SHARED CONTROL OF NATURAL RESOURCES

Participatory Planning for Sustainable Natural Resources Management in Watersheds

C M Wijayaratna,
J M Samarakoon Banda and
Gamini P Batuwitage

February 1997

Shared Control of Natural Resources Project (SCOR)
International Irrigation Management Institute
127, Sunil Mawatha, Pelawatta, Battaramulla
Sri Lanka

Participatory Planning for Sustainable Natural Resources Management in Watersheds

C M Wijayaratna, J M Samarakoon Banda and Gamini P Batuwitage

I. INTRODUCTION

This paper presents a participatory methodology for planning natural resources -- mainly land and water -- in a watershed context. The planning process involved local people, professionals/ Government officials and catalysts in generating and utilizing relevant data; adopted an inter-disciplinary holistic approach in watershed management and **combined indigenous and exogenous knowledge**/information in developing **market-oriented** and **sustainable use of** land and water resources. It was a collaborative exercise and did not depend solely on **either** indigenous **or** external skills and knowledge. It was **neither a "top down" nor a "bottom-up"** approach. Rather, it is an integrated approach of both.

The planning process commenced with an assessment of current or "pre-project" status of natural resources 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 as a first step of an action program and 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. These are integral components of an action-research project on participatory watershed management, namely the Shared Control of Natural Resources, **SCOR** project.

Action research is a special type of research, dedicated to **learning through action**. One explicitly accepts that there is a lack of knowledge about certain implementation issues and this is where action research proves valuable. In "Action science" one should consider "how to increase the chances of achieving desired possibilities rather than to concentrate on estimating abstract probabilities based on actors' fixed preferences, choices and means" (Uphoff, 1992, p.396).

SCOR project is being implemented in Sri Lanka jointly by the International Irrigation Management Institute (IIMI), Government of Sri Lanka and the natural resources users of watersheds. Active participation of the organized private sector and Non-Governmental Organizations, NGOs, can be seen in pilot sub-watersheds of SCOR. The planning as well as Implementation Monitoring and Evaluation (M&E) processes were characterized by the **integrated use of participatory mapping** and **Geographic Information Systems**.

Appropriate methods have been employed to **maintain desirable levels of accuracy** during the participatory mapping which in turn produced digitizable maps.

The SCOR design was built primarily on the progress already made in Sri Lanka and elsewhere in participatory irrigation management and social forestry. 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 (Bruns, 1993, p.1837). Despite the fact that the desirability and merits of participatory approaches are not controversial, the project designers and program implementors look forward to the **operational procedures** of such approaches (Uphoff, 1988). Developing and testing operational procedures for participatory watershed resources management is a major goal of SCOR.

Application of **concepts of decentralization** in integrated watershed management has been considered essential and local administration, local knowledge and **local participation at district and regional levels** have been recognized as pre-requisites for the successful implementation of integrated watershed management projects (UNDP/FAO/Netherlands Government Regional Watershed Project Newsletter, Vol.2 No.2, 1990).

SCOR has undertaken the production of a series of working/research papers on the **learning experiences of SCOR - Analytical studies of the SCOR process in developing and testing concepts, approaches and strategies in managing watersheds through shared control mechanisms over its six-year project period and afterwards.**

The **objectives** of these studies are :

- To document and analyze the processes of the formulation and development of the SCOR concepts, approaches, and strategies through a **participatory project design process (Research Paper 1)**;
- To analyze the Participatory Appraisal and Planning of Natural Resource management in SCOR pilot watersheds (**Research Paper II - Present paper)**;
- To develop and design a **framework and methodology** to analyze and assess the SCOR planning and implementation processes and their successes and failures in achieving results expected in respect of the key components of SCOR (**Research Paper III**); and
- To produce a **continuing series of working/research papers** which describe, analyze and record the lessons learnt from the SCOR processes over the 6 year project period, using the framework and methodology developed under objective III.

The project considers **participatory appraisal** of current status of natural resources use in watersheds and the diagnostic analysis of problems as the first step in an **action research** process. This was considered as the first step in the

implementation process and the present paper is focused on this aspect. The next logical steps would be : evaluation of alternative solutions; experimentation; monitoring the process, effects and outcomes and the evaluation of impacts.

II. PARTICIPATORY DESIGN OF SCOR PROJECT - WATERSHED MANAGEMENT CONCEPTS AND STRATEGIES[1]

SCOR concepts and strategies were developed through a unique participatory project design process which included a review of experiences in the management of natural resources in Sri Lanka and elsewhere, a series of consultations and project development workshops with **cross section of resources users**, government officials at different levels, Non-Governmental Organizations (NGOs), development banks, marketing agencies etc.

Participatory Analysis of Constraints on Natural Resources Management in Sri Lanka

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

(a) The lack of a *production environment* (including profitability and local control of resources) that motivates the resources user to effectively manage the combination of resources essential to optimize economic production while conserving land and water resources.

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

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

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

The SCOR strategy is based on: the need for understanding the hydrological, socio-economic, and other interactions between different segments

[1] For a detailed account ref. Participatory Development and Design of Projects - The SCOR Experience, IIMI, 1997.

of watersheds; the experience in group economic and natural resources 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 resources management.

Objectives of Participatory Action Research

Based on this constraints analysis, the major objectives of SCOR participatory action research have been formulated as follows :

- to **develop and test strategies** to optimize the **watershed-wide macro efficiencies in land and water resources use with due regard to the environment**
- to **develop and test strategies** to improve the *incentive* and *institutional* context in which land and water-related activities are undertaken in watersheds through appropriate *modes of production and state-user partnerships* to ensure both the productivity and the sustainability of these resources
- to **develop and test strategies** 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
- to **develop and test strategies** 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 conservation
- to **develop and test strategies** 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"*

Watershed as the Basic Planning, Coordinating and Implementation Unit

The focus on watersheds as the basic planning, coordinating and implementation unit is an important feature of SCOR. The term watershed is defined as the area of land surface that drains water into a common point along a stream or river[2]. The rationale for using the watershed as the basic unit for integrated planning of (land and water) resources utilization is clear. The watershed is a physical entity

[2] According to this definition there can be sub watersheds depending on the order of streams. Hence, the river basin can be considered as the highest order watershed.

geographically defined by an important natural resource, water; the ways in which the water in the upper parts of the watershed are used affect the ways in which it can be used downstream, and they affect the associated land resource.

SCOR participatory action-research program considers the total utilization and management of water resources and associated land in a watershed. The project aims at optimizing watershed-wide land and associated water use efficiency.

A Participatory Holistic Approach to Watershed Management

SCOR aims at developing and testing a holistic interdisciplinary approach to **integrate environmental and conservation concerns with production goals.** The conservation strategy being 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" is selected jointly by the professionals and users and both conservation and production or other profitable uses of natural resources are incorporated into the package. This means that the package provides adequate incentives -- such as **profitable enterprises,** desired cash flow as well as non-monetary benefits -- to the user to motivate her/him to protect natural resources. Unless the "actors" are informed by the knowledge of potential impact and unless the profitable alternatives exist, environmentally inappropriate decisions will continue to be made.

SCOR approach is being tested and demonstrated in two pilot watersheds in Sri Lanka, namely **Huruluwewa** in the North Central Province (dry zone) and **Nilwala** in the Southern Province (wet zone). (Annex 1).

