Shared Control of Natural Resources Spatial Database for Planning and Monitoring Resource Use Change

November 1994

SHARED CONTROL OF NATURAL RESOURCES SPATIAL DATABASE FOR PLANNING AND MONITORING RESOURCE USE CHANGE[1]

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INTRODUCTION

Shared Control of Natural Resources (SCOR) project is a research project implemented as a collaborative effort of the Government of Sri Lanka, the United States Agency for International development and the International Irrigation Management Institute. The project combines both research and development interventions for achieving sustainable productivity of natural resources in pilot watersheds (map 1). Its role is to act as a catalyst facilitating change in the resources use patterns from an observed sub-optimal status to a possible, desirable and sustainable status articulated jointly with the resources users (figure 1 and 2).

This change is attempted through shared control of resources striking a balance between production and protection. The planning approach is illustrated in figure 3. SCOR teams developed work plans with the resources users, user organizations, relevant government agencies at various levels and with those who have expert knowledge on specific areas of interventions setting targets achievable within a given period of time. It is this process of effecting change that has to be monitored and evaluated to ascertain the viability of the SCOR model of intervention in the watershed resource management.

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LOCATIONS OF PILOT WATERSHEDS – SCOR PROJECT

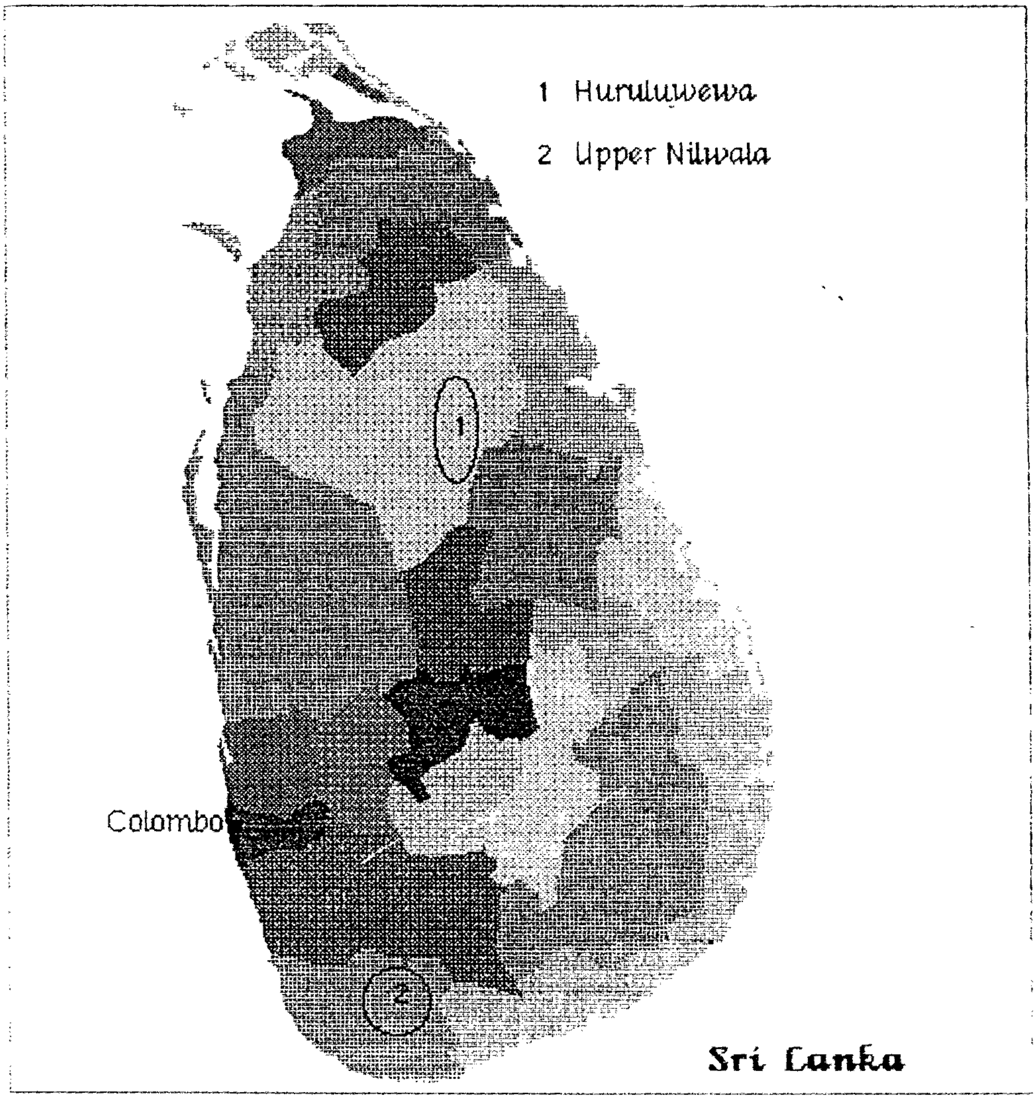
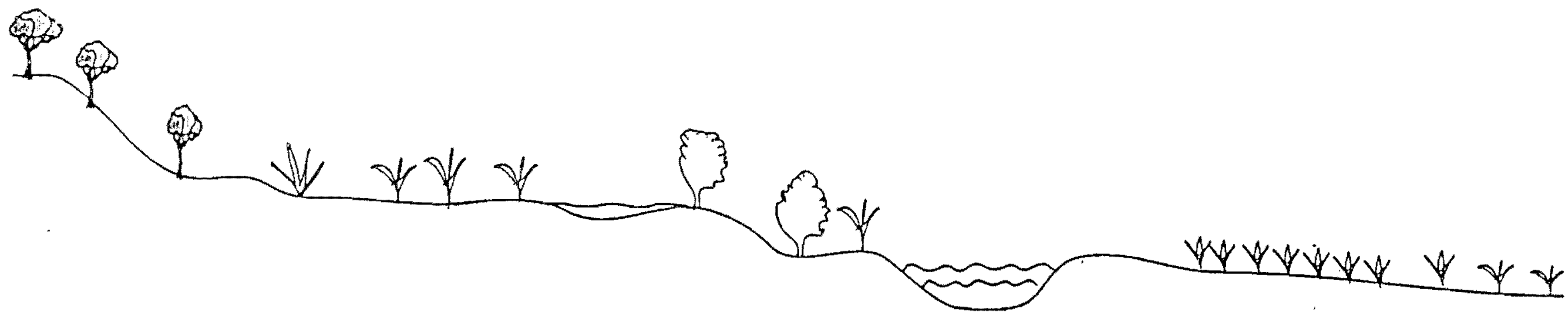
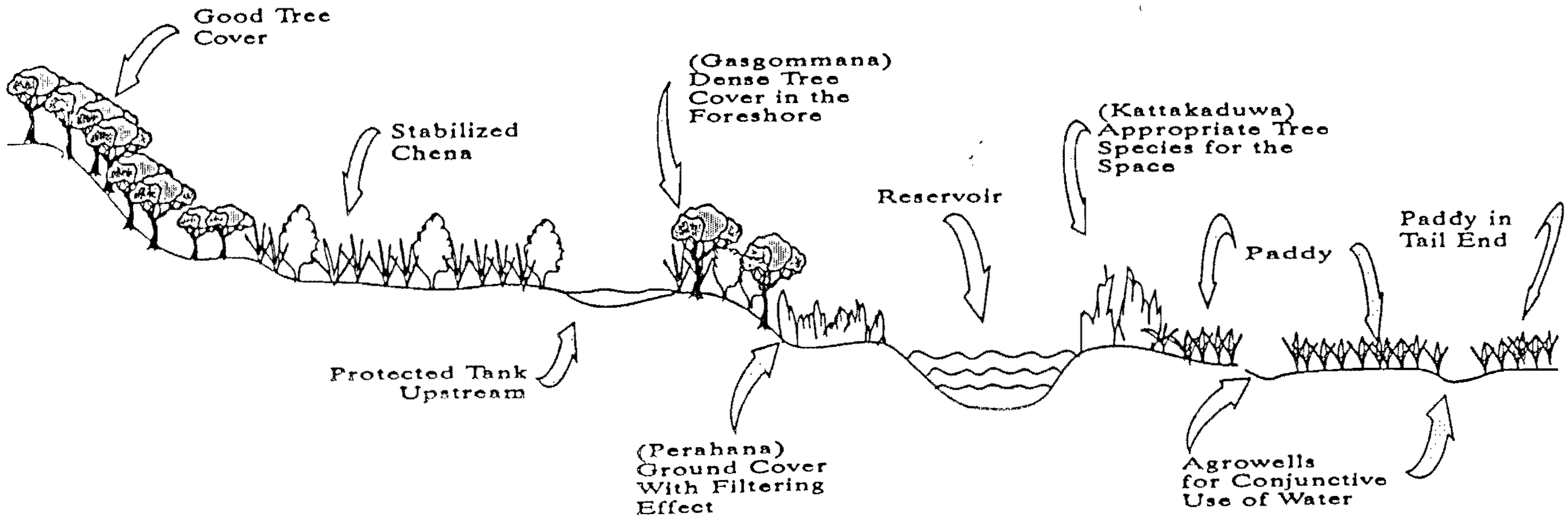


