Irrigation Management Division, Irrigation Department, staff of other line agencies such as the Department of Agriculture, launched a water management program in the wet season of 1994/95 and saved water for the next dry season. SCOR facilitated this process.

  Next, SCOR provided information on the market potential, enabling the farmers to select a cash crop (soybean) for the dry season an arranged, in consultation with the HFFO, a market link between the HFFO and a private company (Thriposha Ltd.) that provided soybean to the Ministry of Health to be used in a country-wide nutrition program. The underlying assumption was that forward contracting systems could help small producers to minimize fluctuations of income due to undesirable changes in price, which could be caused by factors such as seasonal changes in weather (which could lead to surplus production that would lower the price), and corruption and malpractices in the output market, etc.

  Production scheduling and other arrangements for cultivation, harvesting, collection, storage, transport, and other post-harvest operations as well as monitoring were conducted jointly by the HFFO, line agencies, and SCOR staff. With SCOR assistance the HFFO obtained two loans, each amounting to Rs 4 million, from a state bank (People's Bank) and from the Ministry of Agriculture, Lands and Forestry Resources.

  Activities undertaken during this initial stage could be identified as follows :

  a) Review of current income/profit-generating activities and identification of new activities with high market potential.
  b) Make arrangements for entering into a forward contract.

c) Arrange for production planning, input supply, credit, other production-related activities, and monitoring and evaluation.
d) Monitor production and make arrangements for post-harvest requirements as per contract.
e) Motivate farmers/farmer organization to build up initial share capital (or pool part of profit earned from business).

- ***With That Initial Profit, Formally Establish the Company.*** *Farmers received Rs 20/kg of soybean, a price which was about 50 percent higher than the normal farm-gate price (offered by intermediaries).* The HFFO initiated dialogue on the formation of a farmer company. SCOR facilitated this process and provided technical inputs. In addition, SCOR provided loans worth of Rs 1 million to farmer organizations to purchase soybean from farmers. These funds were given to the federated farmer organization, the HFFO, and the HFFO used this as a collateral to obtain a loan of Rs 4 million from a local bank. Four major collection centers had been established for the convenience of the farmers and the local farmer organizations were actively involved in purchasing soybean. Despite the fact that the HFFO had an "agreement" with the private sector company, numerous problems were encountered when they brought the soybean stocks to Colombo. The leader and staff of SCOR helped solve such problems faced by the farmers at this infant stage of the evolution of "small farmer companies" in Sri Lanka. Whether a reseach organization should get involved in this kind of assistance, however, may be questioned.

  The total accumulated capital was Rs 1.4 million (each farmer allocated Rs 2 per kilogram of soybean sold, to purchase company shares). The Huruluwewa Farmer Company, HFC, was registered by the Registrar of Companies, under the Company Act on July 03, 1996. By this time, the company had a constitution or memorandum of articles, a board of 7 directors, etc. Subsequently, the company recruited a manager. The general steps in this stage included:

  * determine geographical area/membership partners/shareholders
  * build up share capital
  * establish constitution and memorandum of articles
  * elect the board of directors
  * register the company (legalize the company)
  * appoint a manager
  * develop business plans in consultation with farmer organizations/groups
  * carry out production scheduling, organizing production, monitoring, collection, processing, storing, marketing etc.

- ***Expand Business and Diversify Business/Activities***

Subsequently, HFC initiated several business ventures including a sales center for agricultural inputs and produce. The steps/activities at this stage would include:

* determine staff requirements/recruitments
* recruit management staff
* procure office/storage space
* operationalize production and marketing links
* negotiate for forward contracts
* plan and implement processing and value-addition ventures for farm products

- ***Long-Term Strategy, Planning and Sustainability/Stability***

Huruluwewa farmer company is now at this stage. Given its capabilities and the constraints it faces due to market failures such as inadequate competition, corruption/ 'rent seeking behavior," etc., it may take few years for the HFC to get fully stabilized. This step, among other things, would include:

* expanding infra-structural facilities such as for processing and storage
* setting long-term production and other business targets
* establishing a farmer bank
* involving in forming a few more companies in major agricultural areas of the country[7]

It should be noted that there can be a substantial overlap in these stages/events. For example, identification of business opportunities, creating awareness, and organizing production may take place simultaneously. The majority of the resource users may well understand the need for a people's company at the very early stages of the process while for certain others, it may take some time. As argued earlier, unlike in water user organizations where the awareness and active participation of all the members (for example, all those who share a field channel) may become essential, in a people's company, understanding and active (and equal) participation of each and every member in the company development process is not a necessary condition. However, as the company would establish norms and rules to maintain the degree of equity they desire, those who do not fully understand the process or who are not actively involved in company activities will not be deprived of sharing benefits. The SCOR experience is that, it takes time for certain people to fully understand the concept of and the need for people's companies. Also, as there can be various forms of interference and organized disturbances, certain resource users may be "confused" at the initial stages.

The Need for Market Facilitators/Catalysts

At the initial stages of this process, SCOR staff performed the functions of a change agent/catalyst as well as a market facilitator. The role of a catalyst/market facilitator is outlined below:[8]

[7] At present, following the SCOR experience, the government is heavily involved in establishing a large number of companies in several districts of Sri Lanka.