Huruluwewa Watershed

The Huruluwewa watershed is located in the Yan Oya river basin in the North Central Province (NCP) in the dry zone Sri Lanka. The NCP consists of two districts and most parts of the Huruluwewa Watershed come under Anuradhapura District. However, the upper watershed extends beyond the NCP upto the Central Province. A feeder canal from a river diversion system (namely Mahaweli) provides water to the water-deficit Huruluwewa reservoir. Prior to SCOR interventions, farmers and businessmen used a large number of siphons and some water pumps (as much as 3,000) to irrigate "illegal" farm plots in this area.

The Huruluwewa watershed consists of the catchment, reservoirs (Huruluwewa and over 200 small tanks), irrigation command and drainage/reuse

areas. The average annual rainfall varies from about 1,900 mm upstream to about 1,300 downstream. The watershed covers over 80,000 hectares. Inadequate tree cover (resulting mainly from slash-and-burn cultivation and illegal logging activities) in the catchment encourages soil erosion. The area irrigated is about 10-15 percent of the total area of the watershed. The water use efficiency is higher in the water deficit (legal) command areas than in the illegal farms in the feeder canal area. The land productivity, however, is higher in many parts of the feeder canal area.

State lands alienated to people are mainly in the command areas and homesteads coming under the Huruluwewa major irrigation settlement. Encroachment of crown lands is predominant in catchment areas (used for slash-and-burn agriculture) and also on reservations of irrigation canals and streams which are declared as state lands. There are also ancestral lands held by people.

Nilwala Watershed

The Nilwala River which is 70 km long drains an area of 1,020 km^2 in the southern province. The upper catchment of about 440 km^2 is steep and the river channel slope averages about 31 m/km, rising to a maximum of about 1,050 m. The coastal plain, of slightly smaller area, is quite flat with about 0.25 m/km of river channel slope. There is a striking increase in rainfall from the coastal plain, where the 75 percent expectancy is about 1,500 mm/year, to the upper catchment where it is about 3,140 mm/y, with local averages reaching nearly 4,500 mm/y. There are no clear indications of trends or changes in rainfall.

Both the upper and lower parts of the catchment are densely populated, and are principally under agricultural forms of land use. For example, in the Anninkanda sub-watershed near the river's source area, population density is 610 persons/km^2. About 22 percent of the upper catchment is under forest, and about two-thirds of this is dense, protected forest. The condition of the protected forests has however been degraded by various assaults, mainly around the boundaries.

Of the cultivated crops, tea has assumed much greater significance in recent times. *The conversion to tea has often been at the expense of the nominally protected forests.* In Anninkanda, 55 percent of the land area is with tea one percent forest land. Land rights are largely private, but there are also substantial extents of state lands. There has been significant encroachment on state lands, which the state organizations have not been able to prevent.

In the lower part, flooding in the wet season and salt intrusion in the dry season have both become more serious in the past two or three decades. Soil erosion in the upper catchment probably contributed to the downstream flood problem by raising river-bed levels in the flood-plain reach. *Illicit felling* and clearing of the boundary of the forest reserve for plantation crops, especially tea, are taking place. Tea plantations exist even in the middle of certain 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 products, although illegal, is taking place fast. 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 a high degree of soil erosion.

The harmful changes of land use have their origins in the high population density, and consequent demand for land. This was reinforced by a boom in world tea prices, plus a preference in China, Russia and the Middle East for Sri Lankan tea which has particularly stimulated demand for "low-grown", varieties such as what this watershed can produce. Contributing factors have been people's realization of the state's weak capacity to enforce its own protective laws, and even its property rights; and the low investment resources of small holders going into tea.

III. PARTICIPATORY APPRAISAL OF PRE-PROJECT RESOURCE UTILIZATION

Participatory Appraisal at Sub-watershed Level

Participatory Appraisal has been widely recognized as a pre-requisite for rural development planning. Many forms of rural appraisals have been used in the past. In these, a variety of methods have been adopted for collection, analysis and interpretation of data/information. Rapid Rural Appraisal (RRA) & Participatory Rural Appraisal (PRA) are two dominant methods of rural appraisals. 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, agroecosystem 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 resources management, agriculture, poverty and social programs, and health and food security. Dominant behavior by outsiders may explain why it has taken until the 1990s for the

analytical capabilities of local people to be better recognized and for PRA to emerge, grow and spread." (Chambers, 1994 P.953)

Chambers has stated that, because of "dominant behavior of the outsiders" it took such a long time for (even) PRA to recognize local analytical capability. 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/interventions. Moreover, it was assumed that the accuracy of PRA can be improved if its use is integrated more with other techniques such as: advanced mapping and incorporating **more** of external (in addition to indigenous) inputs, statistical sampling, direct measurement, objectively verifiable indicators and rigorous analytical tools.

The selected sub-watersheds for SCOR implementation are contiguous areas of manageable size within the main watersheds, each having characteristic profiles of ecological, socioeconomic and environmental features similar to that of the respective main watershed. The size of the selected sub-watersheds ranges from 75 hectares (ha) to 600 ha. Action is being taken to demonstrate an "ideal" land use pattern with due emphasis on production and protection. This "contiguous area" or "model watershed" approach of implementation would illustrate the various production-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* resources use mapping were done by a "group" comprising of IIMI-SCOR professionals/ catalysts, relevant local officials (such as *Grama Niladhari* or the village-level generalist government officer, Colonization Officers of the Land Commissioner's Department, Agriculture Instructor) and farmer/user representatives. The catalysts took the lead role in preparing the "map" and recording information. Other group members and the users helped the catalysts in the identification of land holdings, consultations with users and providing information. The groups were guided and supported by senior IIMI-SCOR professionals, Divisional Secretaries, irrigation engineers and technical officers, Divisional Officers and Agrarian Services, senior officials of Forest and Agriculture Departments, etc. The general objectives of a typical participatory appraisal were to:

a) Prepare a map of the sub-watershed indicating individual *land holdings*, land use patterns, type and quality of vegetation, water use, drainage lines, irrigation methods, etc.
b) Develop a database, including basic data such as: type and membership of user organizations, ownership and tenurial patterns, cropping patterns and intensities, slope category, apparent degree of soil erosion, conservation practices, production and productivity, and constraints to production and protection.

c) Help establish a baseline for the resource use pattern using (a) and (b)[3].

Steps used in the participatory appraisal were as follows :

i. Use of existing maps and secondary data

For all areas topographic maps prepared in 1986 by the Surveyor genera l Department and aerial photographs (taken in 1983) were available. With these maps, sub watershed hydrological boundaries have been demarcated. Several maps from different sources were available for almost all of sub watersheds selected for SCOR interventions. For example, Huruluwewa command area has been developed under a re-settlement 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 sub-division 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 SCOR 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 enlarged with land marks such as roads, streams, location of 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 (An example is given in Figure 1)[4].

In addition, secondary data and data from special bench mark surveys conducted by SCOR on sample basis that are relevant to resources management have been used. These data included: elevation, farm management data such as input-output levels, prices and profits etc available from sample surveys, general demographic characteristics, information related to availability and nature of land and water resources, availability of raw materials or suitability of new crops for environmentally sound enterprises, rural organizations, etc.