Figure 1

Typical Landscape Profile - Huruluwewa Watershed

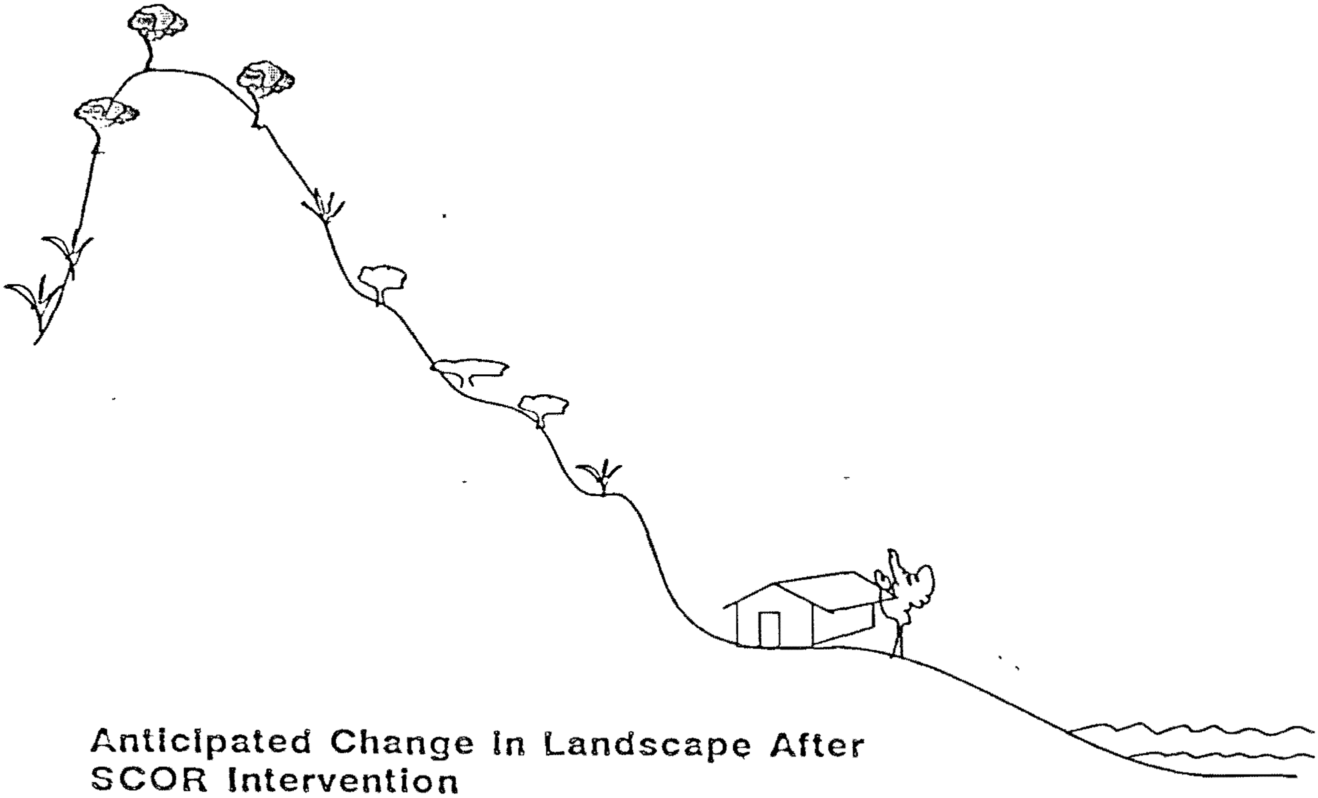


SCOR Perception of a Possible Future



A Typical Landscape Profile Calling for Intervention in Upper Nilwala Watershed

Figure 2



Anticipated Change in Landscape After SCOR Intervention

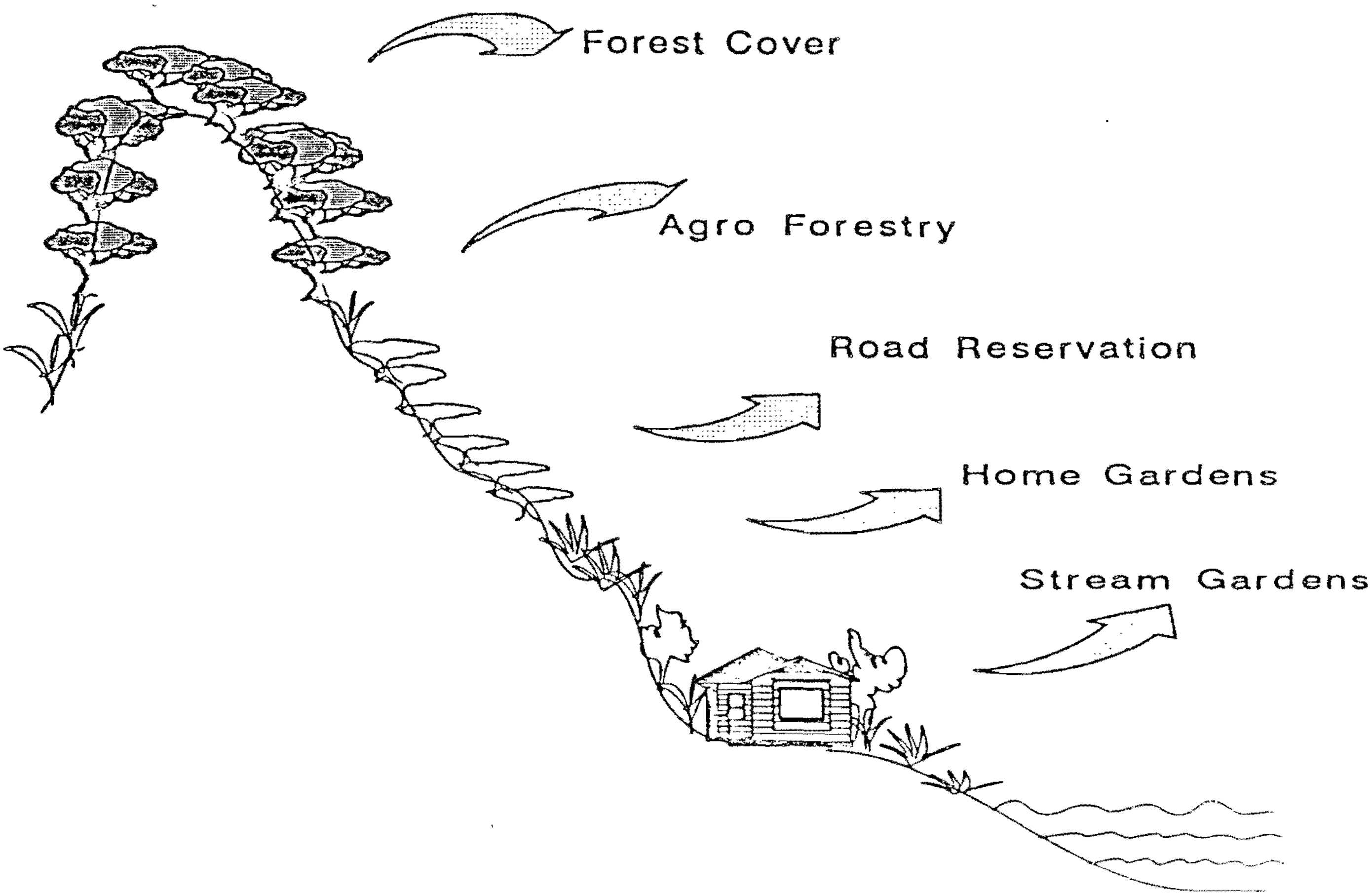
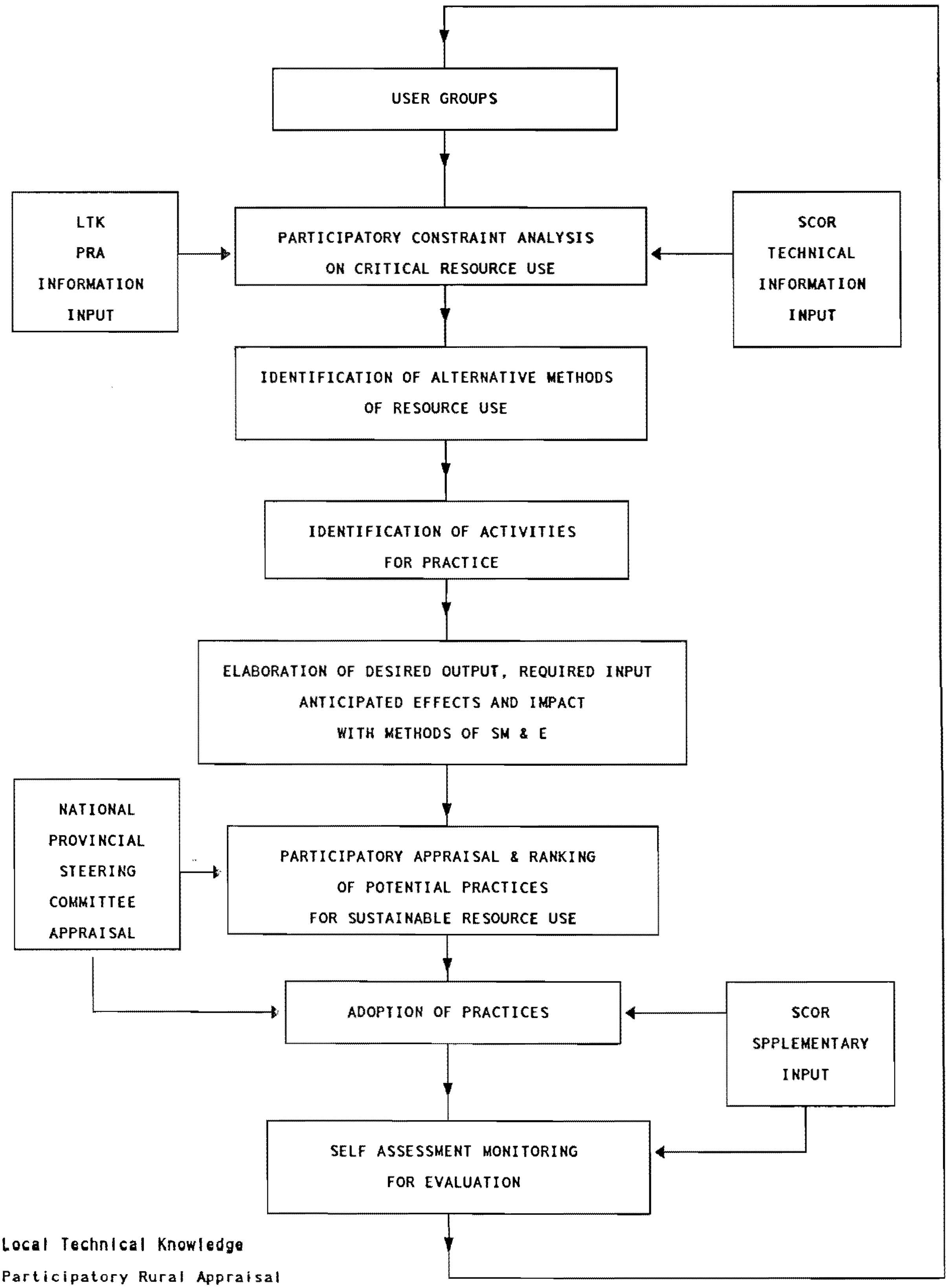


Figure 3

A PARTICIPATORY MODEL FOR SUSTAINABLE WATERSHED RESOURCE MANAGEMENT



LTK = Local Technical Knowledge

PRA = Participatory Rural Appraisal

SM & E = Self assessment and Monitoring & Evaluation

Since SCOR aims at changing the use patterns of resources on physical landscape, it has to use a volume of spatial data. Although some of these data are available as secondary data, quite a sizeable portion of the data will have to be generated through a participatory mode of action. This paper illustrates how this spatial data base is created and managed for planning and monitoring resources use change in the pilot watersheds under shared control of natural resources project.

THE NEED FOR SPATIAL DATA

In a natural resources management project in a watershed context, the focus is on changing the existing undesirable landuse pattern to one of planned sustainable resources use. The expected change will be visible on the geographic space as the result of the action taken by the resources users as figure 2 illustrates. The choice of appropriate action is influenced by the acquired information on factors affecting change of the resources base. The type, size and quality of the resources base is influenced by its location and the form in which the Nature has made them available for human use.

Figure 1 and 2 illustrate this conceptualization. In Huruluwewa, the dry zone agro ecological characteristics set different limits to resources use than those set in Upper Nilwala watershed in the wet zone. While water or lack of it becomes the unifying factor for human action to change the resource use in the Huruluwewa watershed integrated resources management, it is slope that influence same in the Nilwala watershed. In both watersheds, thus the relative location of the phenomena affecting the resource use change is a critical factor. Gaining knowledge on what is where and how involves the acquisition of spatial data on the physical properties and the functions of the geographic space so that the anticipated change can be articulated, facilitated, monitored and evaluated.

The need felt for the design and creation of a spatial database is fourfold. First, it is necessary to gain adequate knowledge of the sub location identified for priority intervention. Second, such a data base would collect, store and provide necessary information for constraint analysis that would lead to the identification of activities for planning. Third, the activities can be monitored to ascertain whether work in progress in achieving the planned output and short term effects. Fourth, it would provide a baseline to record the prevailing status of the subwatershed so that the change taken place can be identified and assessed at a future date.

SPATIAL SETTING FOR INTERVENTIONS

SCOR watershed teams started work in the field with the following set of interventions identified as output of the initial planning and simulation workshops.

1. Stabilization of chena and encroached state lands
2. Regeneration of tank eco-system
3. Integrated water management
4. Sharing resources for improving homesteads
5. Ground water development and management
6. Land consolidation in minor tanks
7. Integrated planning and coordination
8. Organization of user groups for production and related services
9. Integrated management of Land and water resources
10. Improving tea paddy culture
11. Research

Subsequently the teams identified subwatersheds within the watershed for SCOR interventions. Within the sub watersheds, there are sublocations that have been identified as contiguous spatial units based on the watershed principle as micro watersheds in

Nilwala, and as cascades in Huruluwewa for intensive operation of activities covering the entire unit area with all the possible interventions in order to gain knowledge of the impact of the resources management model for the purpose of replication elsewhere.

Figure 4 presents the 11 sub locations where intensive planning and implementation of activities are taking place in the Huruluwewa watershed. Each sublocation is the work area of a catalyst with the exception of the 11th location (Tract 6 of the Huruluwewa command) which is the specific work area for the Coordinator of Women and Youth activities.

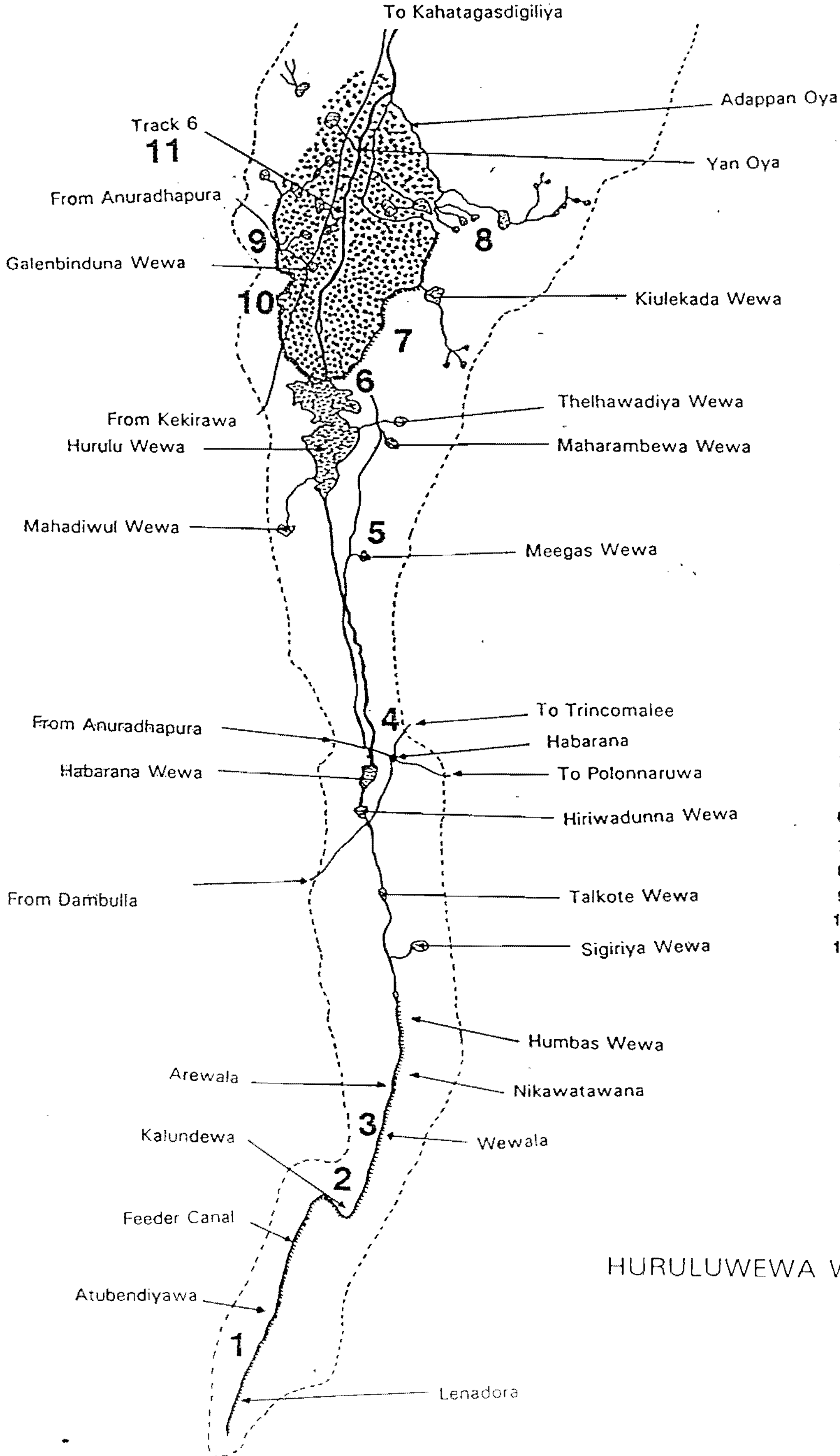
Figure 5 presents the main four subwatersheds of the Upper Nilwala watershed where two large sublocations in the Aninkanda and Millawa subwatershed are under intensive resources use planning and adaptation. Several sublocations of varying sizes are under planning and implementation in the sub watersheds. This distribution of sublocations forms the spatial setting for the creation of the spatial database for SCOR project with the addition of the Huruluwewa command and specific cascades of interest where SCOR activities take place.

INDICATORS FOR MONITORING AND EVALUATION

The choice of indicators for monitoring and evaluation of change expected in a watershed resources management project involves consideration of several important issues as indicated below.

1. How much change can be captured by the M&E in the short run?
2. Does the period of intervention covers a period long enough to capture the long term changes anticipated?
3. Could results of sample surveys be generalized to apply for the entire watershed?

Figure 4



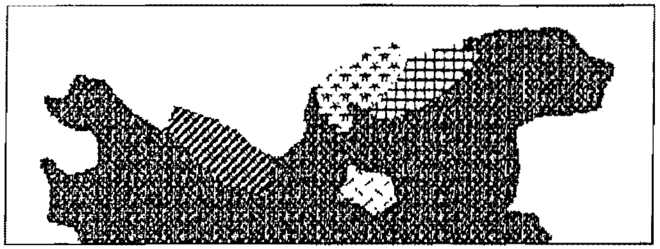
SUB LOCATIONS:-

1. Walgamwewa
2. Angunawelpelessa
3. Welangolla
4. Puwakpitiya
6. Maha meegaswewa
6. Padikaramaduwa
7. Garandiyaulpotha
8. Kokawewa
9. Ulpathgama
10. Maradankalla
11. Tract 6

HURULUWEWA WATERSHED

Figure 5

PROGRESS OF RESOURCE USER GROUP FORMATION BY SUB WATERSHEDS


UPPER NILWALA WATERSHED

	SUB WATERSHEDS				
	Millawa	Aninkanda	Horagala	Diyadawa Thanipita	TOTAL
No of Resource User Groups	17	20	14	20	71
No. of Members	290	193	340	239	1062
Male	251	138	311	223	923
Female	39	55	29	16	139
No. of user grants	05	09	03	04	21
Amount (Rs.)	26,600	50,150	12,000	28,000	116,750
Population	4,400	5,900	3,070	9,750	23,120
Area (ha.)	1,434	1,228	925	1,631	5,218

PROGRESS UPTO END OF 2ND QUARTER '94

Note: Existing organizations strengthened not included

4. What aspect would receive priority between gaining knowledge on performance of the models with direct interventions or gaining knowledge on general processes in the watershed context for research interest.

As far as monitoring of the direct project inputs and outputs are concerned, the above mentioned issues would not make serious problems. SCOR project has an elaborate system to monitor the inputs and outputs of project activities as described in greater details later in this document. The issues are critical when it comes to monitoring and evaluation of project effects and impact which is of paramount importance.

The project effects are defined as the outcome of the increased utilization of project output. Not all the project effects are observable during the short run. It is important to note however, that certain important effects can be observed that would indicate the direction of the interventions towards the achievement of its goal. This position accepts the presence of short and long term effects that would permit partial capture of change adequate to form opinion on the direction of the project.

In respect of certain types of indicators and measures, it is difficult to claim generalizability of results. Soil loss and sediment transportation are two of such indicators. The difficulty arises when the results are used to generalize claiming effects/impact attributable to a particular intervention across the watershed.

SCOR project addresses this difficulty in two ways. First, it listed all possible indicators and prepared an indicator matrix that carries information on each indicator in respect of its particular unit of measure, data needs and sources, methods of data collection and techniques, the sub location and who is responsible for data collection, measurement and reporting (See annex 1).

Second, it evaluated each indicator in respect of its validity, generalizability, and adoptability in terms of time, cost, and degree of contribution to SCOR process. It was then possible to come to the following conclusions in respect of the 3rd and fourth issues.

1. Generalization is attempted across space of given conditions where insitu values of change can be computed at lesser cost and time.
2. Priority is given to a combination of factors directly revealing the usefulness of interventions at micro level and few general processes such as water use efficiency, resources conservation and degradation to meet the obligations of a research project.

A set of indicators selected with an indication of its spatial reference appear on figure 6. Information provided using these indicators can adequately characterize the change took place in the subwatersheds under SCOR interventions. These indicators are categorized under four sub headings to reflect their level of aggregation.