1. Identify and estimate market potential for selected agricultural enterprises (crops, livestock), fisheries, etc. For scheduling production in a given farmer company, the initial role of the market facilitator would be to inform the *farmer company* and other technical officers (such as the Agricultural Instructor, relevant officers of the Departments of Agrarian Services, Irrigation Department, etc.) of the availability of markets for enterprises that would match with the agro-climatological and socioeconomic conditions of the area.

2. *Estimate the production* of these selected enterprises *jointly with the farmers* and then arrange for *forward contracts with identified markets/buyers*. In this way, the facilitator will link the producer groups/companies/organizations with potential markets/private sector firms. This process will include market surveys and discussions with buyers and farmers, providing market information to the farming community, training farmers on the required quality, quantity, and grading, and other aspects expected by the buyers, etc.

3. *Monitor the feasibility of meeting the contractual agreements* by the farmer organizations/companies. For this, he/she will join the local staff of government agencies such as agriculture, plantation, and agrarian services in checking, on a monthly basis, whether there are any constraints faced by the farmers in the production process, which may affect the quantities and quality standards included in the forward contracts or other agreements. If the organization or company is unable to produce the required amount, this will be known in advance (based on monitoring information) and the market facilitator will assist the company, purchasing the balance amount from other areas of the country to meet the contractual obligations. The monitoring process will be a joint exercise involving farmer organizations/ companies.

4. *Arrange for expert advice* as well as *other needs* of the organization/company. These will include all aspects of marketing such as storage, cropping, packing, transport, etc. The objective is to evolve the required business mode of operation within the organization/company.

5. *Be accountable to the producer's organization/company.* During the pilot phase, the market facilitator will be paid by the project. However, the performance of the facilitator will be evaluated jointly by the farmers and the government or the respective facilitating agency from time to time. After 2 years, the facilitator is expected to be absorbed by the organization, or the company will select and employ someone else.

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[8] This was required at the "take-off" stage. At a later stage, farmer companies will employ their own staff for such purposes.

Problems—Manager's Experience[9]

- At the bank, he experienced much red tape. More often than not, even for small transactions he had to spend hours in the bank. The bank officers did not treat him as an important customer. This situation caused delays in purchasing activities of the HFC; for example they did not have adequate funds in time to purchase soybean from the farmers. *This led some farmers to sell their produce to "middlemen" at a lower price.*

- Sri Lanka has a very poor record of small farmer credit. Recovery rates have been extremely low for all types of formal lending. However, the HFC has paid back millions of rupees worth of credit they obtained, since its inception, with interest. Sri Lankan banks have no record of lending such amounts to any farmer group, organization or a company in the past. In short, the HFC has an exceptionally high rating in regard to creditworthiness. Nevertheless, it has been extremely difficult to obtain loans from the bank. Certain commercial banks and a few other private firms, institutions, and individuals are either reluctant to accept or not yet convinced of the capacity of farmer companies. To quote an example, early this year (1998), the bank agreed to issue a loan to the HFC against the purchasing of soybean from farmers. There was a Cabinet approved forward contract with the Thriposha Ltd., to supply soybean at a fixed price to be used as a major ingredient for a government sponsored health program. The earlier understanding was to accept the stock of soybean as the "collateral." However, at a later stage, the bank demanded that the Board of Directors should submit their private assets, as a bond (or collateral).

- Lack of vehicles of its own for the farmer company. At the time of soybean collection, the manager used to ride on a motor bicycle with large sums of money to make payments for the farmers and settle the accounts of collection centers. The farmers' board of directors and the manager had expected the SCOR Project to donate the HFC one or two vehicles. For private investors there are a number of concessions available such as duty free importation of vehicles, other tax holidays, soft loans, etc. However, farmer companies are not entitled to such privileges and, as mentioned earlier, they are not "accepted" as "good customers."

- Because of the inadequacy of the professional staff, sometimes, it was difficult to cope with the workload. For example, in the past season (1997/98 *yala)*, the board of directors requested the manager to take charge of soybean purchasing from the farmers. Hence, he had to visit the collection points daily to supervise the purchasing. As a result, he found it was impossible to do a perfect job with regard to "office work."

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[9] This analysis is based on: a). author's personal contacts with, farmers, The manager and the Board of Directors of HFC and Government agencies. After leaving SCOR, the author spent his "week ends" with these people at Huruluwewa. Author, however, never visited Nilwala, since he left SCOR in December, 1997.

- The HFC is engaged in business worth of millions of rupees but it does not have a separate professional (cashier) to deal with money and related transactions. The manager, in addition to his other duties, has to deal with the bank, and is involved in all other transactions on a day-to-day basis. He is given only an accounts assistant.

- Difficulties in dealing with certain farmer organizations. In input and output marketing, the farmer organizations are supposed to work as "agents" of the farmer company. In addition, the FOs are expected to involve actively in organizing the production process. However, all the farmer organizations are not equally strong. In some organizations, only the president and secretary were involved in the purchasing and some of them have not yet settled the accounts.