---

[3] This is supplemented by other sources such as: sample surveys, direct measurement of additional variables/indicators etc. See MIS & M&E process in section 3 for details.

[4] 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.

Figure 1. *Participatory mapping of resource use by plots - Kokawewa sub-watershed.*

ii. 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 different knowledge and skills who had been working earlier as school teachers, agricultural instructors, social mobilizers etc. They were trained on advantages and disadvantages of popular PRA techniques, SCOR concepts, basic farm management aspects, social organizations, etc.

In addition, discussion sessions were held with farmers and farmer leaders. Local officials participated in the Participatory Appraisal.

iii. 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 paddy tracts, home garden area, shifting or slash and burn cultivation area etc. Each group comprising of few catalysts, about 2-3 local officials / professionals and few farmer representatives has been assigned with a "zone" and provided with a base map (as shown in Figure 1).

iv. Conducting Participatory Appraisal

The appraisal was conducted in each zone by respective groups by walking through every plot and talking with farmers. A questionnaire and a data format was used to collect basic data at plot level. Each plot as well as the land use pattern (seasonal and permanent crops, livestock etc) have been marked to the scale, as much 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 to a selected zone is illustrated in Figure 1 while a sub-watershed map prepared at the end of this step is presented in Figure 2 and 3.

v. Establishing Bench-mark 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 bench-mark in relation to pre-project Natural Resources Management. An example is presented in Tables 1, 2 and 3.

Figure 2. Kokawewa sub-watershed - Land use 1994.

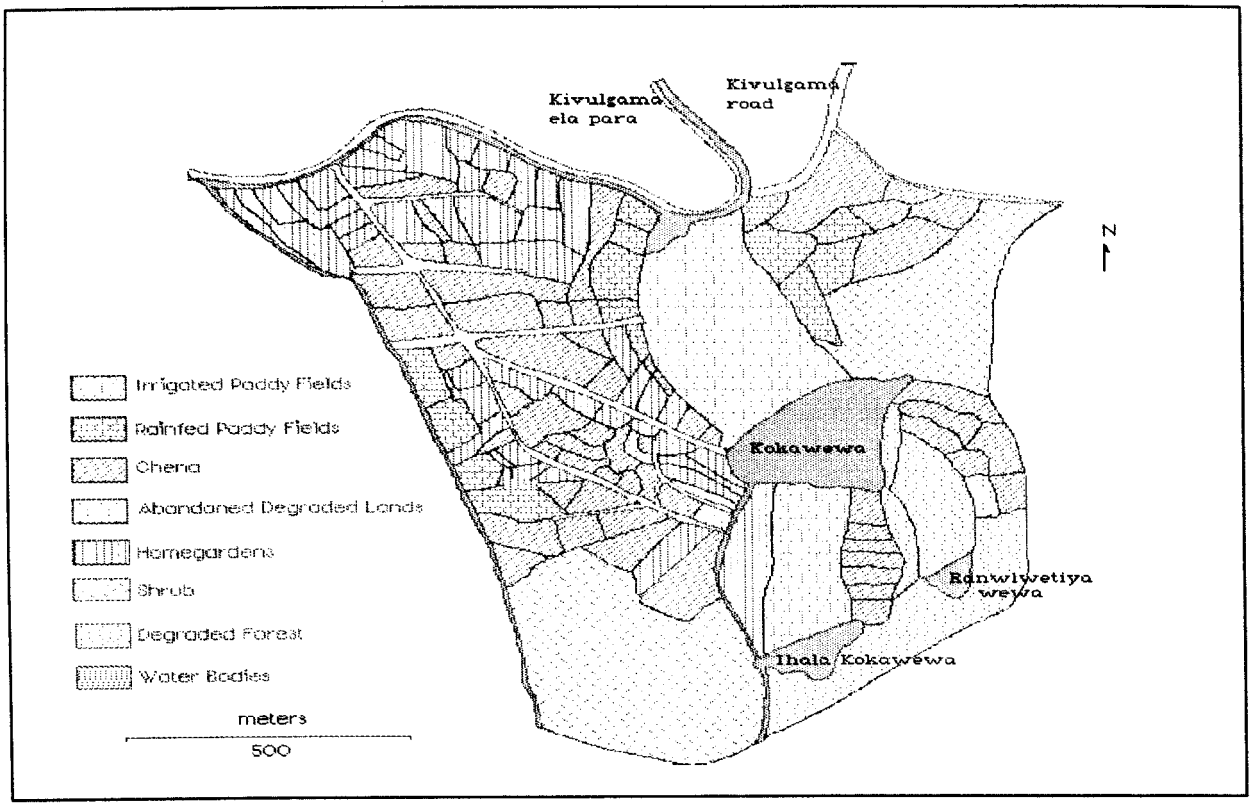


Figure 3. Mahameegaswewa sub-watershed land use - January 1994.