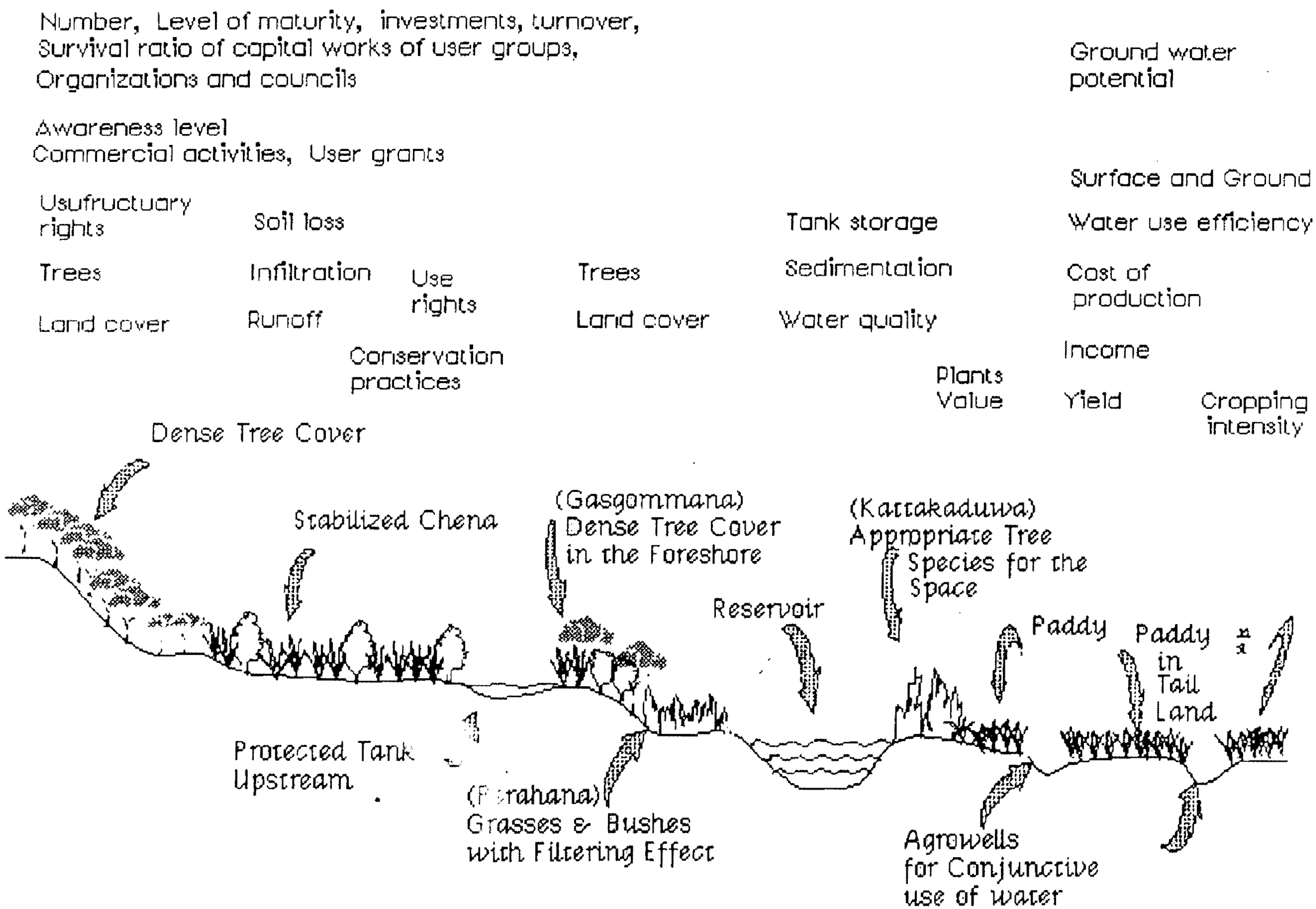
At the highest aggregated level the change (progress) is reflected by strategic level indicators in a summary form. The next level is the programme outcome level that gives more details of output and possible effects. The third level presents a set of indicators allowing a quick look on direct outputs realized. The fourth level is the lowest level of data presentation by activity with remarks explaining the figures there in, referring to documents that carry further details of the activity and process involved.

STRATEGIC INDICATORS

The strategic indicators characterize realizable effects of the interventions within the project period in relation to broad

Figure 6

INDICATORS FOR MONITORING AND EVALUATION
SCOR PROJECT



strategic objectives within which the project is placed by the sponsoring agency. The three strategic objectives are, (1) Economic Growth, (2) Environment, and (3) Democracy.

The life of project target (LOP TARGET) relates to the target set for the first phase of two years since the current agreement covers only the first phase.

Table 1 presents the strategic level indicators.

PROGRAM OUTCOME LEVEL INDICATORS

These indicators characterize the activity status in the context of the direct output and realizable effects in the short run. The program outcome level indicators are categorized under the relevant strategic level indicators. The indicators are reproduced separately to give the details by watershed together with remarks that describe the activity status in greater detail.

Table 1 presents the progress by program outcome level indicators.

PROJECT PURPOSE LEVEL INDICATORS

These indicators relate to the project purpose, i.e. shared control, characterizing the type of achievements to be monitored. (Table 1)

MAJOR OUTPUT INDICATORS

Table 2 presents the major promised output indicators that directly relate to the output as indicated on page 21 to 24 in the SCOR technical report.

Table 1

TARGETS AND PERFORMANCE

1. Program Level Indicators:

TBD = To be determined

STRATEGIC LEVEL INDICATOR	UNIT	BASELINE YR VALUE		LOP TARGET	TOTAL TO DATE	CY 94 ACTUAL / PLAN
1. Targeted hectares under improved production and protection techniques.	Hec.	92	0	3,000	1156	
2. Value of targeted investment by the resource users in environmentally sound production practices	$Mn	92	0	0.4		
3. Government policy decisions initiatd	No.	92	0	3	1	

PROGRAM OUTCOME LEVEL INDICATOR	UNIT	BASE YR VALUE		LOP TARGET	TOTAL TO DATE	CY 94 ACTUAL / PLAN
1. Targeted land area covered by agreements between GSL and user groups	Hec.	92	0	3,000		
2. Farm households using improved environmental techniques	#	92	0	4,000	1645	

2. Project Level Indicators:

PROJECT PURPOSE LEVEL INDICATOR	UNIT	BASE YR VALUE		LOP TARGET	TOTAL TO DATE	CY 94 ACTUAL / PLAN
1. Number of natural resource groups operating	#	92	0	150		
2. No.of policy/procedures, organizational changes exacted and adopted	#	92	0	6	2	

Table 2

PROJECT OUTPUT TARGETS/PERFORMANCE	BASE YR VALUE	LOP TARGET	TOTAL TO DATE	CY 94 ACTUAL / PLAN
1. User groups organized/assisted to take joint responsibility for management of land and water resources	0	150		
2. Number of new commercial activities supported by linking to markets	0	50		
3. Land leasing/usufruct agreements issued for establishments and functioning of production companies and commercial activities	0	10		
4. Training opportunities provided to representatives of NGOs and other private sector organizations in participatory natural resources management	0	10,000	42	
5. Number of officials trained in local level planning, user group formation, support and collaboration	0	2,000		
6. Number of user organizations conferred with legal status and powers	0	20	18	
7. Number of NGOs and private sector agencies providing technical, managerial and commercial information to user groups	0	8		
8. Research Studies completed on natural resources issues	0	7	1	

There are specific indicators used in research studies to reflect the research findings under SCOR. Table 3 presents an example of a set of indicators used in the research undertaken on conservation farming.

DATA COLLECTION

As it was indicated earlier, the organization of programme planning and implementation by sub locations was the basis for data collection to build up the spatial data bases. This results in the building up of a spatial database in respect of each sublocation facilitating planning, implementation, monitoring and evaluation of interventions under the SCOR model of resources management.

Any planning approach for sustainable area development should initiate action on establishing a spatial data base that would help extracting information on the human and physical resources and their interaction of the area concerned. In fact it is this interaction that will be changed by the planning effort for sustainable productivity of the resources use. Figure 7 shows the guidance for data collection by the segments of functional space in the landscape of the selected sub location.

The following steps are considered important in this process.

1. Involve resources users for data collection and initial mapping by individual plots.
2. Use RRA (Rapid Rural Appraisal) / PRA (Participatory Rural Appraisal) techniques for data collection within a reasonably shorter period of time to meet the planning needs.
3. Use technology appropriate to the task putting the `mission first and the machine next' to produce the required output on time extracting information for planning.

PLAN FOR M&E OF EFFECTS AND IMPACT OF CONSERVATION MEASURES IN HURULUWEWA WATERSHED

Table 3

Activity/Area	Sub activity	Indicator	Data to be collected	Methodology	Frequency	Location	Commencement
Conservation Farming							
Rainfed uplands	Alley cropping Contour bunding Mulching Tree planting	Land cover	Percent ground & canopy cover	Total survey using visual method in locations & grid point method in sites	Annually	Padikaramaduwa, Mahameegaswewa, Walgamwewa, 18 plots	on-going
		Soil loss	Contours & peg hight	Contour survey using dumpy level & install	Annaually	Sample plots from each three locations (PMW)	September '94
		Wind Erosion	Soil mass in collectors	Dust collectors pegs & measure hight	Seasonaly	Sample plots from each three locations	February '95
		Erosion coeficient	Rainfall, slope & slope length	Soil loss equation Measure slop using dumpy level	Annaually	Sample plots from each three locations (PMW)	September '94
		Soil compaction	Penetrometer readings	Random survey 48 hours after rains	Annaually	Sample plots from each three locations (PMW)	December '94
		Moisture Depletion Index	Days to 50% wilt	Phythometer Plants grown with mulch Farmer records	Daily	Selected plots Plots with mulch	On-going
		Earthworm Cast	Number of cast per unit area	Count number of casts in a selected plot	Annaually	Sample plots from each three locations (PMW)	February '95
		Biomass	Weight of crop residues Weed & alley biomass	Collect biomass from selected plots, dry & weight	With each operation	Sample plots from each three locations (PMW)	September '94
		Weed Composition	Number & type of weeds, weed distribution pattern	Survey using grid point method	Annually	Sample plots from each three locations (PMW)	September '94
		Crop Yield	Yield of each crop type	Crop cut survey/farmer records	Seasonaly	Sample plots from each three locations (PMW)	January '95
		Net return	Cost of inputs, yield & price	Calculate using farmer records	Seasonaly	Sample plots from each three locations (PMW)	January '95

Contd...

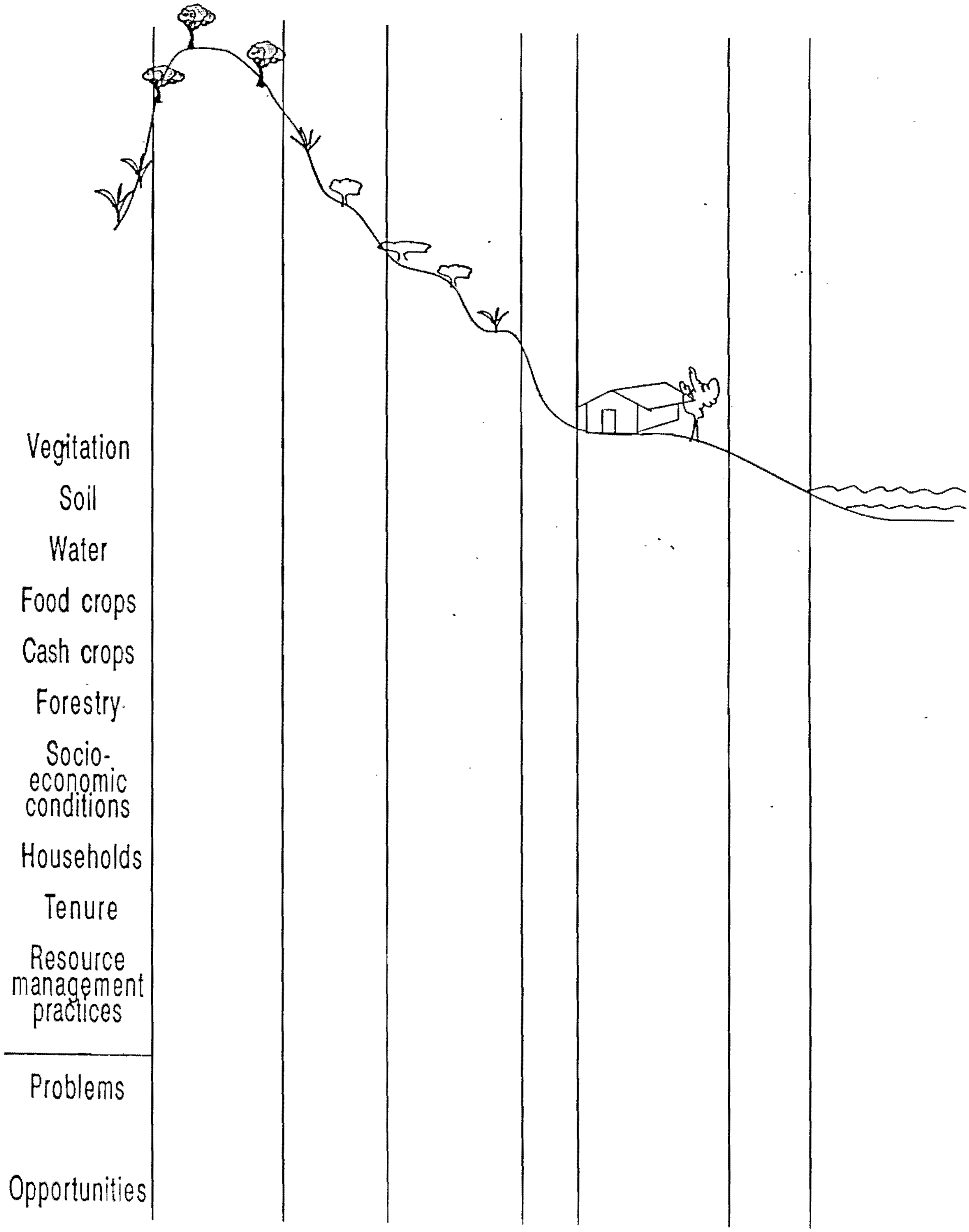
Activity/Area	Sub activity	Indicator	Data to be collected	Methodology	Frequency	Location	Commencement
Homegarden	Gliricidia planting Bunding Mulching Tree planting Green manure Management & Composting	Land cover	Same as earlier			Sample plots f[illegible] four locations (PMWT/6)	October '94
		Tree density	# & species of trees	Survey	Annually	Sample plots from each four locations (PMWT/6)	October '94
		Moisture Deplation Index	Same as earlier	Phytometer plants grown with mulch, farmer records	Daily	Selected plots with mulch	Already
		Earthworm Cast	Number of cast per unit area	Count in a selected plot	Annually	Sample plots from each four locations (PMWT/6)	February '95
		Biomass	Weight of weeds, live fence, Gliricidia & leaf litter	Collect biomass from selected plots, dry & weight	With each operation	Sample plots from each four locations (PMWT/6)	September '94
		Weed Composition	Number of type of weeds Weed distribution	Survey using grid point method	Annually	Sample plots from each four locations (PMWT/6)	September '94
		Yield	Yield of trees	Farmer records	Seasonally	Sample plots from each four locations (PMWT/6)	September '94
Lowland	Mulching Green manure Management (Gliricidia & Sasbeniya) Recycling of rice strow & Introduces new cropping patterns	Moisture Depletion Index	Same as earlier			Sample plots from each five locations (PMWT/6 & Puwakpitiya)	
		Biomass	Biomass of rice strow Crop residues, weeds Gliricidia & Sasbenia	Same as earlier	with eact operation		September '94
		Weed Composition	Same as earlier				September '94
		Crop Yield Water Productivity Land productivity & cropping intensity	Yield of each crop Water duty Extent of each crop	Farm records Calculate	Seasonally		September '94

Contd...

Activity/Area	Sub activity	Indicator	Data to be collected	Methodology	Frequency	Location	Commencement
Regeneration of ecosystems Tank	Planting trees in Gasgommana Perahana & Kattakaduwa Removal of silt	Extent Nuber Density of species Gasgommana Kattakaduwa & Perahana Tank water loss	Crop type, extent, Frequency of cultivation Yield Storage***	Survey	Annual	Padikaramaduwa Meegaswewa	Already
	Cropping intensity	Crop type, extent frequency of cultivation	record keeping	Seasonally	PMW	October '94	
	Tank water productivity	Yield, extent, water duty	record keeping	Seasonally	PMW	October '94	
	Opportunities for cottage industries	Type, number & quantity	Survey	Annually	tank systems	January '95	
Streams	Planting trees & other species at banks & foreshow areas of streams & canals	Number of plants Sediment load	Suspended sediment load	count Water sampling	Annually Annually	Feeder canal, Yanoya Before & after HW	December '94

Figure 7

Data gathering for Model Sub-watershed



4. Pass the information back to the resources users for management that includes implementation and self monitoring.

Figure 3 on page 5 presents the various steps undertaken in the required planning approach once an area (sub-watershed) is identified for planning. The case of Mahameegaswewa spatial data base is used to illustrate the process involved.