Problems due to Market Imperfections

The most serious or threatening problems faced by the HFC, no doubt, are due to market imperfections.

Currently, the private company that has entered into a forward contract with the HFC has already breached the contract and has started purchasing soybean from a middleman. The Ministry of Agriculture had to interfere and this has been brought to the attention of the Hon. President[10]. The purchaser claims that there were impurities in the stock supplied by the HFC. However, according to the contract, the purchaser has no right to bypass the HFC and purchase from a middleman. Based on the interviews conducted by the author, it was clear that the board of directors and the manager of the HFC, as well as the general membership are frustrated with this incident.

From the inception there were serious threats to farmer companies.

Need for a Strategic Plan to Overcome Difficulties

Banking

The bank supported the HFC at its inception. It would have been nearly impossible, for Huruluwewa farmers to establish the HFC or for the HFC to "take off" without this impetus. This was primarily due to the understanding and commitment of a few senior officials attached to the bank at different levels, including the local branch on the doorstep of the HFC. Similarly the problems encountered by the HFC at present too, are a result of undesirable acts of a few officials. In the author's view, until a perfectly competitive, non-corrupt, and efficient system is established in the Sri Lankan commercial banking sector, the Huruluwewa Farmer Company must have a senior person with good personal contacts, as the manager. This person should be fully aware of these short-comings in dealing with the banks in the "private sector" and should be capable

[10] As a result, the HFC hopes that it could resume the transactions.

enough to get through such obstacles. Also, the company should establish links with other commercial banks.

Role of the Manager and the Board of Directors

Based on the author's intimate contacts with the HFC from its inception up to now, and also based on the review of records, interviews with the board of directors, the manager of the HFC, and with others, it is suggested that the present functions should be changed drastically. At present, both parties, the manager and the board of directors are involved in day-to- day operational activities of the company. The role played by the board of directors, especially their dedication, commitment, and hard work, had contributed significantly to the success of the HFC. Considering the constraints faced by the company, especially due to market imperfections and the difficulties in coordinating the production, marketing, and associated activities of a large number of small farmers operating on tiny small farms, such a role is useful at the initial stages of a small farmers' farmer company. However, it is proposed that the Directors should withdraw from this role. Instead, they should perform the role of "Direction" (including strategic planning, taking the responsibility for monitoring and evaluation), and supervision. Once the board of directors is withdrawn from day-to-day operations, a gap/vacuum will be created. It is the responsibility of the manager to design mechanisms for the implementation of the major activities of the company, obtain the approval of the board and implement the same. For example, in regard to the production, purchasing, storage, cleaning, transportation, etc., of soybean and maize, as this has been undertaken as a longer-term contract, the HFC should have a regular cadre of staff. The manager can "manage" the entire program. When the HFC expands further, it could afford to employ separate managers for each of the major activities, under the supervision of General Manager. The HFC immediately needs a cashier.

Dealings with the Farmer Organizations

As stated earlier, certain farmer organizations are not yet "developed" up to the standards demanded by a market-oriented apex organization, in this case the farmer company. At the same time, it should be realized that most of the farmer organizations have been established to cater to the needs of irrigation management. The leadership selected for such functions may not be necessarily competent enough to handle an efficient marketing system. Therefore, the FOs should seriously explore the possibility of selecting a set of production and marketing organizers/agents. Either the FO or the HFC may employ a cadre of such organizers/agents. In the 1996/97 wet season, the company employed a cadre of youths selected from the farming community to organize the collection of dried maize and to be responsible for the collection centers. This was a successful experience and the FOs and the HFC could make use of such experiences.

Nilwala People's Company[11]

In the Nilwala watershed, a large number of families are involved in producing *jaggery*[12] and treacle out of *kitul.* Usually, people sell these to collectors, either the middlemen or the traders themselves. Sometimes, people take these products to nearby townships hoping to fetch a better price. It has been observed that, on many occasions, people do not get a fair price. The SCOR Project has identified *kitul* as a tree that could be promoted for conservation purposes. Following the project concepts, the team explored the possibilities of enhancing profits and reducing the risk of fluctuating income, as an incentive to motivate resource users.

The first step taken by the team was to transform the existing cottage-level industry into an organized enterprise with the objective of making higher profits. In this respect, the SCOR team, in consultation with local officials and in collaboration with resource users, organized weekly/biweekly gatherings of "buyers and sellers" at central places convenient to both parties. This took the form of an "auction." The first auction was conducted at the Horagala sub-watershed in April 1994. Through this process users managed to increase the selling price by about 10-20 percent.

Meantime, the SCOR team consulted the Palmyra Development Board and the Industrial Development Board (IDB) of Sri Lanka to obtain their resources to train resource users. This has been successful. For example, forty selected *kitul* tappers were trained by the IDB in 1995.

At the same time, the Marketing and Enterprise Development specialist of SCOR explored the possibilities of establishing market links to enable producers to supply treacle in bulk on forward contracts. However, most of the private firms contacted offered low prices. Therefore, the SCOR team and the farmer organizations thought of processing treacle and to sell the "value-added" product. Following this idea, potential markets have been identified. Similarly, the farmers requested SCOR personnel to assist them in marketing jak fruit and breadfruit that are in abundant supply in the project area. Farmer organizations requested for SCOR assistance to process the surplus production.[13]

Based on the knowledge of such opportunities, the SCOR staff discussed the potential for establishing a company, and in collaboration with farmer leaders, commenced a campaign to create awareness within the community about the formation of a people's company.