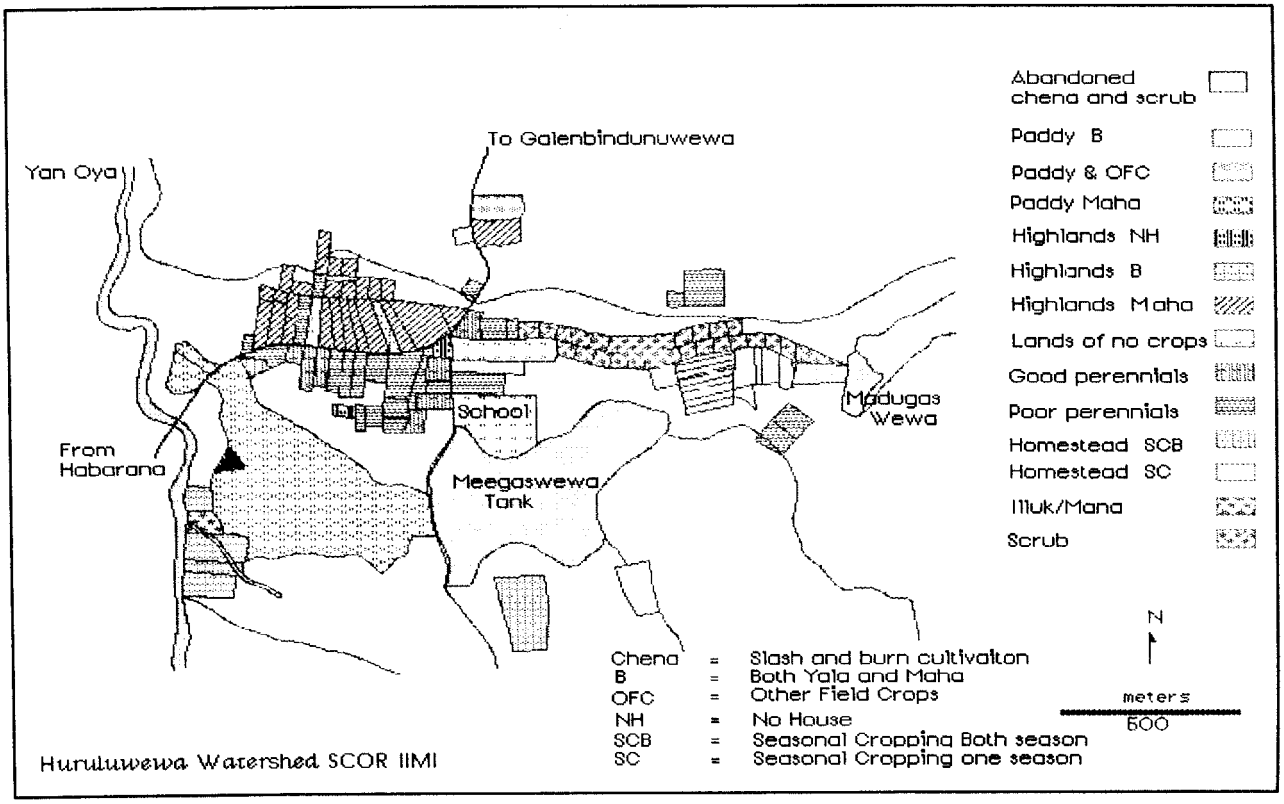


Table 1. *Kokawewa - Landuse 1994.*

Land Use	Extent ha.	%
Low lands		
Rainfed paddy	17.81	11.8
Irrigated paddy	8.50	5.4
Highlands		
Homesteads	24.28	16.0
Chena	75.67	50.0
Secondary forest	19.02	12.6
Barren lands	6.07	4.1

Table 2. *Land ownership pattern - Kokawewa sub-watershed - 1994.*

Land Use	No. of Plots	Extent ha.
Paraveni* (settled)	2	0.61
Paraveni (unsettled)	51	7.18
Freehold (single owned)	22	14.79
Freehold (multiple owned)	1	0.30
LDO** permits	13	7.08
Encroachments	80	75.47
Government Lands	3	1.11
Total	172	106.55

* Paraveni = Land inherited.
** LDO Permits = Permits issued under Land Development ordinance.

Table 3. *Erosion status - Kokawewa sub-watershed.*

Category	No. of Plots	Status 1994	Planned Status 1999
Gravel exposed	10	5.8	2.5
Sand deposited	11	6.4	2.0
Relatively less erosion	95	55.2	5.0
Paddy lands	54	31.4	31.4
Others	2	1.2	0.0
Erosion control measures adopted	-	-	59.1
Total	172	100.0	100.0

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

(a) Maps drawn to scale were enlarged with land marks such as roads, rivers and locations of schools, temples etc. for the use of small groups engaged in walking through every plot in an assigned smaller area to map the plots.

(b) A questionnaire was used to collect basic data on plot size, land use/land cover, ownership, level of degradation as perceived by the user etc. for the database.

(c) Plots were marked to the scale by a draughtsman 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 landscape was produced to improve visual image.

(f) Superimposing land use map on elevation, a map visualizing the problems of land degradation was produced. Table 4 shows consistency of information mapped and verified in group discussions in participatory appraisal of conditions with the resource users. Similarly, distribution of land plots and the distribution of tenurial forms can be merged together. Figure 4 shows the pre-project land use pattern of Anninkanda sub-watershed in Nilwala while Figure 5 shows the distribution of land plots by tenurial forms in Anninkanda, a typical sub-watershed in the Upper Nilwala watershed. It will be seen that there is a mixture of tenurial patterns with marked encroachment of state lands for undesirable land use such as tea cultivation in steep slopes. Private landholdings are predominant, presenting a contrast from the patterns prevailing in the dry zone watershed.

Table 4. Consistency of 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 by thick forest.)	1.	Rocks on hill tops are exposed and visible with a threat of landslides
2.	Tea cultivation and encroachments expanding from lower elevations to hill tops and on slopes > 60%	2.	Villagers move into the state forest lands to grow tea for which a ready market is available providing cash income to household
3.	Source of origin of streams has been stripped of its tree cover changing from dense forest to open forest	3.	A drinking water supply project had to be abandoned for want of water during dry months. A serious drinking water problem is predicted. The dry weather affects tea crop which is the main source of family income.
4.	Fern lands continued to be a feature on the landscape	4.	Clearing and burning of state forest and scrub continues for seasonal crops on slopes by encroachers. Once abandoned such lands become lands covered by fern which fall easy prey to fire during dry months.

(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 plot wise.