Mahameegaswewa is a small tank cascade system in the Huruluwewa watershed. Its landscape matches the typical landscape profile as illustrated in figure 1. This area was selected as a model contiguous area for intervention under SCOR.

The SCOR team members formed a group consisting of resources users of the village and few government officers to carry out the participatory resource use survey in the village. The group was provided with a map of 1:3000 scale with land marks indicating roads and streams for guidance. The group collected data and mapped each land plot of the village.

Cleaning of the map to maintain accuracy to scale was done subsequently by a draughtsman supporting the group and the map was available for planning a resources management project for the area.

The map was digitized and linked to the computerized data base using IDRISI Geographic Information System. Map 2 shows the current land use as at end of January 1994 by individual plots.

The database provides information on the ownership, tenure, slope soil erosion status, soil conservation practices adopted, current land use, number of trees on the plot, and socio economic data of the household.

Extracting information from the database the following theme maps were produced.

1. The current land use that can be updated seasonally with the micro level changes taking place under the planned activities in the area. (map 2)
2. The slope of each highland plot categorized as the c' 'n, slope and plane within the average 4 to 5 % slope ıe area allowing the selection of the plots f contour bunds.(map 3)
3. The status of soil erosion on the highland plots. (map 4)
4. The current conservation methods adopted by the resources users. (map 5)
5. The ownership of each land plot. (map 6)
6. The land tenure. (map 7)

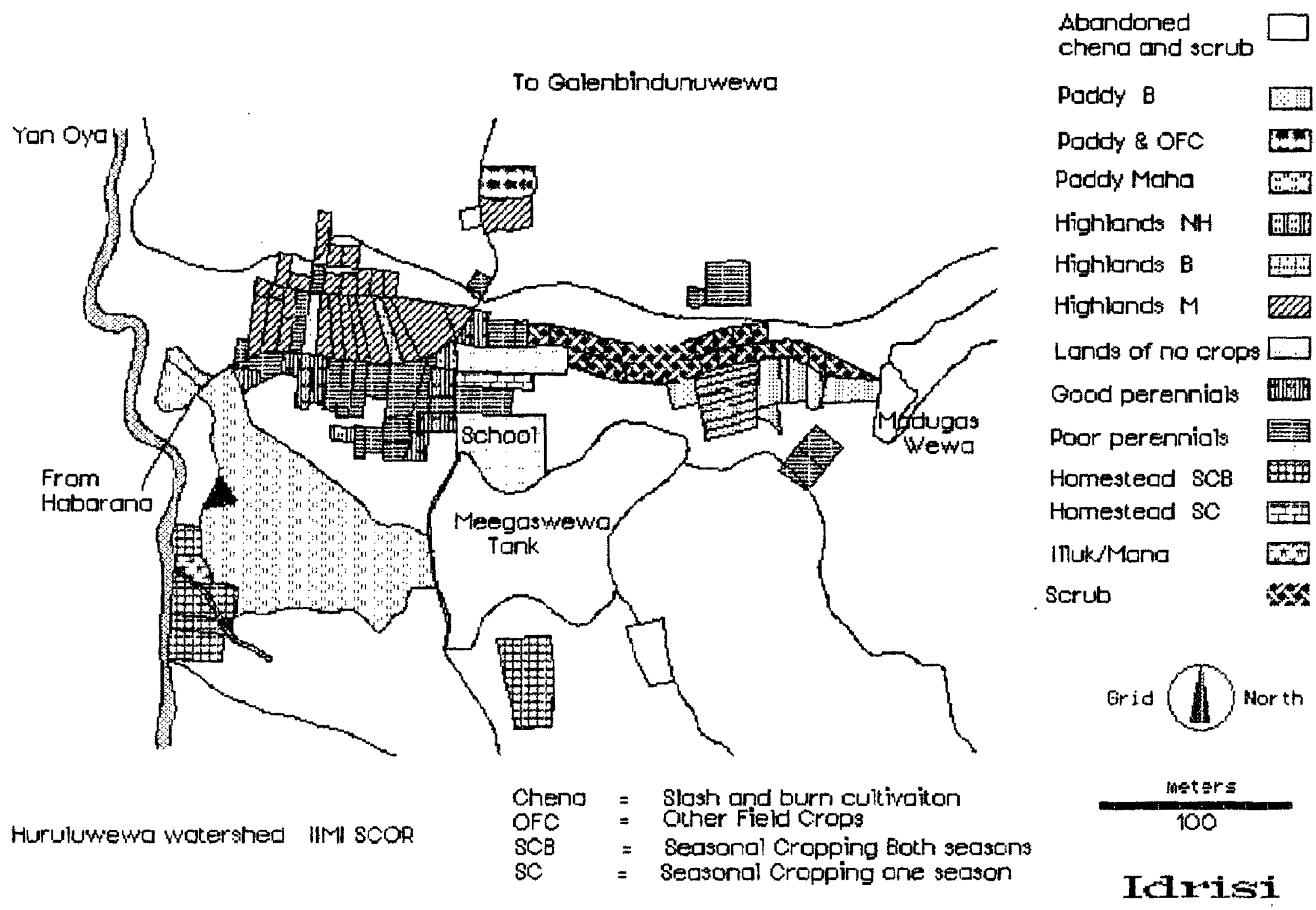
A participatory resources management project was formulated with an investment of Rs. 1.2 million. The project aims to change the current land use pattern to a productive diversified resource use pattern combining production and conservation with interventions in each major category of the land use map (Map 8). .olombo based company offered a forward contract to the user anization of Meegaswewa to purchase a major portion of exportable produce under the project. A commercial bank agreed to provide a loan 4 times larger than the SCOR grant for the user organization using the grant deposit as collateral.

Selection of plots for various activities is guided by querying the database. Map 9 illustrates this point. The need was to identify the plots having the best potential for homestead development. These plots will have to be selected from the highland plots. The following set of criteria was built up.

a) The plots should have an area of one acre or more.
b) The house of the family should be located within the plot to provide family labour including women easily and continuously.

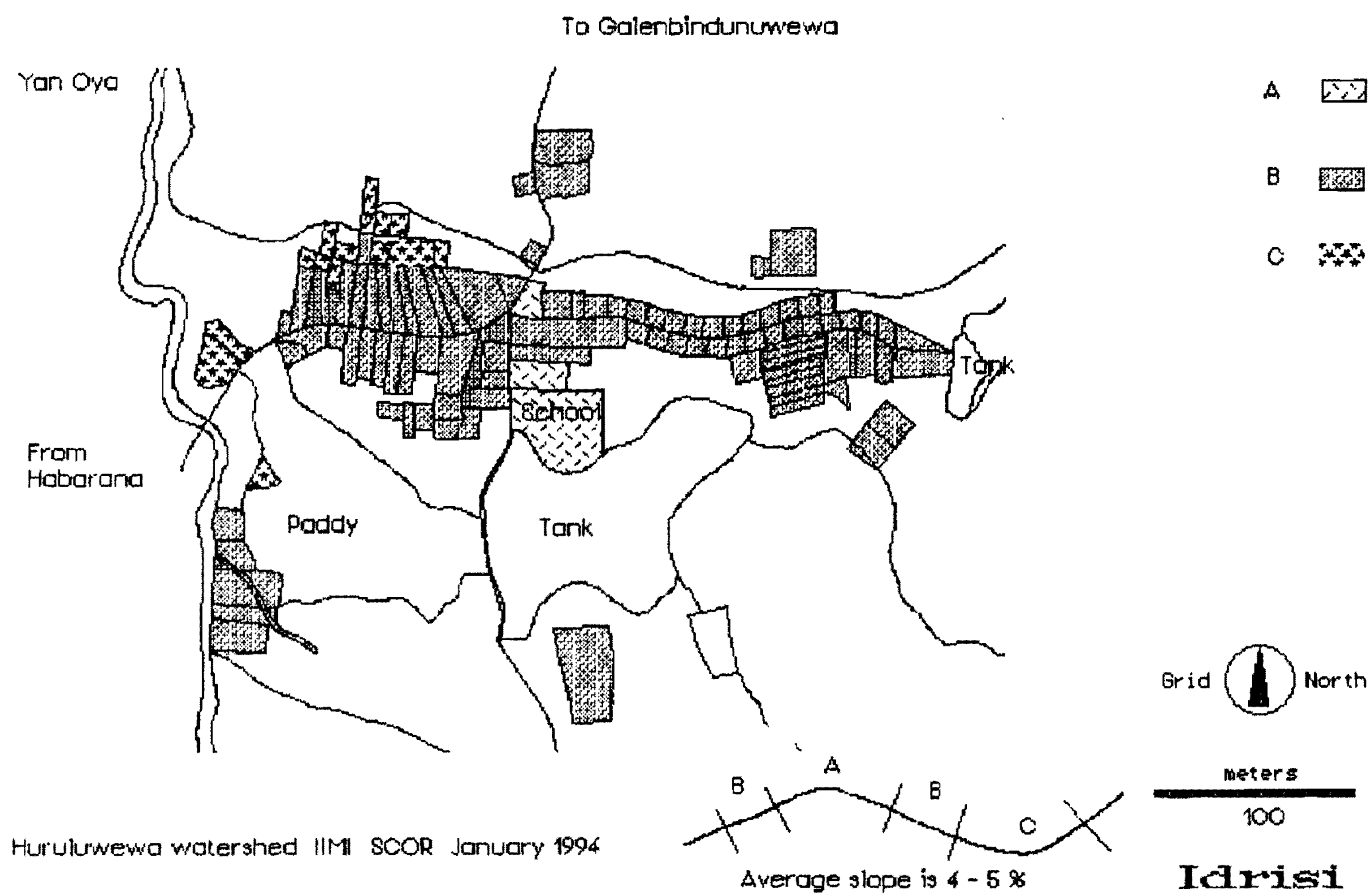
Map 2

MAHAMEEGASWEWA LAND USE - JANUARY 1994



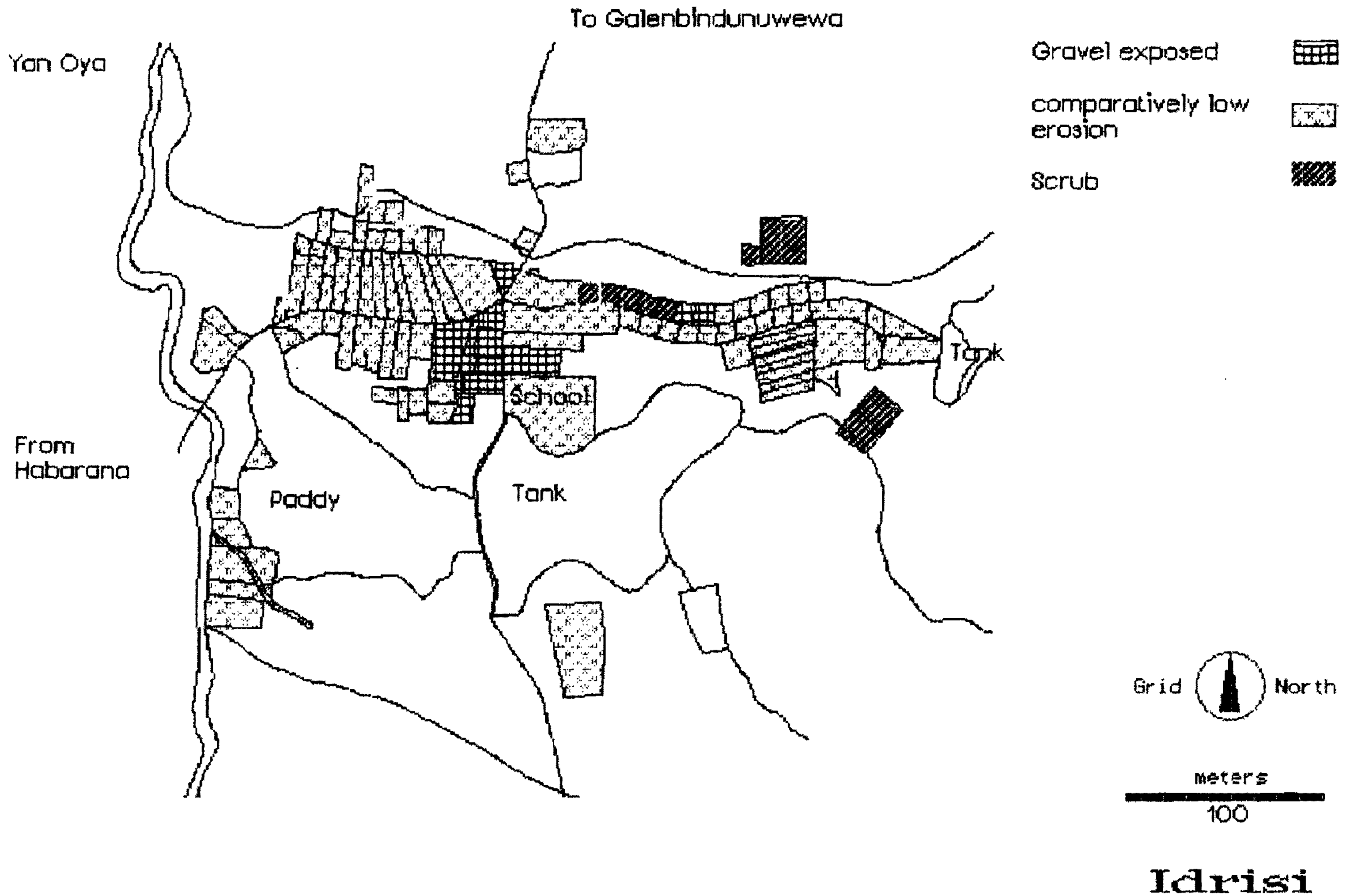
Chena = Slash and burn cultivaiton
OFC = Other Field Crops
SCB = Seasonal Cropping Both seasons
SC = Seasonal Cropping one season