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[11] Marketing and enterprise development specialist of SCOR Nilwala team, K.N. Jayasuriya coordinated this activity, with the support of the Team Leader, catalysts, other professional staff of SCOR, and officials of government line agencies. This section is based on a report prepared by K.N.Jayasuriya.

[12] Jaggery is a sweet made of solidified *kitul* treacle.

[13] The production is much higher than the domestic consumption within the area.

Formation of the People's Company

The process of the formal establishment/enactment of the "*Seemasahitha (Janatha) Nilwala Krushi Nishpadana Sekasum Samagama*"
(Nilwala Agricultural Product Processing Company Limited), has been very much similar to that of the HFC. The company was registered under the Companies Act in July 1995. The company, jointly with the four service farmer organizations of Nilwala, prepared a "mini project" and this was accepted by the SCOR project. On this, SCOR granted Rs 99,500 (about US$1,500) to the company. By the end of 1996, the company had a share capital of Rs 221,560 (about US$3,600). According to Jayasuriya 1998, the important events of the evolution process were as follows:

- Divisional Secretary, *Kotapola,* released a building in April 1996 to be used as a processing center.
- The first dryer was purchased in May 1996. Treacle processing equipment was fabricated in September 1996.
- Eight resource users selected from sub-watersheds were given residential training at a private food processing center in May 1996, and this was arranged through the Integrated Rural Development Project of the Matara district.
- Jak processing, on a trial basis, commenced in August 1996.
- Test marketing and market exploration of dehydrated products with samples were initiated in December 1996.
- Test operations of treacle processing were begun in December 1995, in the presence of the private firm that entered into a forward contract with the Nilwala company, to purchase treacle.
- The first Annual General Meeting of the company was held on 28 December 1996.
- Commercial operations of treacle processing commenced on 15 February 1997. Working capital support in the form of material from the purchasing firm (value of stocks) was agreed to be Rs 350,000 (about US$6,000) per month.
- In addition to the manager of the company, employment was provided to 10 other people at the initial stage.
- Senior government officials discussed the possibility of linking the beneficiaries of a government-assisted aid program to supply treacle (18 April 1997).
- Demonstrations on dehydration were arranged to attract possible entrepreneurs to be engaged in jak/breadfruit dehydration activities. As a result, two entrepreneurs purchased dryers and entered into the business.
- Kotapola Multipurpose Cooperative Society purchased 3 dryers.
- Company Directors, with the assistance of SCOR staff, developed a strategy and an activity plan for the future expansion of the Nilwala company. The major future activities include: sale of packeted tea, sale of packeted spices, and manufacture of green tea leaf sacks. A development bank had favorably considered the expansion project and agreed to issue a loan.

- An improved variety of *kitul* plants was obtained from the Export Development Board of Sri Lanka, and planted (by the resource users) in three sub-watersheds. This is considered as a *major achievement of SCOR and a successful test or a proof of SCOR's underlying theme,* "market-oriented conservation."
- The performance of the treacle project up to 12 July 1998 is summarized below[14]:

  - Total treacle purchased.....29,465.35 kg.
  - Total sales
    325 ml bottles.....46157
    750 ml bottles.....115
  - Value of stocks.....Rs 473,964 (approx. US$7,300)
  - Gross profits.....Rs 237,559 (US$4,000)
  - Profit per share.....Rs 10.44

The "Balance Sheet" of the company as of 30 June 1997 is given in table 11.1 and the organizational structure in March 1998 is shown in figure 11.2.

It can be concluded that the companies formed so far have addressed the question of how small farmers can coexist in a market economy and provide a meaningful interpretation to the government-advanced concept of giving a human face to the open economy.