Figure 4. Land use in Aninkanda sub-watershed in 1994

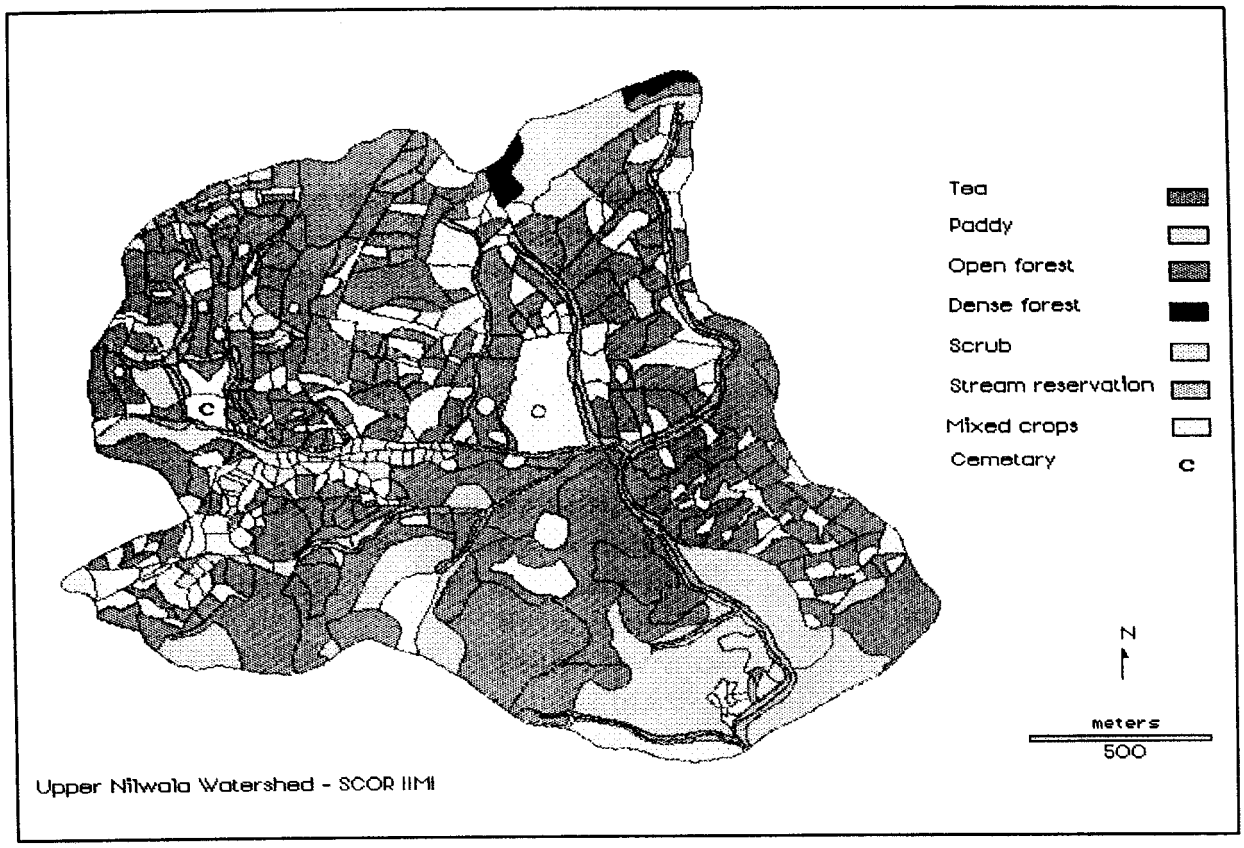
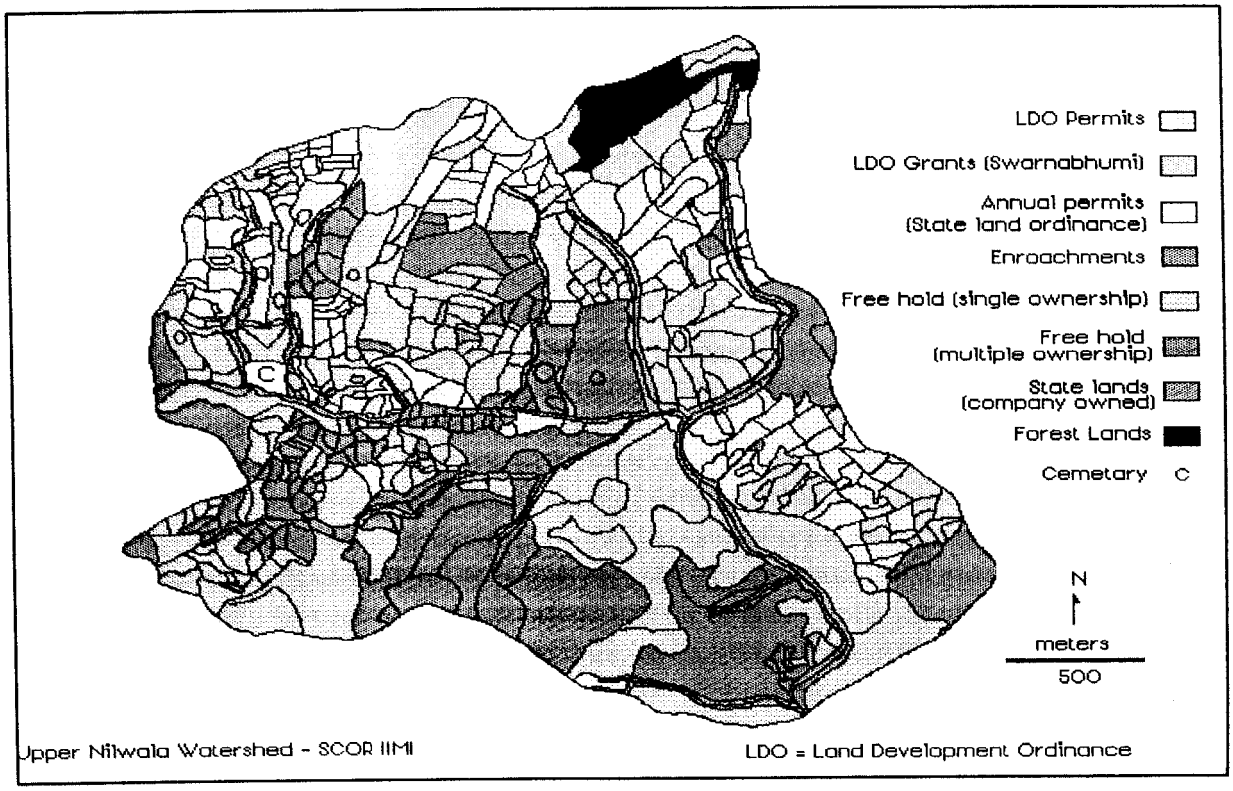


Figure 5. Distribution of land by tenurial forms - Aninkanda sub-watershed



Some Important Characteristics of Participatory Appraisal

Several important characteristics of Participatory Appraisal could be highlighted as follows:

(a) Appraisal is undertaken by resource users, local officers and SCOR professionals including the Institutional Organizers.

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

(c) Interactions and dialogue focus on three major aspects : **description, analysis and prediction**. The current use of land and water resources in the sub-watershed is described. How such resource use patterns evolved is described to analyze process and trends. Future is predicted as the outcome with implications if the current use patterns continued.
For example, in Anninkanda sub-watershed, participatory appraisal **described** the land use categories given in Figure 4, **appraized** reasons for denudation of forest areas in the past and in the present, **analyzed** and **revealed** processes motivating users to encroach state lands for expansion of tea lands and **predicted** possibility of future land slides from the hill top with exposed boulders, and continued dryness and absence of stream flows depriving the users with drinking water, forcing them to leave the area.

(d) A desirable and feasible future resource use is mapped based on the analysis as a shared vision.

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

(f) Information is extracted to prepare a "mini-project", with balanced disposal 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 of future resources use is briefly outlined in the next section.

IV. PLANNING OF NATURAL RESOURCES MANAGEMENT INTERVENTIONS

After refining the map (indicating the pre-SCOR resources management pattern), the same group of resources users, local staff of line agencies and SCOR professionals used the map and corresponding database **for participatory planning of future use of natural resources** of that particular sub-watershed. The formulation of a participatory resources management "mini project" is an output of the planning process. For the village in Figure 3, such a mini project

was formulated with an investment of Rs.1.2 million (US$24,000)[5]. The project aims to change the present *land and water use pattern to a more profitable and diversified resource use combining production and conservation using appropriate technologies/techniques, novel shared control arrangements and resource augmentation.* New commercial enterprises and conservation practices in a typical sub-watershed in the Huruluwewa Watershed include: cultivation of medicinal plants, fruits and vegetables in *chena* (shifting cultivation areas), processing industry for medicinal plants, stabilized cropping patterns for chena and highlands. *contour bunds to cover the entire area,* water harvesting techniques, etc.

This means that the villagers in such pilot sub-watersheds have "action plans" that guide them along a path to the planned future from the current status of resources use. The planned future land use pattern is illustrated in Figure 6 while the status as of March 1995 and the status as of end of 1995 are illustrated in Figures 7 and 8. Contour bunds and drains are being established to cover the entire extent shown in this map as well as in several other plot areas. Other activities include the planting of Gliricidia Sepium as hedge, growing seasonal cash crops and perennials between bunds in the uplands, increasing soil moisture retention using mulch (both in uplands and rice fields), home garden development--especially by farm women, integrated pest management, organic farming, etc. Novel modes of state-user partnerships in land and water resources use have been arranged. This mini-project is backed up by SCOR with a sub-grant of approximately Rs.300,000 (US$6000).[6] The banks agreed to provide a loan four times larger than the SCOR grant for the user organization using the grant deposit as collateral. A Colombo-based company offered a forward contract to the user organization to purchase most of the expected produce under the "mini-project".

---

[5] This process of formulation of participatory natural resources management MINI PROJECTS as well as an indepth analysis of participatory implementation and Monitoring and Evaluation (M&E) of these Mini Projects will be the subjects of a forthcoming IIMI-SCOR research paper. At present, there are over 20 on-going MINI PROJECTS in SCOR pilot watersheds.

[6] 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.