SLOPE – MAHAMEEGASWEWA



Map 4

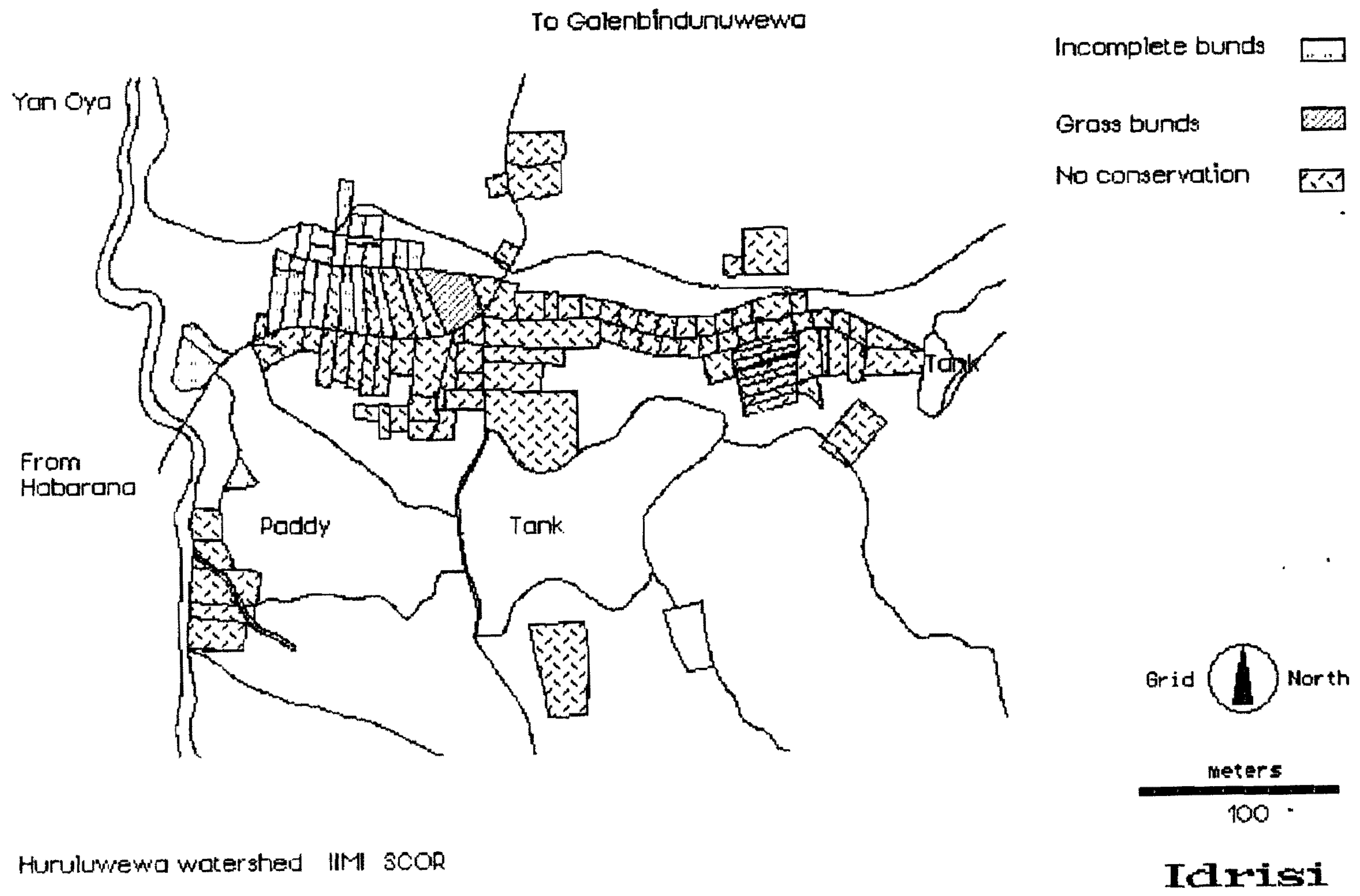
SOIL EROSION STATUS - MAHAMEEGASWEWA
JANUARY 1994



CONSERVATION METHODS – MAHAMEEGASWEWA

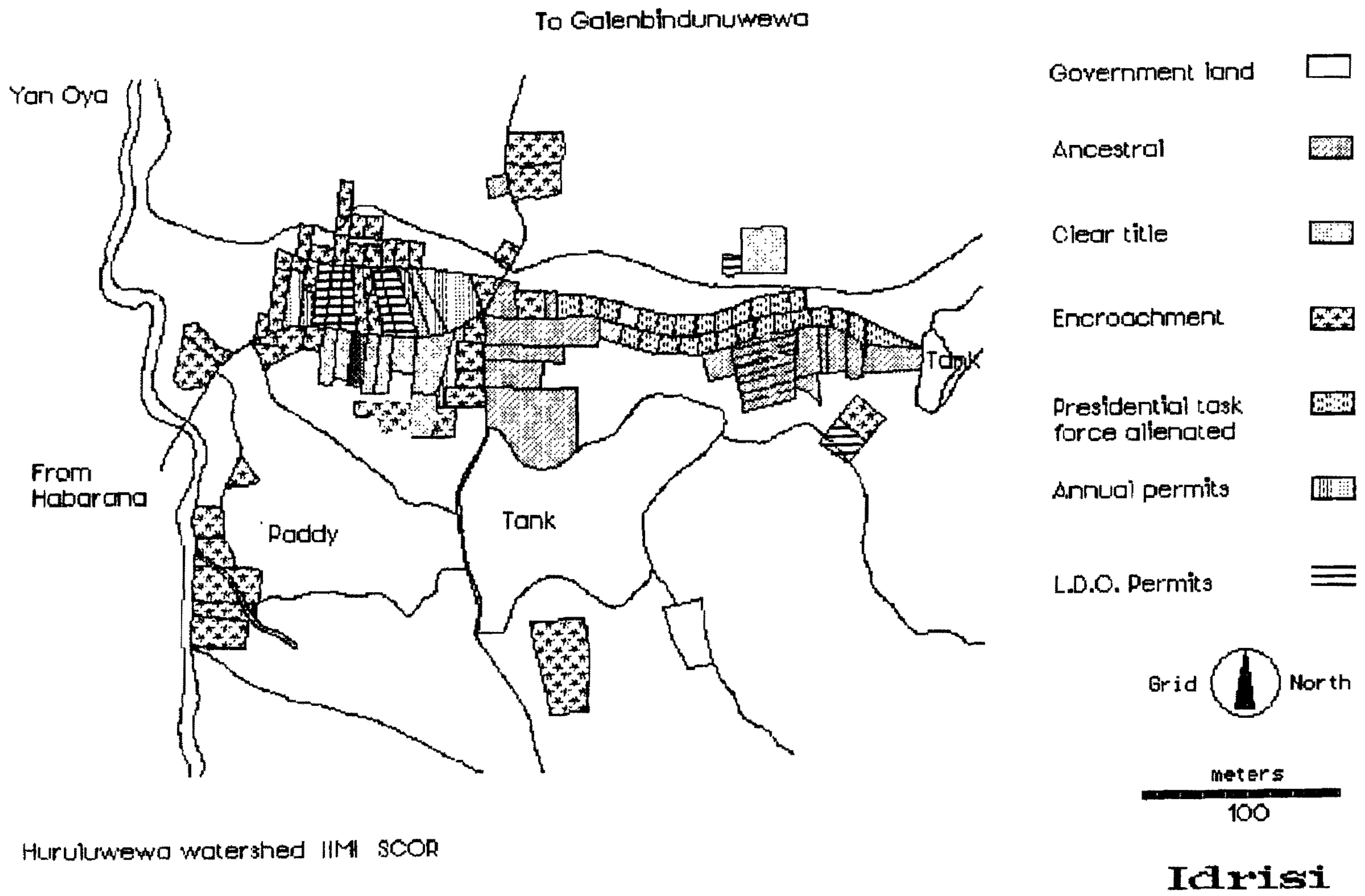
JANUARY - 1994

Map 5



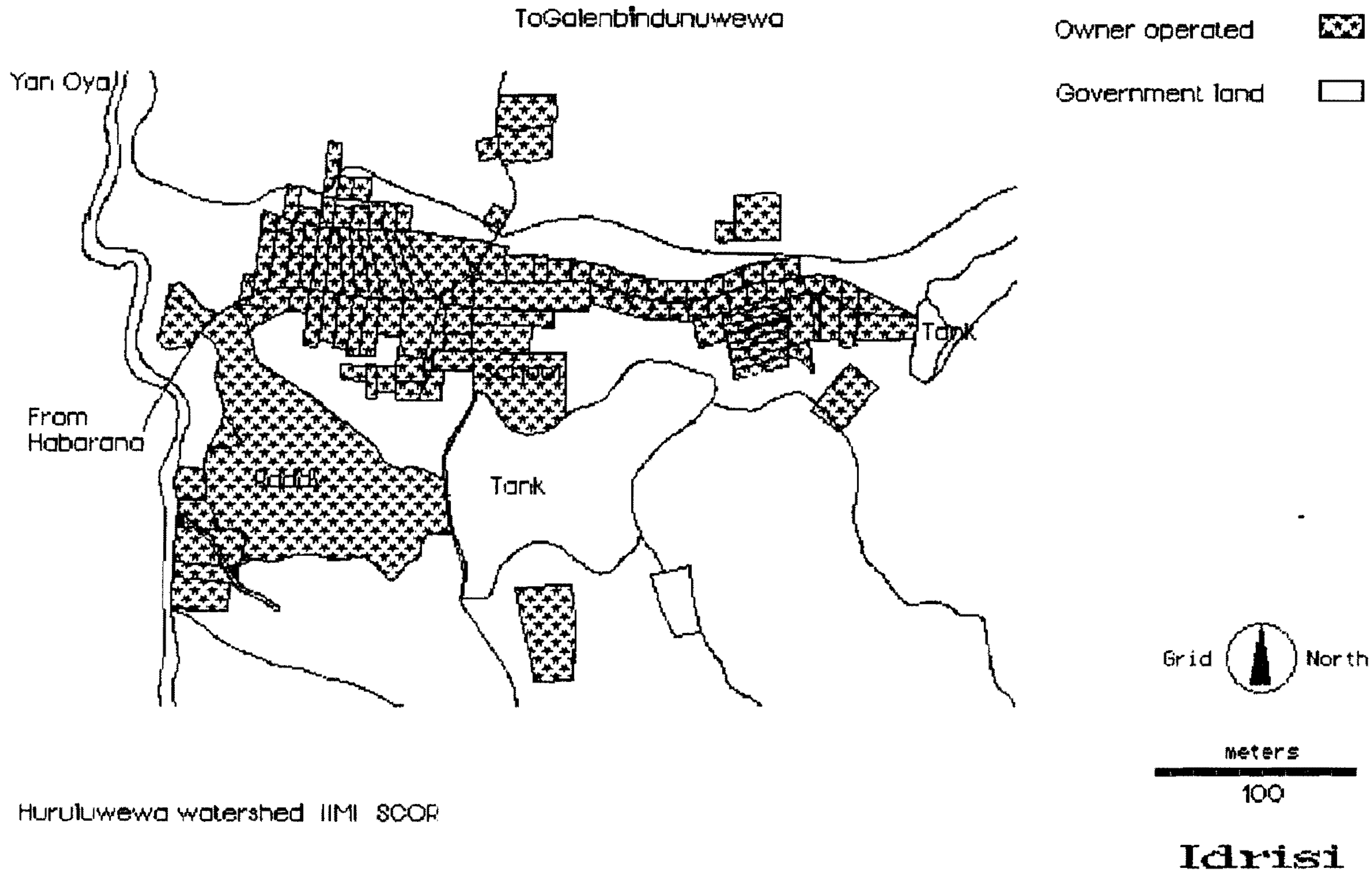
Map 6

LAND OWNERSHIP – MAHAMEEGASWEWA –JANUARY 1994

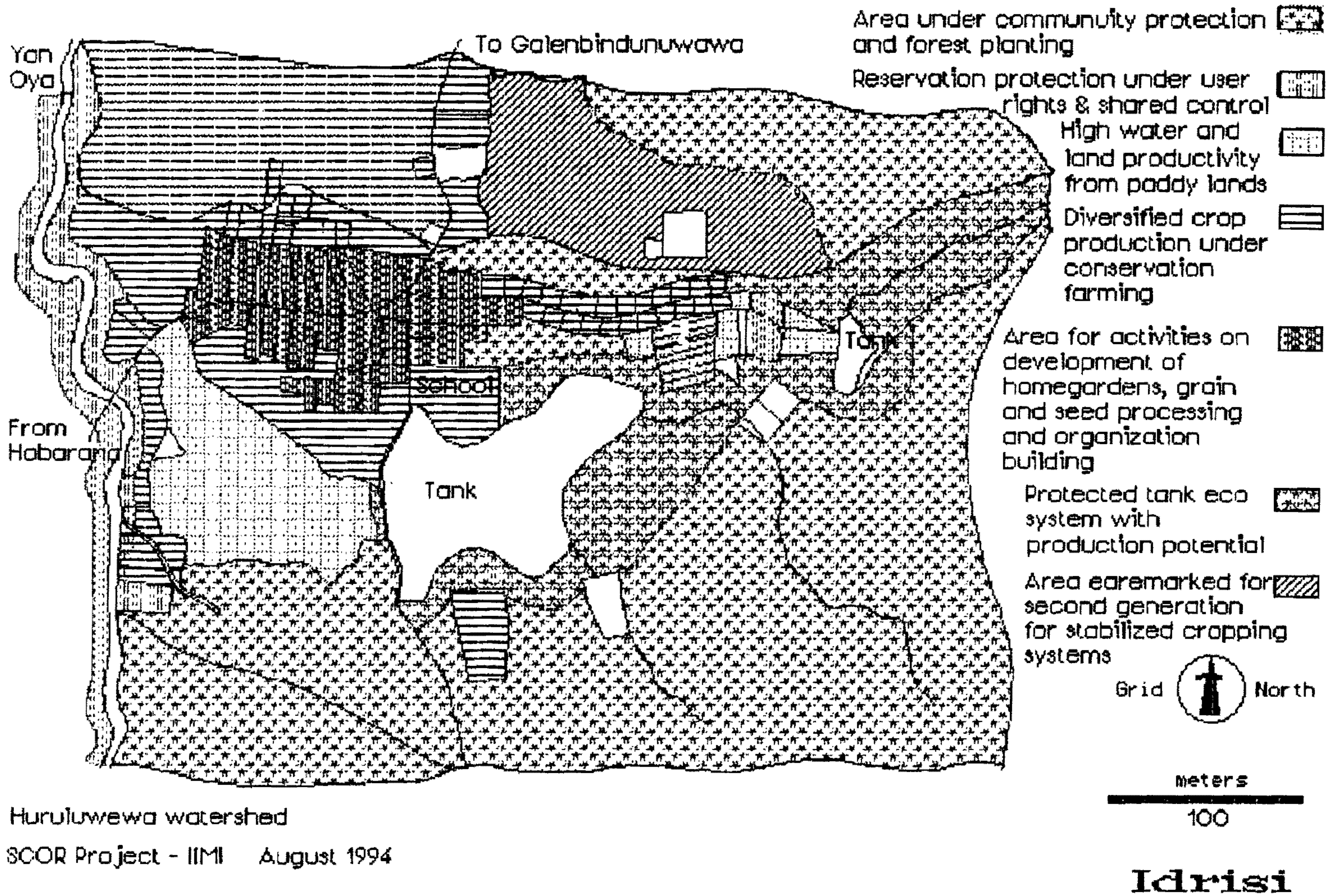


Map 7

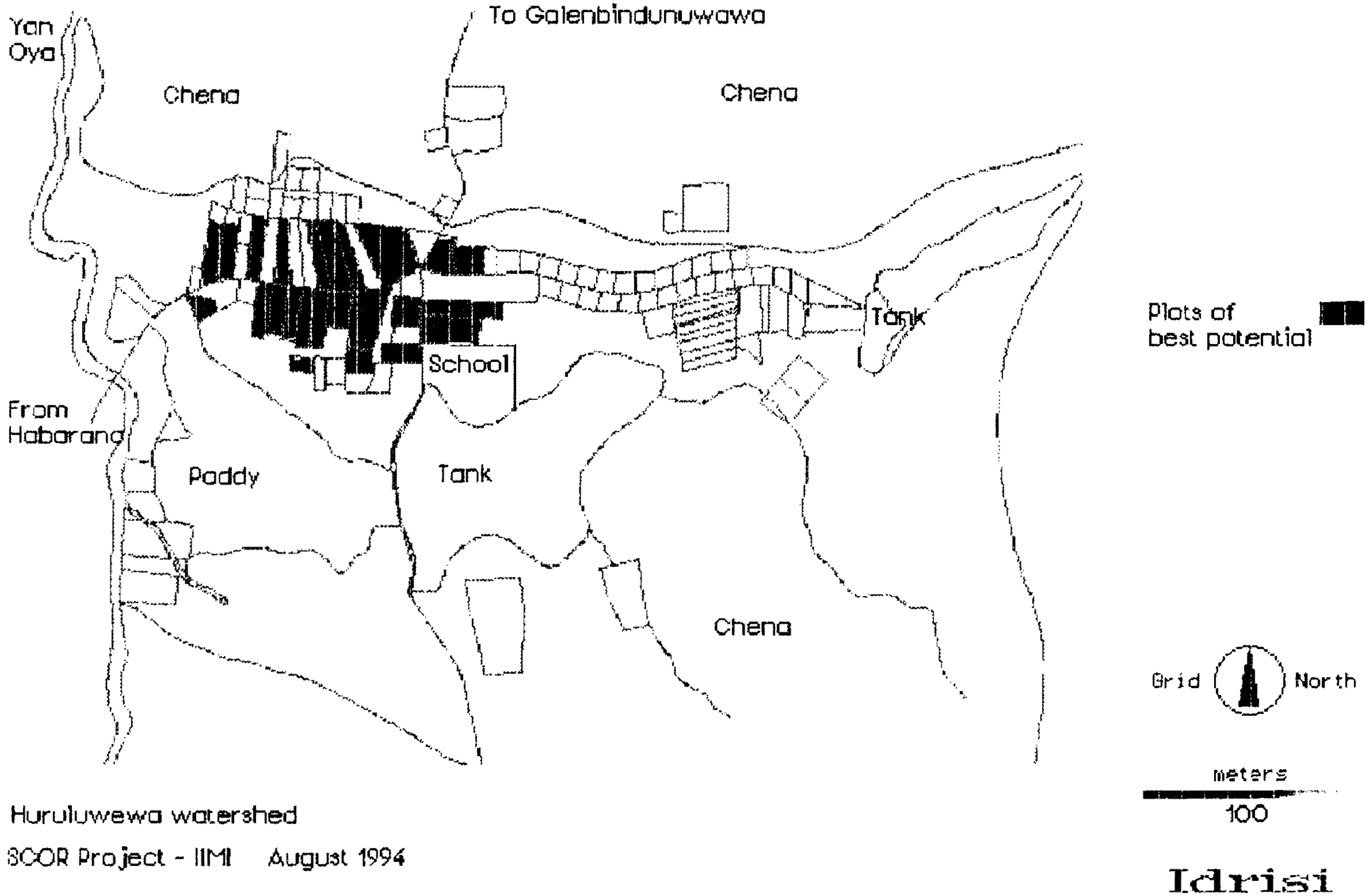
LAND TENURE - MAHAMEEGASWEWA 1994



PLANNED FUTURE LANDUSE FOR MAHAMEEGASWEWA



PLOTS OF BEST POTENTIAL FOR HOMESTEAD DEVELOPMENT
MAHAMEEGASWEWA



Huruluwewa watershed

SCOR Project - IIMI August 1994

c) The slope of the plot should be of the category that requires soil conservation practices.

d) The plot should be of a status already subjected and vulnerable to erosion.

e) The plot should have no satisfactory conservation practices adopted.