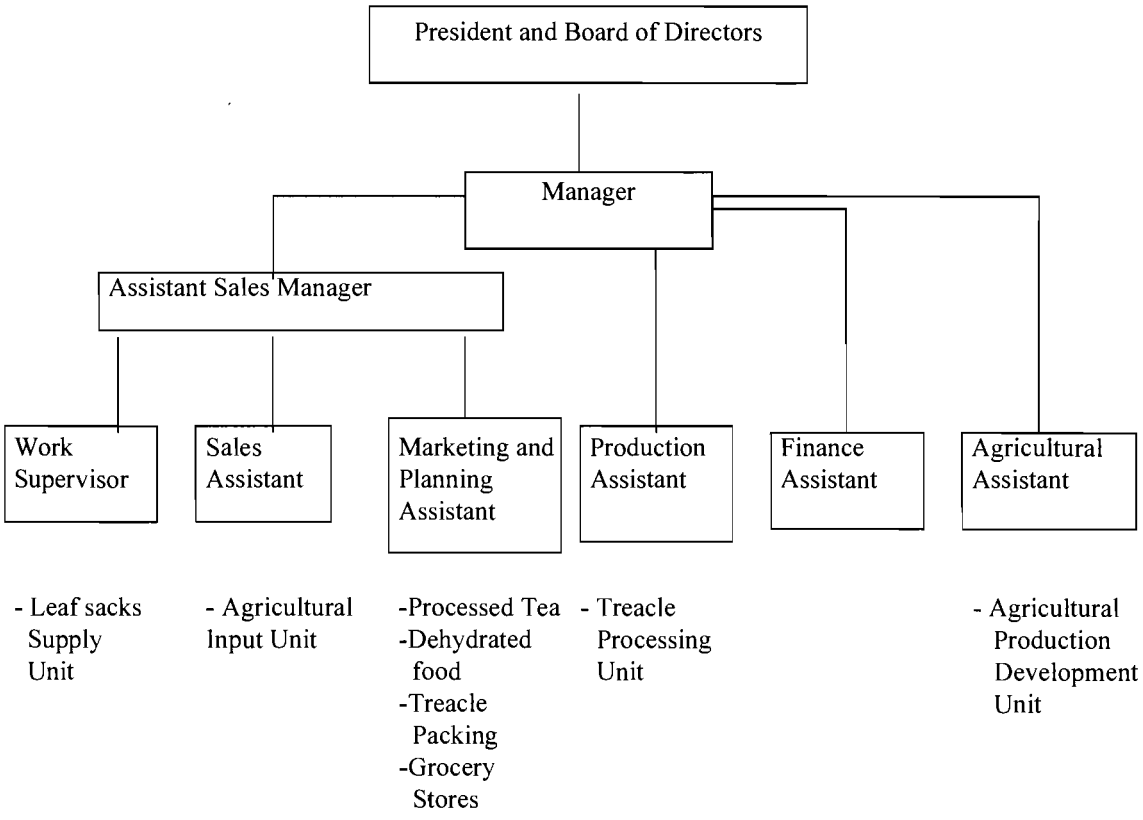
[14] One junior staff was suspected of an incident of "misappropriation of money" and was interdicted pending a court enquiry. This happened in early 1998 and the author has no access to the relevant information. However, the company activities are in progress as usual and the incident has had no significant impact.

Table 11.1 Janatha Nilwala Agro-Processing People's Company
Balance Sheet as at 30, June 1997.

Description	Rs	Rs	Rs	Rs
Fixed Assets				
Plant and Machinery				
Dryer	65,688.00			
	1010.58			
Treacle Machine	28,410.00			
	437.08			
Gage	16,900.00	110,998.00		
	260.00	**1707.66**		
Office Equipment				
Furniture	3,120.00			
	48.00			
Scale	4,728.00	7,848.00	118,846.00	
	72.74	**120.74**	**1828.40**	
Less: Cumulative Depreciation			39,615.00	79,231.00
			609.46	**1218.94**
Current Assets				
Stocks		377,760.00		
		5811.69		
Debtors		166,440.00		
		2560.62		
Advances		-		
Cash at Bank		112,242.00		
		1726.80		
Cash in Hand		200.00		
		3.08		
Cash in Transit		-	656,642.00	
			10102.18	
Current Liabilities				
Bank O/D			-539.00	
			-8.29	
New Current Assets				656,103.00
				10093.89
Net Assets				735,334.00
				11312.83
Capital Reserve		99,000.00		
		1523.08		
Grant from SCOR	200,000.00			
	3076.92			
Shares Issued - Others	25,920.00	225,920.00	324,920.00	
	398.77	**3475.69**	**4998.77**	
Profit			410,414.00	
			6314.06	
				735,334.00
				11312.83

US$ values are given in **Bold** figures (Conversion rate used 1US$ = Rs. 65)

Figure 11.2. Organizational chart as at March, 1998.



CHAPTER 11

DEVELOPMENT WITH CONSERVATION - A HOLISTIC AND USER-ORIENTD APPROACH -

Shared Management of Natural Resources – A Field Test

This book is focused on a participatory *natural resources (mainly land and water) management* strategy aimed at *integrating environmental and conservation concerns with production goals Internalization of Environment Considerations into Agricultural Decision Making.* It is primarily based on firsthand experience in working with watershed resource users, mainly small farmers, government and non-governmental organizations, researchers and the international donor community. It examined the experience of the Shared Control of Natural Resources (SCOR) Project, Sri Lanka, funded by the United States Agency for International Development (USAID) and implemented by the International Irrigation Management Institute (IIMI) in collaboration with the Government of Sri Lanka, resource users, and NGOs.

The project concepts and strategies were developed through a unique participatory project developing and testing a holistic interdisciplinary approach to watershed management. A participatory analysis of constraints to the potential for sustainable increases in productivity in the watersheds (identified throughout the consultation process) paved the way for SCOR. Four types of major constraints have been identified in relation to environmentally appropriate increases in production:

- The lack of a *production environment* that motivates the resource user to effectively manage the combination of resources essential to optimize economic production while conserving land and water resources.

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

- The lack of adequate information about land and water resources management at appropriate levels.