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

Figure 6. Planned future land use for Mahameegaswewa

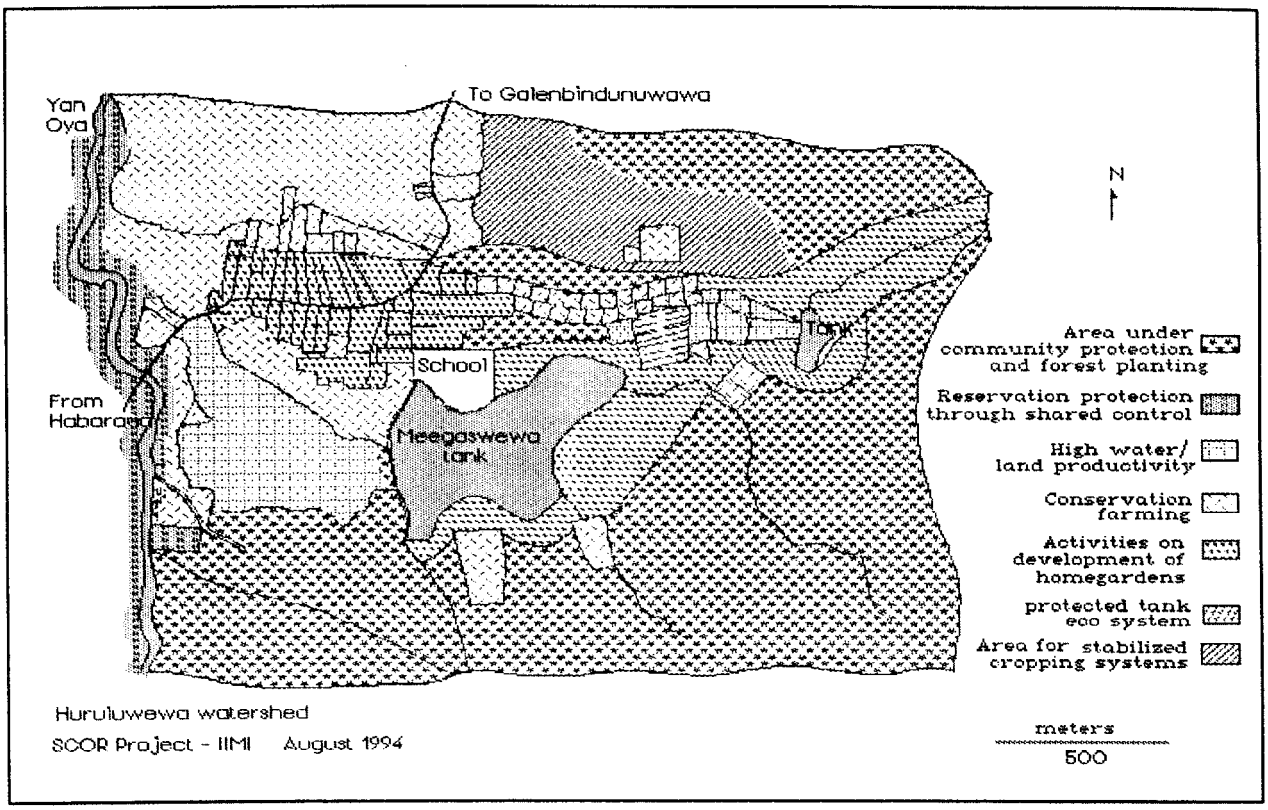


Figure 7. Mahameegaswewa land use - March 1995

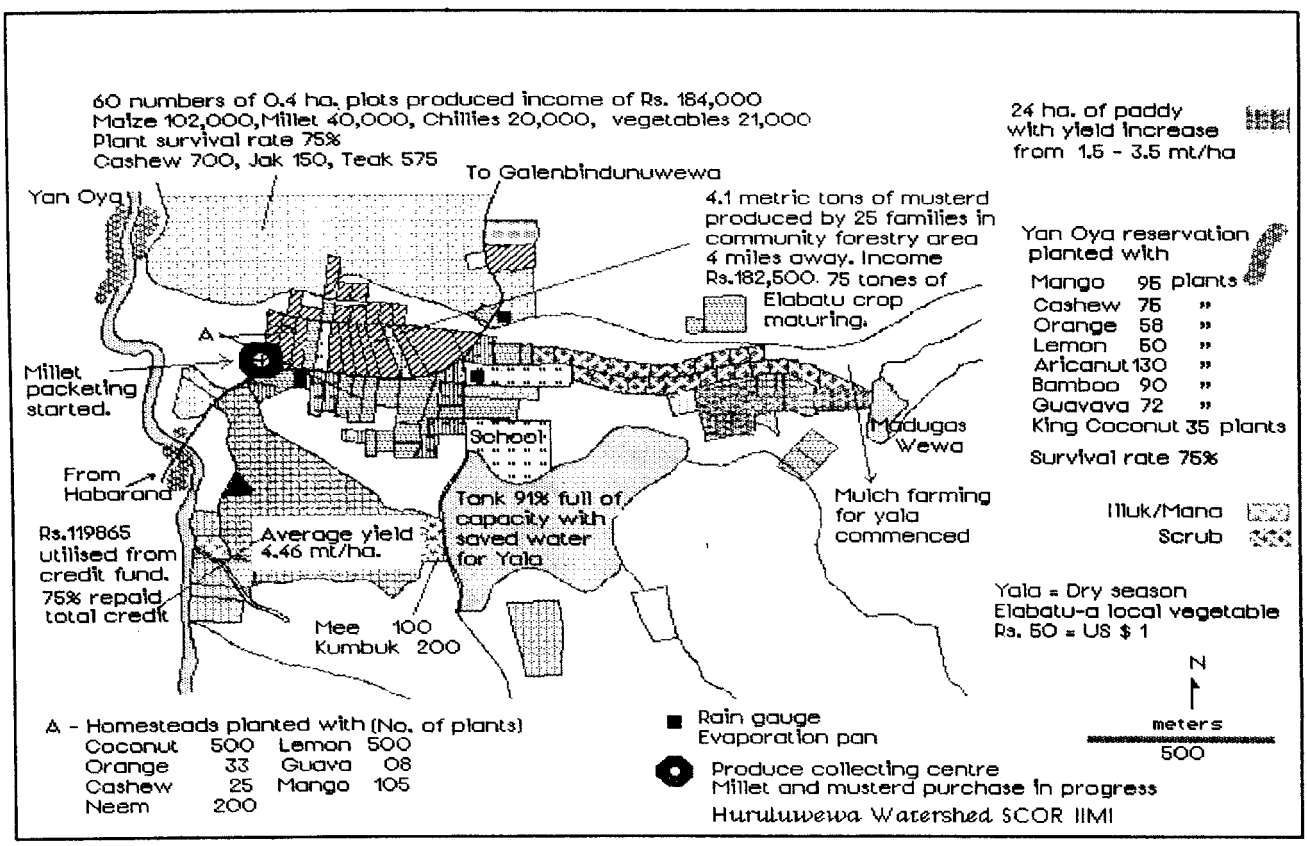
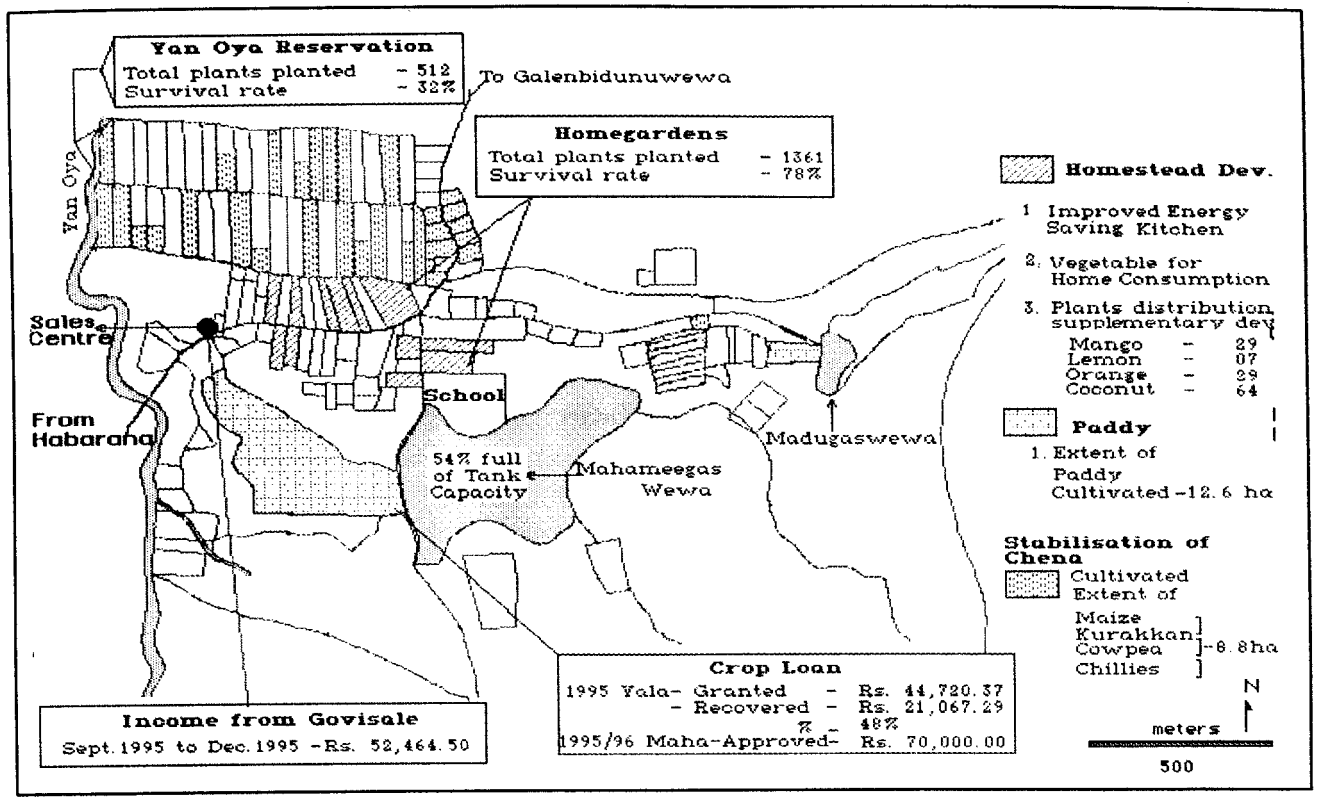