Annex 2 and 3 describe a sample of information extracted from the data base.

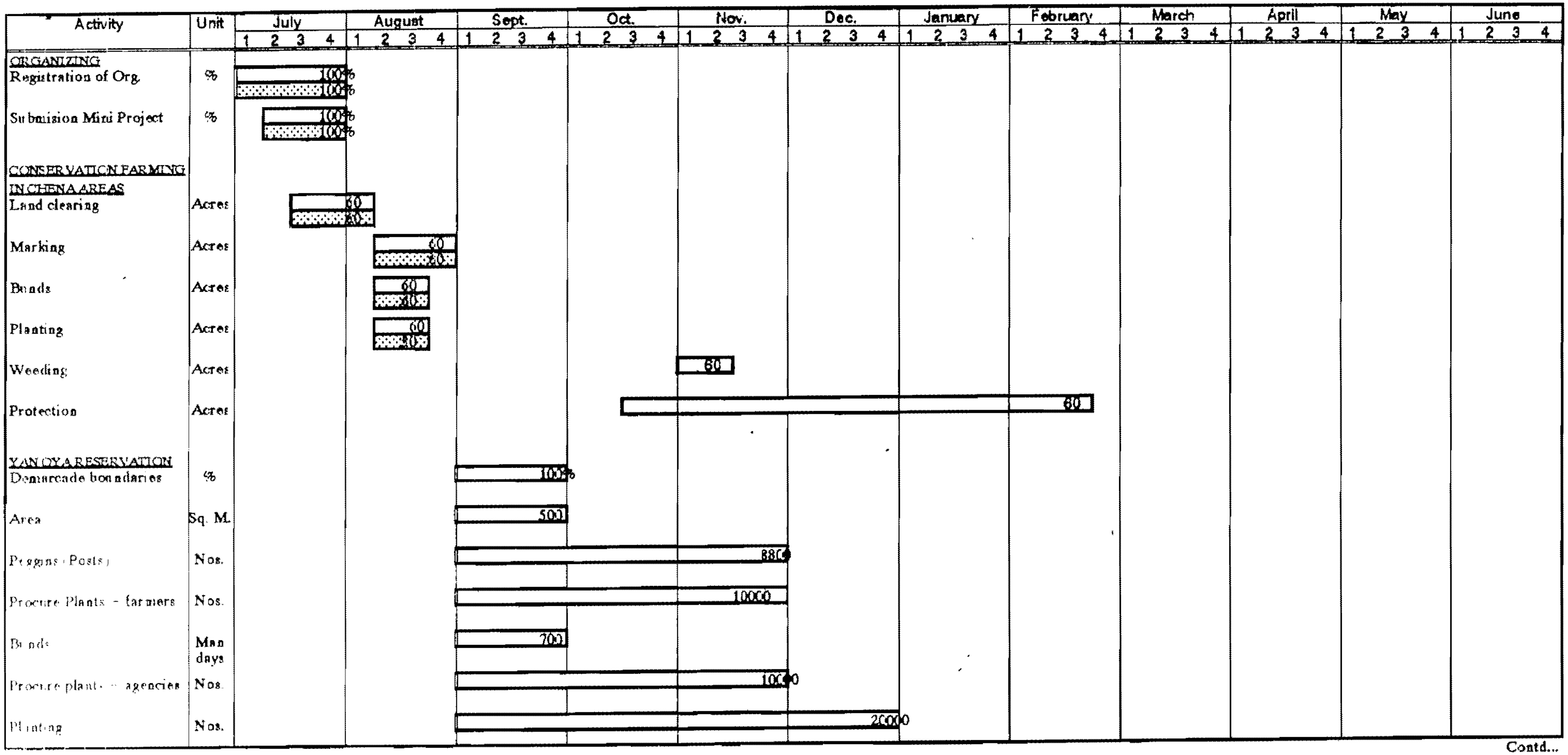
When the database was queried to extract the plots that meet the above criteria, the computer produced a list of 25 plots out of the 120 plots. The GIS mapped those plots by pulling out the selected data from the database showing the distribution of the plots. the total land area under these plots is 30.5 acres where as the project needs 40 acres. Being satisfied with the contiguity of the distribution of the plots the adjoining plots are selected to fill the gap creating a good model for evaluation research so that one can learn to what extent the type of motivation resulting in the desired change of land use on plots both that satisfy and do not satisfy the set criteria.

MONITORING BY USERS

Map 8. outlines the major interventions guiding action on the ground facilitating self monitoring by the user organization. Thus the spatial database combines spatial and attribute data for providing the ability to control action with the information generated to implement the project to achieve the status articulated as the possible future prosperity of the area and people concerned.

Table 4 presents the monitoring format for the farmer organization to monitor their activities. Such an activity monitoring is necessary to effectively manage the funds mobilized by the farmer

PRODUCTION AND PROTECTION PROJECT FOR
MAHAMEEGASWEWA CASCADE
TARGETS AND ACHIEVEMENTS - 1994 MAHA SEASON



Contd...

organization from the bank under the SCOR user grant component.

In the Upper Nilwala watershed the spatial data collected was used to extract information of the extent quality and the form of the land and water resources in the subwatersheds. Map 10 combines slope data and plot data of the Aninkanda model production and protection area where SCOR interventions are expected to cover the total extent of land. Slope categories were computed and classified showing the areas under stress. Plot data from the participatory resource survey undertaken by the watershed office with resources users and officials were used to superimpose each plot on the slope map so that the combined map can give information that would provide new information that would lead action. This is facilitated by pointing the area under stress, and the plots in those areas.

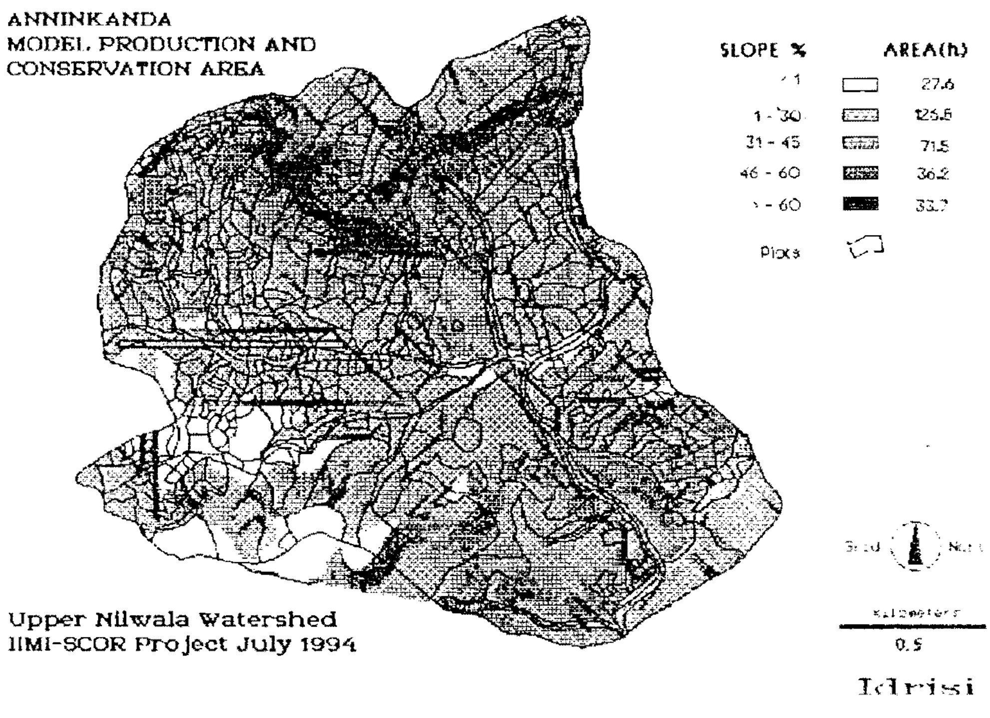
Since the map is linked to a database, data available on who occupies what land plot with what land use etc. can be further analyzed highlighting the spatial aspects extracting more information from the data set.

Map 11 presents a three dimensional view of the landuse in the Aninkanda model sublocation mapped using the secondary data available for 1989. According to this map the forest area is limited to only 3% . Map 12 Shows the landuse as at January 1994 as mapped by the participatory resources survey, carrying plot level data. This map and the database linked to it reveal the fact that the area under dense forest had got reduced to a mere 1% .

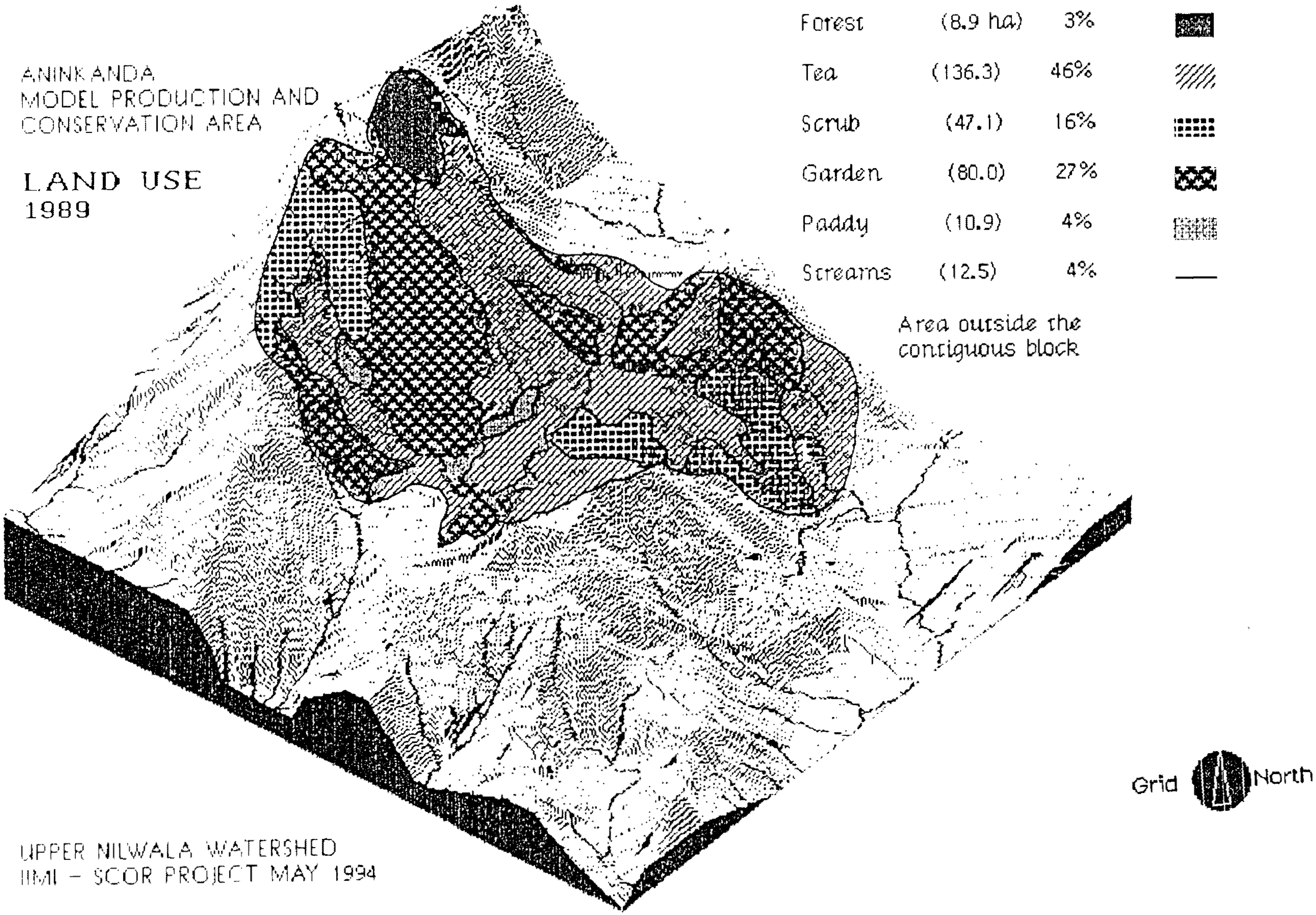
The creation of the spatial database put the resources user representatives and officials through a process of more fact finding which is very complementary to the constraint analyses undertaken using the ability to predict the future status of the resources base.

Map 10

SLOPES AND PLOTS



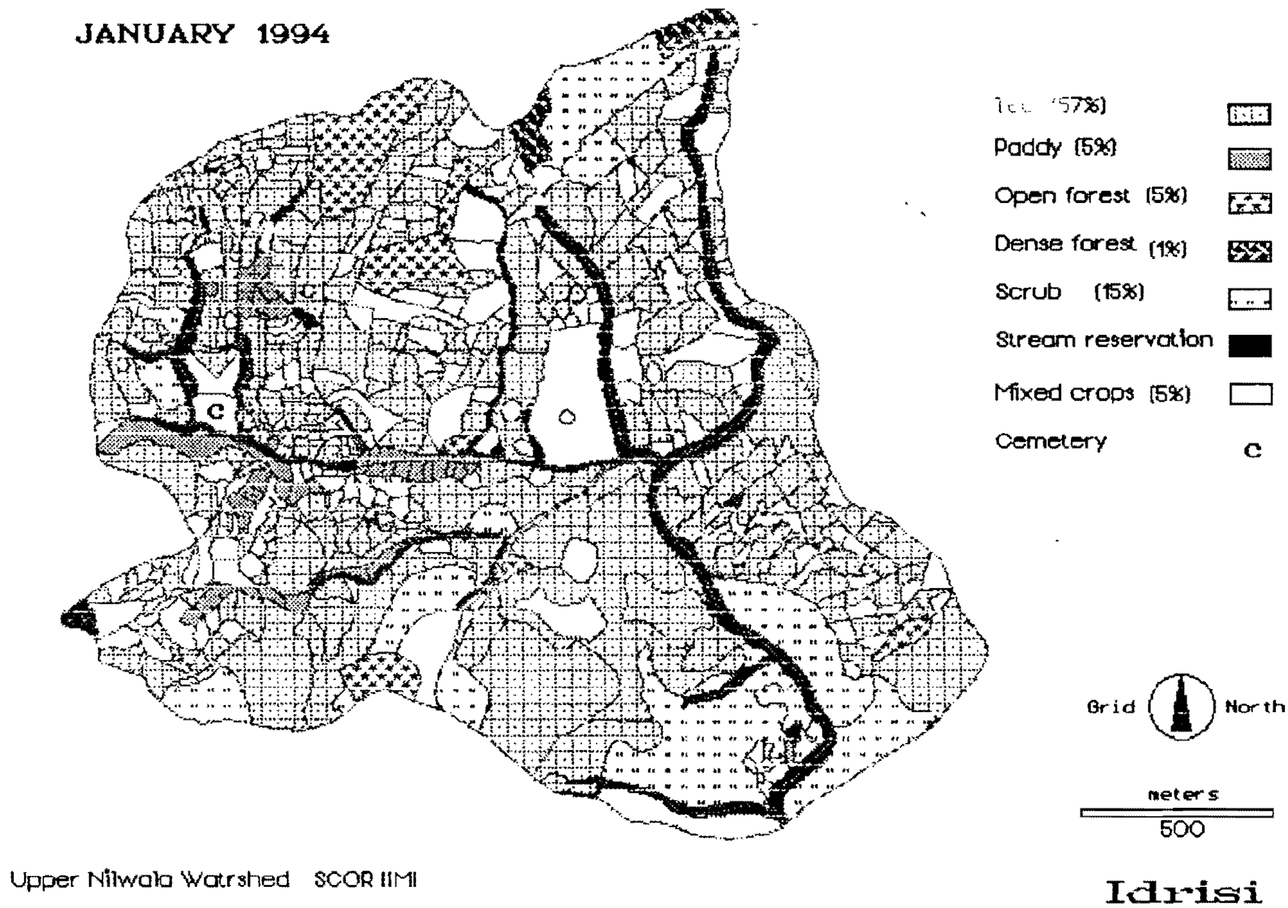
Map 11


ANINKANDA
MODEL PRODUCTION AND
CONSERVATION AREA
LAND USE
1989
Forest (8.9 ha) 3%
Tea (136.3) 46%
Scrub (47.1) 16%
Garden (80.0) 27%
Paddy (10.9) 4%
Streams (12.5) 4%
Area outside the contiguous block
Grid North
UPPER NILWALA WATERSHED
IIMI - SCOR PROJECT MAY 1994

Map 12

LAND USE - ANINKANDA MODEL PRODUCTION AND CONSERVAT N AREA

JANUARY 1994



Map 13 shows locations of measurement points for data collection on the rainfall, soil loss, sediment transportation, water quality and other relevant aspects of the baseline conditions and the change after interventions.