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

SCOR demonstrated that a *package* of measures, such as type of vegetation/crops, appropriate land and water saving and conservation practices, user rights to earn economic and other benefits from the (participatory) conservation of natural resources, are more effective in protecting environmentally fragile lands in water basins and watersheds. The "package" was selected jointly by the professionals and users. Important conservation and production or other profitable uses of natural resources were incorporated into this package.

SCOR operated at multiple levels, ranging from resource users or farmers' field to national policy. Field interventions of SCOR action-research has being tested and demonstrated in over 30 sub-watersheds of the two pilot watersheds. The selected sub-watersheds for SCOR action-research were contiguous areas of manageable size, having characteristic profiles of ecological, socioeconomic and environmental features similar to those of the respective main watersheds. Size of these selected pilot sub-watersheds ranged from about 200 to 1,000 hectares. Action has being taken through a participatory process to learn, test, and demonstrate an "ideal" land use pattern with due emphasis on production and conservation. This participatory approach of developing methodologies for combining technology, organizations, and resources illustrated the various production-conservation elements with their intimate relationships, that will have to be incorporated in the management of watersheds or ecosystems in a sustainable manner. Micro concentration on *contiguous areas* or ecosystems within which the land use has been carefully planned and monitored for the impacts of participatory research interventions is a special characteristic of SCOR.

In the sub-watershed, participatory appraisal of the characteristics of resource uses and users and mapping of *current* resource use were done using a by groups comprising resource users/farmers, IIMI-SCOR professionals, and catalysts. The SCOR catalysts took the lead role in preparing the resource use maps and recording information. A participatory resource management "mini project" was formulated for each pilot sub-watershed. The "mini project" aimed at changing the present *land and water use pattern to a more profitable and diversified resource use by combining production and conservation using appropriate technologies/ techniques, novel shared control arrangements and resource augmentation.* New commercial enterprises and *soil and water conservation* practices in a typical *sub-watershed* in the *"dry zone" pilot watershed included: integrated wet and dry season* water management in command areas (e.g., water saving techniques to improve cropping intensity and introducing short-duration commercial crops in the dry season, cultivation of medicinal plants, fruits and vegetables in *chena* (shifting cultivation areas), processing industry for medicinal plants, stabilized cropping patterns for *chena* (shifting cultivation) and highlands, contour/graded bunds, water harvesting techniques, etc. In the *Nilwala* watershed similar activities have been included in "mini projects" developed for selected sample sub-watersheds. Because tea occupied nearly half of the watershed area, special activities were included to enhance management while improving conservation. These included: regular maintenance of existing conservation measures, establishment of biological measures such as vetiver grass hedgerows, maintaining a good plucking table to minimize soil erosion and at the same time to improve yields, etc. Taking advantage of the

terrain characteristics and availability of perennial streams communities were organized for micro hydropower generation coupled with participatory management of hydro-catchments.

This means that such pilot sub-watersheds had "action plans" that guide them along a path to the planned future from the current status of land and water resource use.

The main thrust of SCOR experimentation could be summed up as an attempt to internalize in a watershed context, a combined strategy of effective application of already known and new technology, strengthening/forming appropriate organizations, especially the *small farmer companies* to take advantage of scale, pool resources, securing credit from banks, secure assured markets and schedule production, add value to agri-products, acquire appropriate managerial competence, etc., and resources augmentation through measures such as profitable conservation, water harvesting, and human resources development, and innovative policy changes relating to natural resources management coupled with new state-user partnerships based on viability testing and validation on the ground.

The project's effects and physical outputs are comparable with the targets (chapter 6, 7, 8, 9, and 10). The significant policy changes initiated as a result of SCOR included: a). Grant of usufructuary rights for using state reservations (such as irrigation reservations), on pilot basis; b). Government's acceptance of "Farmer Company" strategy: the decision by the Ministry of Agriculture to include the formation of farmer companies as a function of a special task force; c). Government initiative to test Irrigation Management Turn-Over (in two major irrigation systems) using Farmer Company Strategy; c) Decision to establish an agricultural settlement incorporating "encroachers" in the Huruluwewa upper watershed; d) Legal recognition of watershed-based farmer organizations by the government (Department of Agrarian Services), even though they are not coterminous with administrative boundaries; and, e) Extending the mandate of the Irrigation Management Division of the Ministry of Irrigation, Power and Energy, to manage watersheds associated with major irrigation systems.

In addition, SCOR experiences have been utilized in: the New Agricultural Policy formulation (see Agricultural Policy document by the Ministry of Agriculture and Lands, 1996 and the revised version, 1997), Forestry Sector Master Plan of Sri Lanka, National Environmental Action plan of Sri Lanka etc., and by several donor assisted projects e.g. ADB-assisted North Central Province Rural Development Project, ADB-assisted Watershed Management Project implemented by the Forest Department.