Figure 8. Mahameegaswewa land use - December 1995



Several mini projects of this nature are being implemented in a large number of sub watersheds in the two pilot watersheds namely Huruluwewa and Nilwala. In the wet zone watershed (Nilwala), it has been observed that deforestation and inappropriate hillside cultivation in the upper Nilwala has resulted in reduced water availability in the dry season, erosion, sedimentation, distorted runoff patterns and decline in water quality. It is proposed that hilltops and high slopes should be under the land cover category of dense forests. Most such areas come under the control of the Forest Department. The department officials, SCOR project catalysts and other relevant agencies joined the user groups to plan reforestation patterns on hillside, helped raise nurseries and facilitated replanting.

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

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

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

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

(c) It recognizes the need for resource use change in each of these land segments for improving the livelihoods of all the people. Example : it involves all the families in the village in sharing the 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 activity can be organized enabling the organization to predict production, enter 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 a balance protection and production. Example: For the first time the MM (Maha Meegaswewa) villagers were exposed to new knowledge on conservation farming. They shifted *chena* (shifting cultivation) farming from the catchment of their tank to a highland area and established organic bunds followed by earth bunds on contours with protective and productive plants and crops for a stabilized farming system that ensures a family food supply with maize, pulses and vegetables. In addition, valuable timber trees planted on boundaries provide security for the future. They try mulch farming using straw in the rice fields raising a crop in *yala* season for the first time in their village.

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

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

A leadership emerged from the community with volunteer catalysts representing each production zone in the village, which is the correct basis for

selecting mobilizers without considerations of party politics. These "mobilizers" in each of the sub watersheds catalyze development, harmony and contentment. They have experiments in their own farms with the support of the government officers and others who extend such support to them. They can mobilize resources to carry out their plans and finally become shareholders of their own company with control over the production process, which is the only way for small farmers to gain and share prosperity in an "open economy".

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

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

Organized Group Action for Production and Protection

To maximize the environmental impact, efforts/activities aimed at balancing production and protection must cover the entire area of the selected contiguous block, *and should not be limited to sample plots or selected farms/home gardens.* As most of the holdings are small (ranging from about 2.0 ha to about 0.25 ha), most productive conservation practices such as integrated water management, building contour bunds and water harvesting/saving techniques, biological measures (eg., planting along contour), integrated pest management, reducing water pollution, etc., demand group action. For instance, contour bunds will cut across individual holdings.

A leadership emerged from the community with leaders of groups, organizations and companies aimed at production and conservation representing each production zone and/or profitable enterprises with due regard to sustainability of resources utilization. Resources users have access to information from outside and knowledge gained from their own experiments in their own farms with the support of the government officers and others who extend such support to them. They can mobilize resources to carry out their plans and finally become shareholders of their own business companies/

organizations with control over the production process, which is a productive way for small farmers to gain and share prosperity in an open economy.

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

V. IMPROVING ACCURACY OF APPRAISAL AND PLANNING PROCESS : DATA/INFORMATION GATHERED

a) Accuracy of mapping

The plot level mapping is undertaken by small groups on small **blocks** with known boundaries such as roads, streams, canals etc. For this purpose, the 1:50,000 map is 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** is known. During the participatory "walk-through survey", plots are marked on those enlarged **block** maps. Therefore, the accuracy of mapping is maintained at a higher level. Extent of the plot is recorded separately during the survey. In addition, the service of a draftsperson is obtained to redraw the final plot map correcting plot size to scale thereby minimizing errors. The final plot map thus become digitizable.