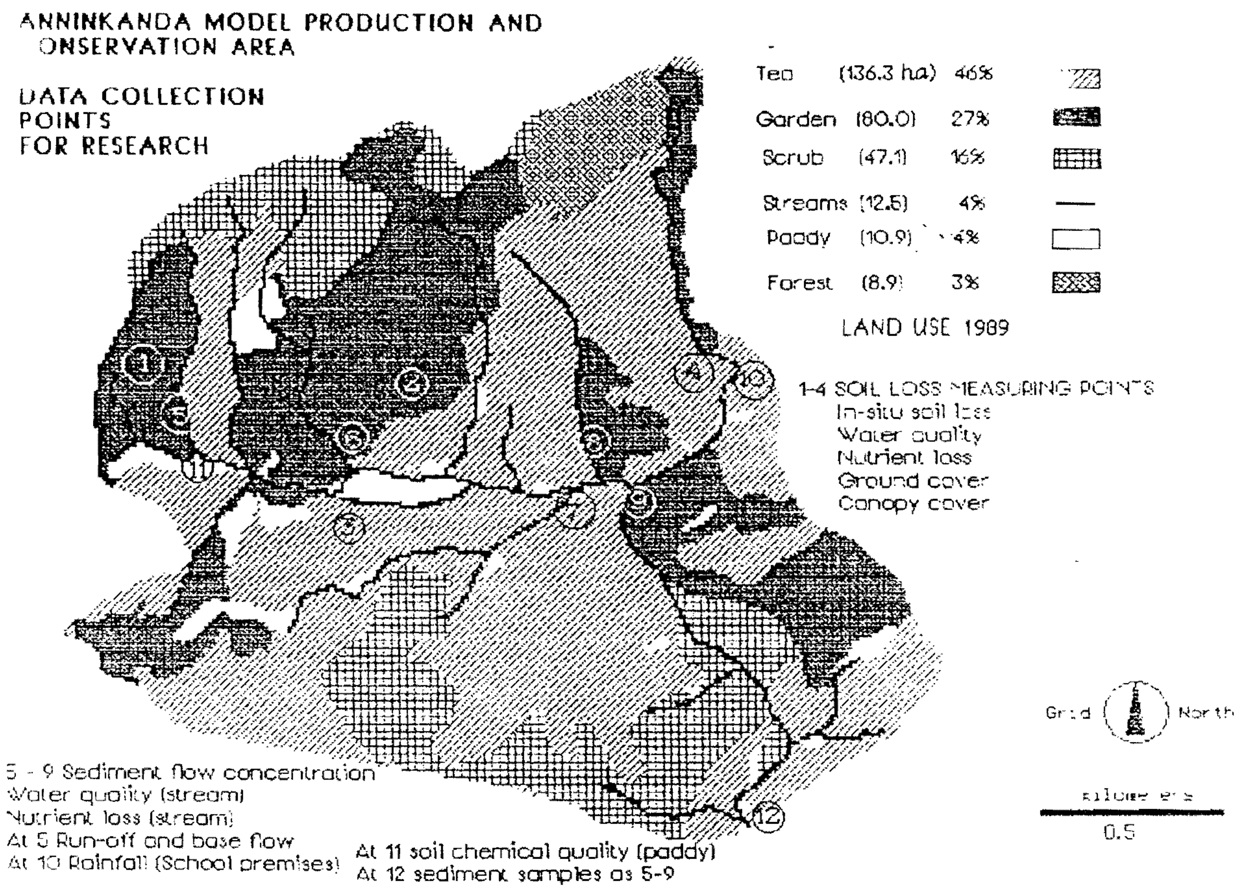
Micro level databases linked to the location map of activities are prepared for all the sublocations for the purposes of better management of activities and monitoring. An illustrative case is the Annasidola production and protection project in Millawa subwatershed.

Map 14 presents the before project status as at end of January 1994 as mapped by the participatory resource use survey. The map shows the level of resource degradation with a large area under moderately or poorly managed tea, exposed waterways, and open forest areas. Map 15 portraits the possible future planned by the resources users. The map indicates the planned vision of transforming all the tea lands to well managed tea, lands with fern to floriculture, low productive paddy to a seed farm, open forests to agro forestry, exposed streams and road reservations to avenue planting and stream reservation protection.

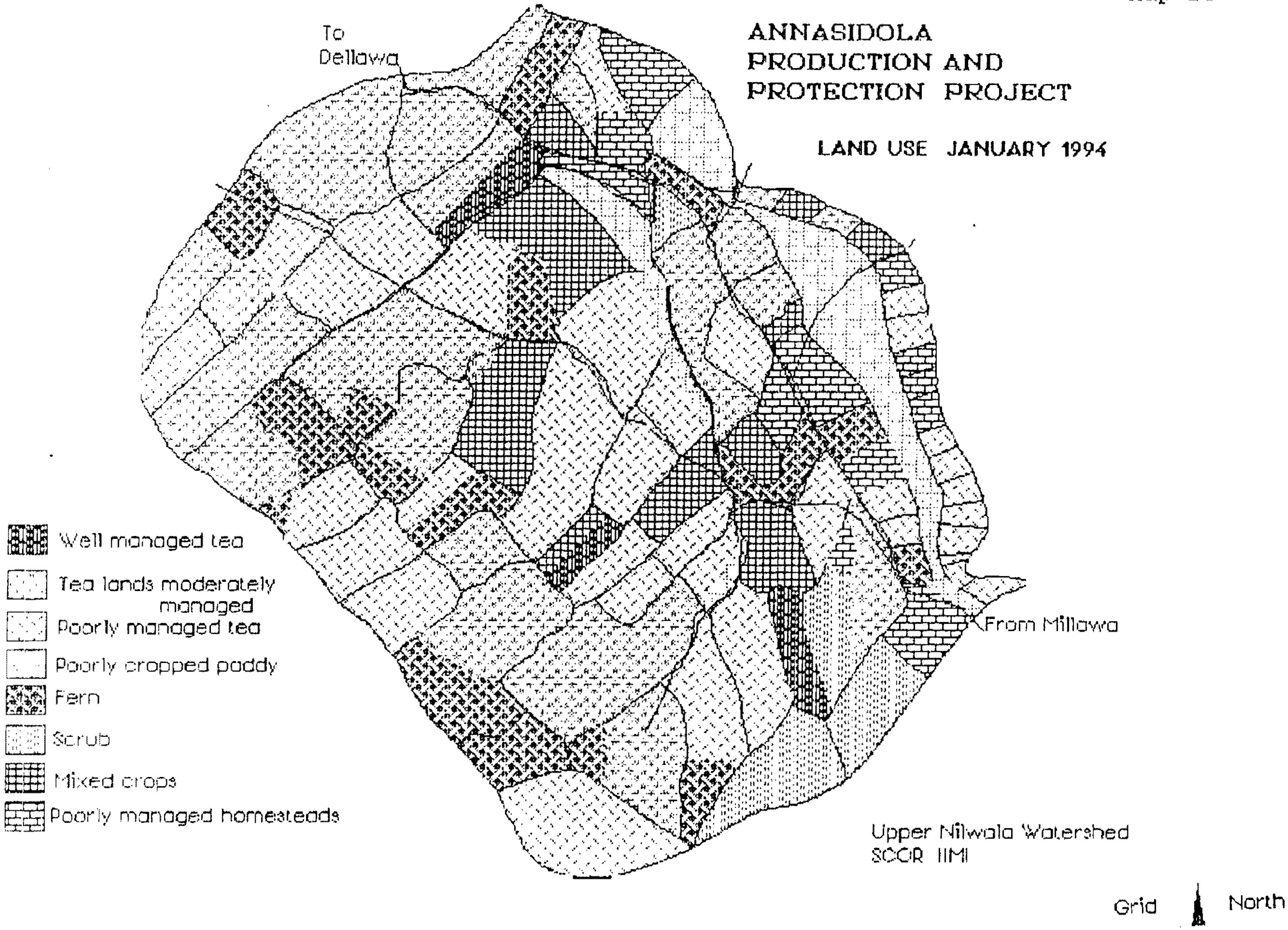
This project formulated by the resources user organization has a plan of action to make this transformation on landscape happen with the technology, organization and resources mobilized under SCOR. It is important to note that all the major interventions can be seen translated to action on this space by the resources users.

Milla Ela flows from North to South east as indicated in the map. The slope is from South west to North east. This land form indicates the direction of drainage and the protective action envisaged under avenue planting, stream reservation protection and managing crops balancing production and protection on the sloping lands. The map also indicates the importance of the interventions covering all categories of land space for effective results as

Map 13

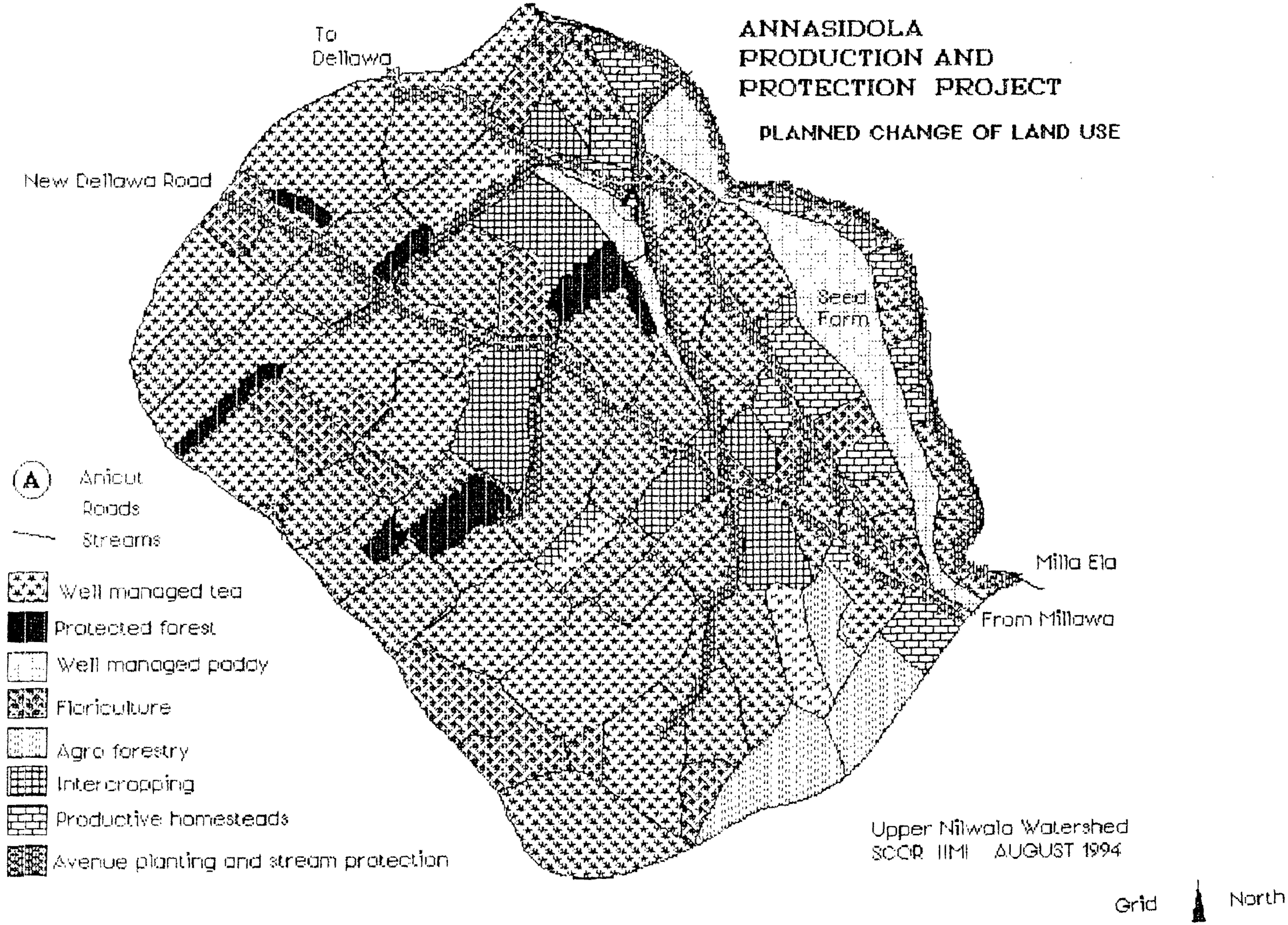

ANNINKANDA MODEL PRODUCTION AND
ONSERVATION AREA
DATA COLLECTION
POINTS
FOR RESEARCH
Tea (136.3 ha) 46%
Garden (80.0) 27%
Scrub (47.1) 16%
Streams (12.5) 4%
Paddy (10.9) 4%
Forest (8.9) 3%
LAND USE 1989
1-4 SOIL LOSS MEASURING POINTS
In-situ soil loss
Water quality
Nutrient loss
Ground cover
Canopy cover
5 - 9 Sediment flow concentration
Water quality (stream)
Nutrient loss (stream)
At 5 Run-off and base flow
At 10 Rainfall (School premises)
At 11 soil chemical quality (paddy)
At 12 sediment samples as 5-9
Grid North
0.5

Map 14



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

Map 15


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

emphasized by SCOR as a strong element of strategy to address one of the downstream problems of flooding in Nilwala basin.

INTEGRATING NON SPATIAL DATA

In order to guide the process of human action on land for changed landuse, SCOR facilitates organization among resources users to strengthen their capacities for resources management. This process generates a volume of attribute data about groups, investment behaviour, management practices and hierarchical organizational development. These changes are input to the process of resources use change and therefore it is necessary to integrate these non spatial data to the spatial data bases.

Map 16 illustrates this point by showing how information on user groups adopting practices of land use change are linked to databases. Five different data bases for user groups are maintained. The group database is updated once in six months, while the group activity database, training database and the group user grant database are updated every month providing information of the expansion, coverage and survival of group practices affecting the planned change.

SCOR monitors the following major inputs that contributes to the catalizing process in the watersheds.

1. training
2. User group formation
3. User grants
4. Complementary research
5. Host country contribution

The spatial aspects of the impact of these inputs are viewed broadly by the watershed at present with the ability to undertake a detailed evaluation with a better understanding of the spatial distribution of inputs vis a vis the programme outcome.