The SCOR action-research or the "learning process" was not free from constraints. Certain participants, including members of the implementing team, could not understand/accept Participatory Action Research in general, and learning process approach in particular, as research methods. At the same time the project suffered from uncertainties in donor funding, drought conditions prevailed in the dry zone areas during certain crop seasons. In addition, due to the "project-driven" nature of the experiment the researchers were compelled to focus more on targeted physical achievements than the

learning process. In regard to the rate of adoption of conservation techniques, it has been observed that many farmers did not adopt them in package form. It should however be noted that most of the recommended practices do not yield substantial benefits in the short term and therefore it is too early to evaluate such aspects of the project. Moreover, the business activities of the Farmer Companies suffered from factors that can be attributed to market failures/imperfections in the market such as the vested interest of some businessmen, rent-seeking behavior etc.

Lessons

In watersheds where a large number of small farmers are engaged, the environmental problems mainly result from the cumulative effect of the actions of many individuals. Hence, the remedial measures should be user-oriented and participatory. In addition, people in different "zones" or components of the watershed having access to different aspects of the natural resources base may have different environment conditions, may be engaged in different economic activities, and may be of different social and/or cultural backgrounds. Thus, the personal and economic interests in the different areas do not necessarily coincide, introducing problems for planning and implementation.

Development-conservation approaches need to consider those physical, socioeconomic, and institutional linkages that exist between upstream and downstream of a river basin/watershed, and between systems within watersheds. 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 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. On the other hand, 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 the downstream can be used, and they affect the land resource associated with it. 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.

While recognizing the importance of further improvements in irrigated areas, it can be argued that a great deal of intensification and commercialization is required in rain-fed highlands in many of these countries. Today, nearly two thirds of the cultivated area in the world is rain-fed. Obviously, soil and water conservation play a critical role in rain-fed upland farming. Soil degradation, both in quantity and quality, is one of the major factors that attributed to low productivity levels in upland agriculture. Soil erosion could also have adverse effects downstream. The eroded sediments may settle in the downstream. The sediments may also settle in irrigation canals and reservoirs, reducing their capacity. It is clear that the irrigated commands and their

catchments are interdependent. The form of this interdependency is influenced primarily by hydrological and other climatological factors, socioeconomic and management factors, and various other secondary factors.

As most of the watersheds are degraded mainly because they are "being used," and because watershed resources can be used profitably if due consideration is given to conservation concerns, it is argued that watershed management be considered as a process of participatory planning/formulating, implementing, and monitoring/adjusting and evaluating a course of action involving natural, human, and other resources.

The new management system should be a *user-oriented system*, based on shared control or partnerships between the state and the users. Such a system will need less control by the state so that institutional and legislative deficiencies could be avoided as much as possible. The key to a collaborative or shared management system is to establish a land use and land tenure pattern that is of *economic incentive* (while conserving natural resources) and that will induce a *sense of ownership* of the land. Such an approach will result in the best use of the land thus balancing the economic, environmental, ecological, agricultural and socio-cultural demands or concerns. It is practically impossible to fully meet the needs of all these disciplines or stakeholders. But it is feasible to take into account all these concerns and attempt to strike a balance.

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 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.*

More often than not, it is argued that it is essential to provide incentives to motivate the resources users, especially the small farmers, to adopt resource conservation measures or sustainable crop husbandry. As the benefits to conservation would come in the long run and because of the fact that it is the downstream users who would benefit from the conservation practices adopted by the upstream inhabitants, there is a need for providing incentives. However, small farmers' response to economic incentives and disincentives is clear. 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. Nevertheless, it is argued that there exist technologies (such as crops, cropping systems, value added production and other enterprises), have the potential of giving conservation benefits as well as profits to users, if those technologies are judiciously combined with other resources, appropriate organization and policy.

Under such circumstances, farmers/users organizations (at lower levels) and farmer/user companies (at higher levels on commercial purposes) with appropriate legal rights provide effective mechanisms for overcoming these difficulties. Therefore, SCOR adopted a user-oriented and participatory strategy.

The initial analysis of the interventions of SCOR action-research project reveals that a participatory and production/market-oriented conservation approach, integrating production goals and environmental concerns, would approach a desired balance between long-term economic gains and environmental gains. An integrated and holistic process with appropriate soil and water conservation measures, mechanisms to protect irrigation structures including canals, cropping patterns with high economic returns, and minimum disturbance to soil, acceptable longer-term usufructuary rights and state-user partnerships, and group action by farmers to establish desired upstream-downstream linkages, and most importantly to improve input-output marketing and post-harvest actions including value-added production. The latter has proved to be important in a market-oriented conservation process.

Based on this analysis, the basic features of a practical strategy that may be adopted in market-oriented natural resource management effort are summarized below:

- Participatory Design of project/program: involving resource users, policy makers and other stake holders

- Participatory Appraisal of present status of natural resource use in sub watersheds: involvement of resource users, Government officials, other professionals, NGOs etc. use of "improved" PRA/RRA methods. Maintain accuracy of data. Use this as the first step of a participatory Monitoring process.

- Combine "indigenous" and external knowledge.