Once the map is digitized, data pertaining to each plot is linked to the map in the spatial database. Each data field can be mapped separately using the plot map as the geographic definition image. In database query, values pertaining to the extent in the data field are used eliminating the chance of slight errors in drawing plots entering into computation. The level of accuracy achieved in this way is adequate to the task of participatory planning and monitoring activities and process of change in resources use in sub-watersheds.

b) Use of a mixed group of catalysts with different academic and professional background

This method provides a multi-discilplinary approach to better diagnosis of problems, participatory constraint analyses, a shared responsibility in considering diverse opinion on issues and as a result filtering ideas for discussion minimizing errors and avoiding partial considerations of facts.

c) Walk through individual plots, talking to owners/operators of plots

This allows 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. It also helps build-up rapport with the users for the engagement in further appraisal of conditions, planning and monitoring of interventions.

d) Farmer participation

Farmers participate willingly in the mapping and data collection with the view that the output by way of mapping of resources availability could be useful to them individually as well as a community group. Equal opportunity is given to all in the sub-watershed to participate to ensure that all occupants in the sub-watershed are included as resources users in planning.

e) Consciousness on the purpose of data collection

People know that the task is not just information gathering (for the sake of knowledge generation) but to develop and implement "their own project."

f) Sense of Ownership

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 are indicated create a sense of ownership, belonging and commitment for action for future thwarting uncertainty associated with external interventions by "projects" commonly introduced to the periphery.

g) Use of Different Sources of Data

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

1. Topographical and landuse maps produced by the Surveyor General's Department.
2. Information on watershed resource profile prepared by the Land Use Policy Planning Division of the Ministry of Irrigation Power and Energy on the pilot watersheds on SCOR initiative.
3. Final Village Plans (FVP) from Grama Sewa Officers, and administrative boundaries and socio-economic data from the Divisional Secretariats.
4. Block-out diagrams of the command area from the Irrigation Department.

Since certain secondary data are not upto date, primary data had to be collected in respect of major areas of information needs. For example landuse data on topo sheets were five years old at the time of undertaking participatory appraisal. The plot level map produced by the appraisal is the most current map available for the sub-watershed and it is partially updated on quarterly basis.

VI. SUMMARY

This paper 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 indigenous and exogenous knowledge**/information in developing **market-oriented** and **sustainable use of** land and water resources is described. The elements of the action program aimed at developing a package of interventions related to **Technology, Organization/ Institutions, Resources and Policy** are elaborated as they were adopted by an action research project on participatory watershed management, namely the Shared Control of Natural Resources **(SCOR),** implemented in Sri Lanka jointly by the International Irrigation Management Institute (IIMI), Government of Sri Lanka and the natural resource users in watersheds.

More specifically, the paper focuses 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 planning as well as Implementation ,Monitoring and Evaluation (M&E) processes were characterized by the **integrated use of participatory resource use survey and mapping** and **Geographic Information Systems**. The output produced during the planning phase and the early implementation phase of SCOR are used as evidence of results to illustrate the methodology and steps of Participatory appraisal for planning natural resources 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 that of the respective main watersheds. Size of these selected pilot sub-watersheds ranges from about 200-1000 ha. The paper examines the initial **action-research** which is being taken through a participatory process to learn, test and demonstrate on "ideal" land use pattern with due emphasis on production and conservation. Micro concentration on **contiguous areas** or tank ecosystems within which "every inch of surface" is carefully planned and monitored for the impacts of participatory research interventions is a unique characteristic of SCOR.

In the 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 of resource users/farmers, local officers of relevant Government Agencies, IIMI-SCOR professionals and catalysts. 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 airphotos/toposheets; walk-through surveys; use of different sources of data and the use of GIS; use of mixed group of participants including resources users, local officers, scientists and catalysts; developing a "sense of ownership", belonging and commitment for action by users and partners etc.

A participatory resource management "mini project" was formulated for each pilot sub watershed. 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 a shared future vision.*

REFERENCES

Bruns, Bryan. 1993. Promoting Participation in Irrigation: Reflections on Experience in Southeast Asia. *World Development*, Vol.21, No.11, pp.1837-1849.

Chambers, Robert. 1994. The Origins and Practice of Participatory Rural Appraisal. *World Development*, Vol.22, No.7, pp.953-969.

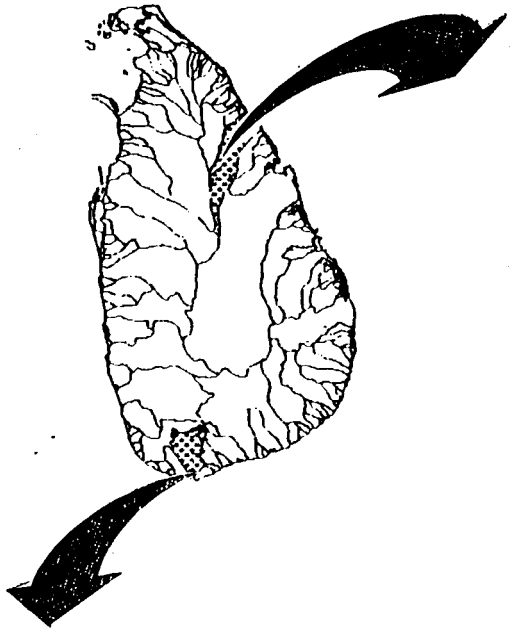
UNDP/FAO/Netherlands Government Regional Watershed Project Newsletter, Vol.2, No.2, 1990.

Uphoff, Norman. 1988a. Participatory evaluation of farmers organizations' capacity for development tasks. *Agricultural Administration and Extension* 30(1): 43-64.

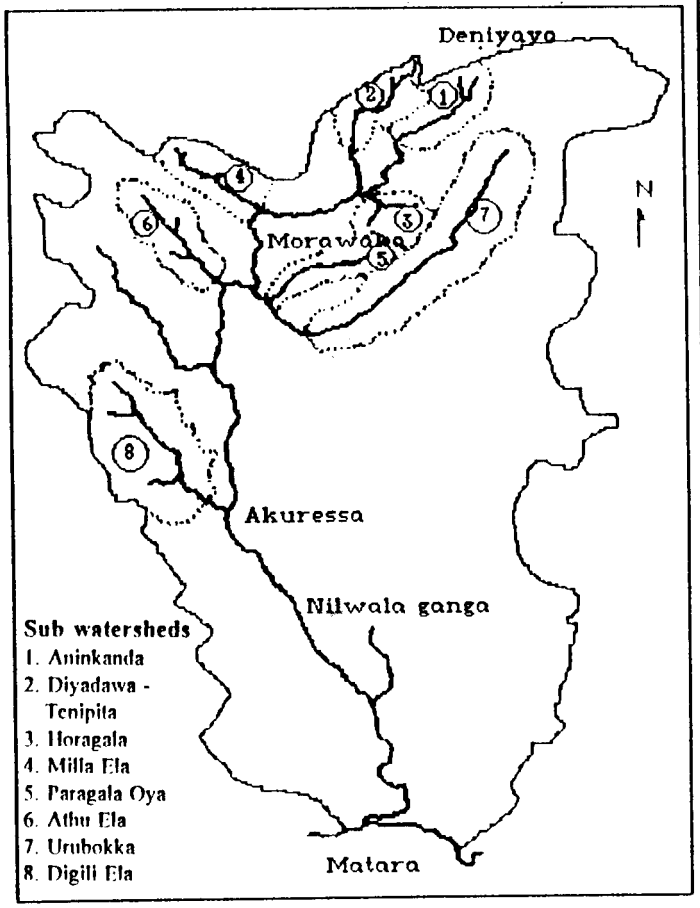
_____. 1988b. Assisted self-reliance: Working with, rather than for, the poor. In *Strengthening the poor: What have we learned?* ed. John C. Lewis, 47-59. New Brunswick, N.J.: Transaction Books.

_____. 1992. Learning from Gal Oya.. *Possibilities for Participatory Development and Post-Newtonaian Social Science.* Cornell University Press. New York.

Annex 1 Location of Huruluwewa and Nilwala Watersheds.



Nilwala Watershed



Huruluwewa Watershed