Map 16

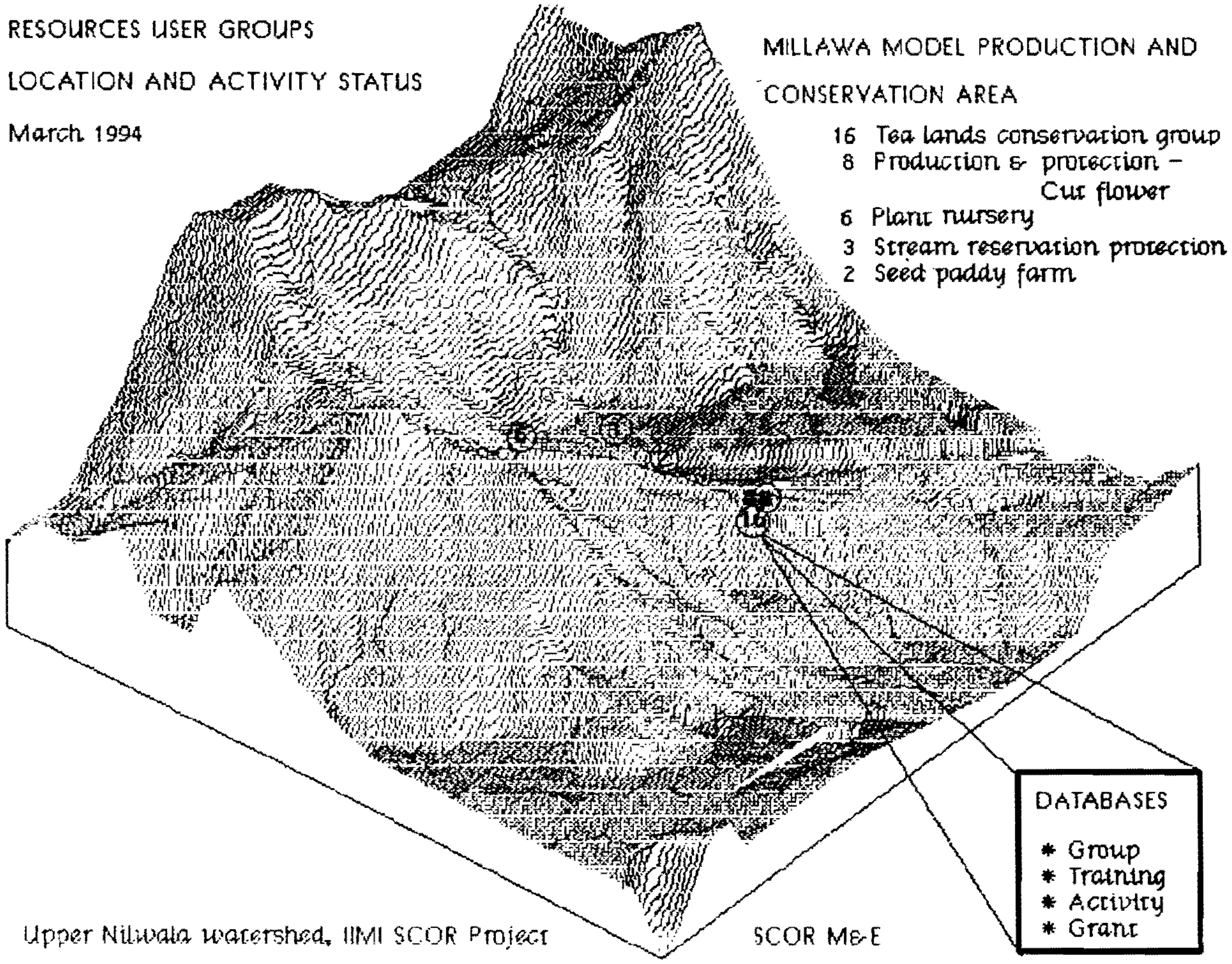

RESOURCES USER GROUPS
LOCATION AND ACTIVITY STATUS
March 1994
MILLAWA MODEL PRODUCTION AND
CONSERVATION AREA
16 Tea lands conservation group
8 Production & protection - Cut flower
6 Plant nursery
3 Stream reservation protection
2 Seed paddy farm
DATABASES
* Group
* Training
* Activity
* Grant
Upper Nilwala watershed, IIMI SCOR Project
SCOR M&E

Figure 5 presents a sample data collection and display format used in the Nilwala watershed indicating the field level organization for data collection, planning, implementation and monitoring and evaluation as explained earlier. In support of these information the catalysts have information in respect of each location on the process of action and change in text form. Information is extracted from the databases maintained that can be mapped to show the relevance to impact on the two pilot watersheds. Annex 4 presents sample outputs of training, user grants and host country contribution by pilot watersheds.

TECHNOLOGY FOR SPATIAL DATABASE

It is important to make the right choice of technology for developing spatial databases for watershed resources management in the context of appropriateness, usefulness, complementarity, adaptability and affordability. The following considerations were important to SCOR project.

1. Participatory resources use survey and mapping should be facilitated.
2. Information collected by the people should be available with them for their use once processed and analyzed.
3. Timely production of maps in adequate numbers with descriptions in local language should be made available for the use for planning, implementation and monitoring.
4. Micro level planning and management of activities should be facilitated by the information system.
5. The choice of technology should be appropriate to the local conditions to sustain. "Mission first, machine to support"

Participatory resource use survey and mapping work was designed to collect minimum information needed in a short period of time with locally available know how. Maps available were enlarged wherever possible with the major land marks and boundaries marked to scale so that the survey teams could mark plot level data maintaining accuracy. The field maps were redrawn by draughtsman adjusting for scale where necessary. Maps drawn for mini projects are in many cases of 1:3000 scale. For the purpose of computerization of these maps and the subsequent analysis, SCOR uses a low cost appropriate Geographic information System (GIS).

GIS FOR WATERSHED RESOURCE USE PLANNING

Acquisition, analysis, display and reporting of information extracted from spatial and non-spatial data on resources base and use patterns are important functions of the Management Information System of SCOR project. The major task of the GIS is to create a spatial database for the sub-watersheds generating information to guide action in changing the current resources use to the desired use and to help monitoring and evaluation of the process of participatory watershed resources management. SCOR project uses IDRISI Geographic Information System (GIS) for this task.

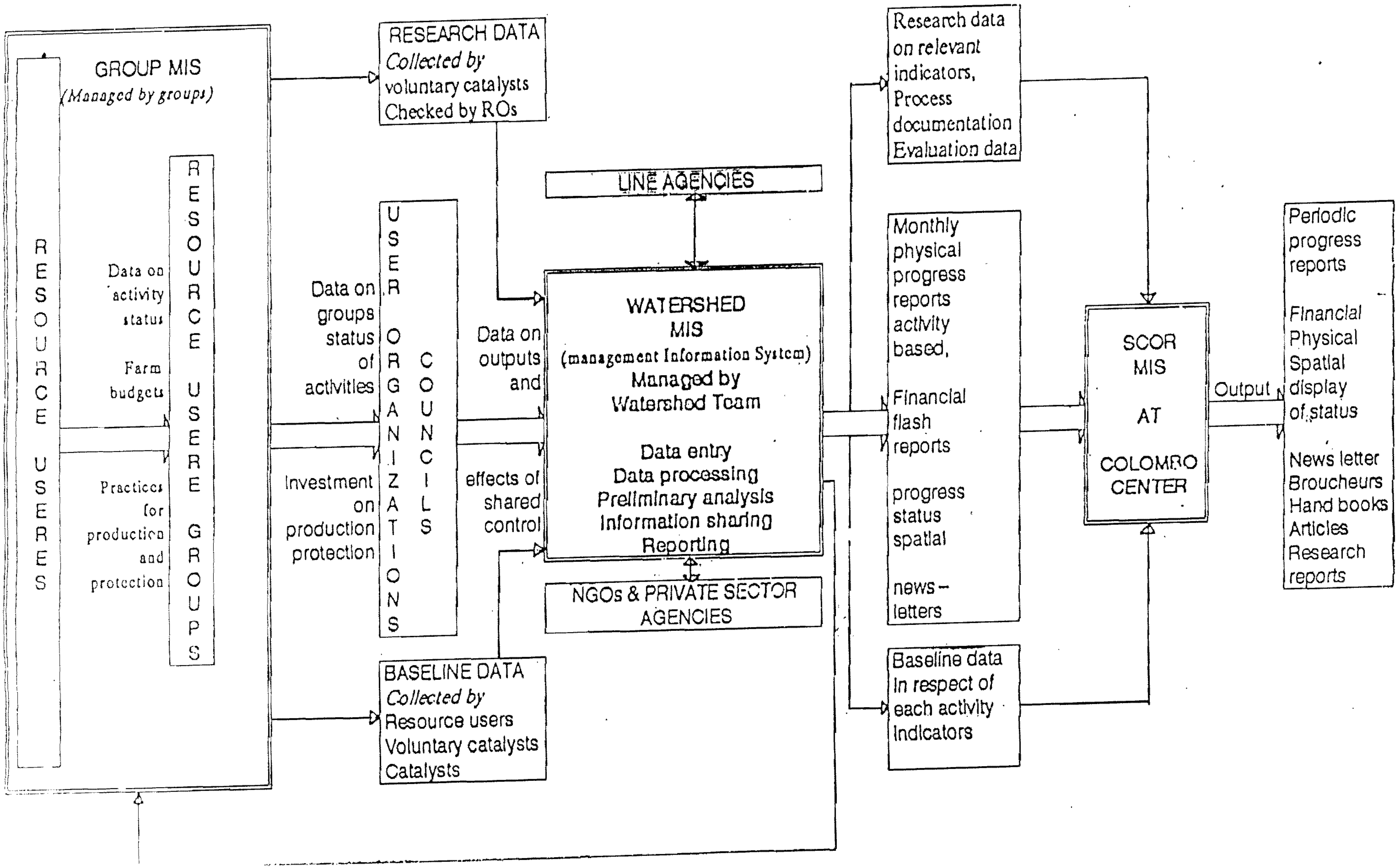
Maps were digitized using PC ARCINFO and converted to IDRISI format for making rasterized images. Creation of various thematic maps, and extracting information from the spatial data through proximity analysis, contiguity analysis and overlay operations were possible. Once the geographic definition map was produced in IDRISI it is possible to link the database that is maintained in dbase or Lotus to the map. Delux paint software was used for map display and for producing hard copies.

Expensive color printing is minimised to meet the needs of presentations while more dot metrix printing of maps with titles and legends in the local language was the method used to produce maps for circulation among the resources users. These maps can be produced at the watershed offices in the two pilot watersheds.

The local production of maps and information is part of the spatial data base and the monitoring system of SCOR project. Figure 8 presents the broad M&E framework within which all the functions are structured to ensure a sound management information system for integrated watershed resources management.

Fig 8

OPERATION OF M&E SYSTEM OF SCOR PROJECT



SCOR PROJECT – HURULUWEWA
WORK PLAN (NOVEMBER 1995 TO SEPTEMBER 1995) – INDICATORS

MAJOR INTERVENTION	OUTPUT	INDICATORS
(1) STABILISATION OF CHENA AND ENCROACHED STATE LANDS.		
(a) Conservation farming		
Awareness Programme		Increased awareness indicated
Training Of Officers/ Users	Officers–125 Farmers 1000	in before after assessment
Demostrations	15	
Workshops	04	
Visits /Field Days	Farmers 1000	
School Programmes	Awareness created among school children	
(b) Stabilisation of chenas	20 Ha. from each User Groups (2000 ha.)	Tree density Yield of chena crops Profits
(c)		Water infiltration Soil loss Moisture retaining capacity Soil fertility # of Formal agreements Investments Permanent crops Extent freed from encroachments
Conservation of Channels, Roads, Streams and Tank Bunds.		
Channels	30 k.m.	# of eroded locations conserved # of groups formed # of usufructuary rights granted
Roads	15 k.m	# of trees surviving # of eroded locations conserved
Streams	25 k.m.	Tree density Plants by type Reservaton extent demarcated # of vulnerable sand mining locations conserved # of formal agreements # of permanent crops
Tank Bunds	05 k.m	# of scoured sections conserved

Annex 2

Conservation Practices

SOIL AND WATER CONSERVATION CATEGORIES	NO OF PLOTS	TOTAL EXTENT (ac)
Incomplete Conservation Bunds	25	18.25
Grass Bunds	1	1
No any conservation methods	93	84.75

Land Use Patterns

LAND USE CATEGORIES	NO OF PLOTS	TOTAL EXTENT (ac)
PADDY		
Paddy – yala and maha	17	12.5
Maha – paddy; yala – OFC	1	2
Maha – paddy; yala – fallow	2	3
CHENA		
Highland with a house	3	3.25
Yala and Maha – Chena crops	1	1
Maha – Chena crops	26	19.75
Yala – Chena crops	–	–
Not cultivated	3	10
HOMESTEAD		
Good permanant crops	8	7.25
Poor permanant crops	22	21
Yala/Maha – seasonal crops	5	7
Maha – seasonal crops	1	2
Shrub	29	14.75
CEMETERY	1	0.5

Table 3 - Land Ownership

LAND OWNERSHIP CATEGORIES	NO OF PLOTS	TOTAL EXTENT (AC)
Purana land	24	26.75
Clear title(Sole owner)	10	9.5
Encroached land	45	39.75
Land task force	27	13.25
Annual permits	6	5.5
L.D.O. permits	7	9.25

Table 4 - Soil Erosion

SOIL EROSION CATEGORIES	NO OF PLOTS	TOTAL EXTENT (AC)
Gravel exposed	11	10.5
Comparatively low erosion	98	82.75
Shrub	10	10.75

Land Slope

LAND SLOPE CATEGORIES	NO OF PLOTS	TOTAL EXTENT (AC)
A - crown	3	7.5
B - slope	100	86.25
C - plane	16	10.25

Land Tenure

LAND TENURE CATEGORIES	NO OF PLOTS	TOTAL EXTENT (AC)
Self operated	119	104

TRAINING OF RESOURCES USERS - UPTO END OF 3RD QUARTER 1994

SUBJECT AREA	HURULUWEWA		NILWALA		TOTAL	
	DURING 3RD QTR.	TODATE	DURING 3RD QTR.	TODATE	DURING 3RD QTR.	TODATE
1. Resources use planning	977	3216	617	1171	1594	4387
2. Organization and Financial Management	33	260	0	67	33	327
3. Marketing	78	206	5	30	83	236
4. Group dynamics and Leadership	27	1023	28	50	55	1073
TOTAL	1115	4705	650	1318	1765	6023

Source: Training Database.

SUMMARY REPORT ON HOST COUNTRY CONTRIBUTION (HCC) 25.10.93 - 30.09.94

Description	Nilwala		Huruluwewa		Total Number of persons	Total HCC (Rs.)
	Number of persons	HCC (Rs.)	Number of persons	HCC (Rs.)		
Contribution of NGOs, groups, farm households, and individuals by way of time/labour, and materials supplied	2,199	373,796	3,821	968,138	6,020	1,341,934
Value of conserved capital assets	0	9,050	0	0	0	9,050
Value of sub Grants	0	128,800		102,518	0	231,318
Govt. officers contribution	768	112,514	296	116,438	1,064	228,952
Conserved Area		672,000		4,585,000		5,257,000
Total	2,967	1,296,160	4,117	5,772,094	7,084	7,068,254

USER GRANTS – UPTO END OF 3RD QUARTER 1994

No of Grants to Groups	Purpose	Amount Granted Rs.
4	**Nilwala Watershed** Seed Paddy Enterprise	41,000
8	Plant Nursery Establishment	26,500
7	Anthurium Planting	30,000
1	Coconut cultivation	6,500
1	Model Stream Garden Development	5,500
2	Forest reservation tree planting	19,300
23	Sub Total	128,800
	Huruluwewa watershed	
1	Cultivation of Other Field Crops	11,250
1	Plant Nursery Establishment	17,240
1	Soya bean cultivation	50,000
2	Cashew cultivation	17,028
1	Bunana cultivation	7,000
6	Sub Total	102,518
29	TOTAL	231,318