- Develop action plans (who will do what and when) or "mini projects" covering the entire area of sub watersheds and combining production and conservation. e.g. internalize soil and water conservation decisions into production planning/scheduling

- Employ a *package* of innovations: *Technology, Organization, resources and Policy. Produce for identified markets. Small farmer Companies to enhance bargaining*

power, organize production and marketing, achieve economies of scale and to combat market failures

- Plan for short, medium and long term benefits and a cash flow suitable for farmers who are at subsistence level at present. Negotiate with local banks for funding "mini projects" using small grants as collateral

- Less formal training and more experiential training and skill development

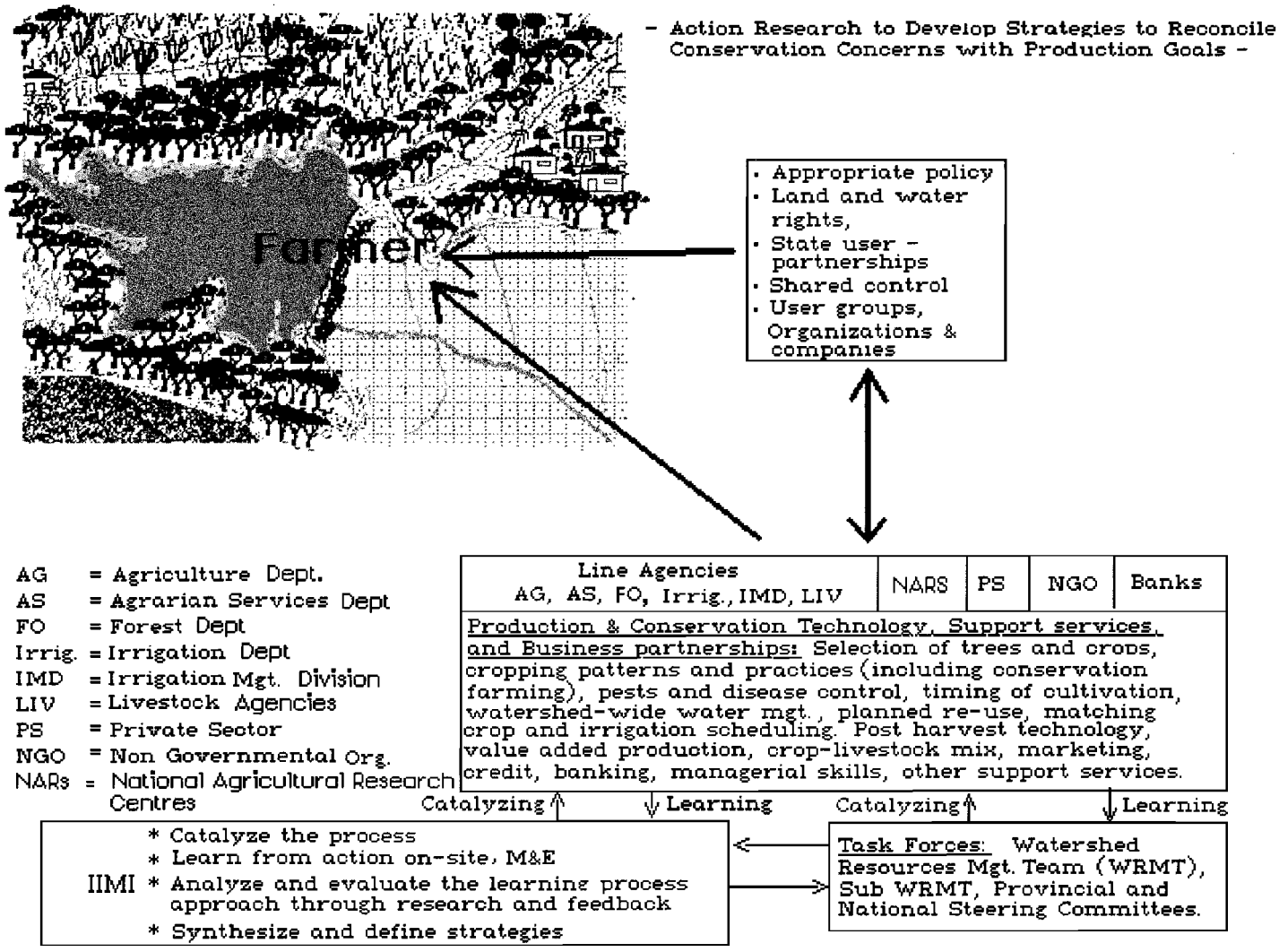
- Participatory Monitoring and Evaluation

Such a process is illustrated in figure 11.1

It can be concluded that profit is the driving force behind unsatisfactory land use and other undesirable forms of natural resource management. An integrated and holistic process with appropriate soil and water conservation measures, mechanisms to protect infrastructure facilities such as canals, cropping patterns with high economic returns while minimizing the resource degrading effects, acceptable longer-term usufructuary rights and state-user partnerships, and group action by farmers to establish desired upstream-downstream linkages, and most importantly to improve input-output marketing and post-harvest actions including value-added production. The latter has proved to be important in a market-oriented conservation process. The right as well as the capacity of local resource users to utilize reservation lands for economic gains, without compromising the protection of waterways, should be recognized.

Unless the actors are informed of the potential impact, and unless the profitable alternatives exist and unless the resource users are organized and supported, specially at the initial stages, the environmentally inappropriate decisions will continue to be made.

Figure 11.1 Development with Conservation – Shared Management of Natural Resources in Watersheds



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