PARTICIPATORY WATERSHED MANAGEMENT PLANNING FOR THE SUSTAINABLE DEVELOPMENT

TINAU SUB-WATERSHED, PALPA, NEPAL

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ABSTRACT:
Nepal is a mountainous country with thousands of sub-watersheds. The sub-watersheds in Nepal suffer a certain degree of degradation. Financially as well as biophysically fragile country's government only cannot bear all the expenses for the watershed management planning. Hence, other sectors such as NGOs, INGOs and people's participation is the most essential alternatives. Government of Nepal is forwarding its attention to manage the sub-watersheds of the country on the basis of the concept of people's participation since last decade. People's participation in watershed management planning for the sustainable development is a decision tool, which guides for efficient allocation of scarce resources in minimizing advancement of degradation.

INTRODUCTION:
Nepal, a mountainous country with thousands of sub-watersheds, is heavily dependent on its natural resource base. Owing to the rapid growth of population, insufficient agricultural production, low off-farm sector production and concomitant developmental changes, the natural resources particularly public lands and forest lands are being over exploited to meet the basic needs of the people. This has been brought rapid changes in the environment and the power of the nature, instead of being used in the welfare of mankind, is being diverted to bring natural calamities in the forms of landslides, soil erosion, floods, drought and so on. Therefore the country's fragile natural environment is now under serious threat. The increasing trends of hill-landslides and silt load in the major river systems are indicators of serious watershed natural resources and environmental degradation problems. In order to combat with and to address these problems, sustainable development of the watershed is, no doubt, the most appropriate policy strategy. However, an even more daunting challenge is how to operationalize the concept of sustainable development of watersheds in a resource-scarce country like Nepal. For the sustainable development of natural resources, watershed planning is essential. One of the approaches to address this issue is prioritization of sub-watersheds on the basis of Soil Erosion Status (SES). Prioritization makes it easy to use limited manpower, budget and time optimally for watershed planning. It is not possible to implement Soil Conservation and Watershed Management (SCWM) programs in all areas simultaneously given the limitations imposed by weak financial state and low technical know-how. Furthermore, It is impossible to treat all areas immediately and sometime, it may not be necessary to treat all areas to prevent further degradation of the watershed.

Prioritization of sub-watersheds emphasizing the participation of local people is an excellent design of watershed management planning. It is obvious that the living standard of mountainous people in sustainable way is only possible if watershed management planning focusing on conservation of natural resources is done along with local people's participation. Participatory watershed management planning allows local people to determine programs based their needs, ability and resource available at the local level. At the same time they utilize their knowledge and skills to set objectives for the betterments of their villages or places.

STUDY AREA:

The study conducted in Tinau watershed, Palpa, Nepal is a typical mid hill watershed, aimed at the formulation of a participatory watershed management planning for the sustainable development. Tinau watershed lies in Palpa District, Lumbini Zone, Western Development Region of Nepal. Latitude ranges from 27º45'00" North to 27º52'51" North and longitude ranges from 83º25'30" East to 83º42'30" East (Figure 1). The total area of this watershed is 333.6 Sq. Km. Lowest altitude of the watershed from mean sea level is 330 m at the confluence of Tinau and Jhumsa Khola (27º45'00", 83º30'27") and highest is 1893.4 m at Ghustung Lekh (27º49'49", 83º26'11"). Rugged terrain with steep slopes and deeply incised Tinau Khola, bounded in the south by the Siwalik range. The Mahabharat range occupies the central and northern part of the watershed (Map 3.4). Relief is moderate and low. Elevation and relief increases from east to west. Being in between of Main Boundary Thrust (MBT) and Central Boundary Thrust (CBT), this watershed is tectonically very active and geomorphologically very vulnerable. There is a big fertile, Mandi Phant, valley in between the eastern subwatersheds namely Majhare Khola, Sukhajor Khola and Upper Tinau Khola. Twenty five per cent of the total area is very steep in slope (Table 3.2). Forty per cent of the area is south facing and only 3.52% is flat (Table 3.3). Main soil of the watershed are sandy loam, silty loam, loam, loamy clay, and clay (LRMP, 1982). It exists tropical to temperate forest type (Fleming, 1973). Deciduous broad leafed like maple and beam. Chilaune - Katus (*Schima wallichii-Castanopsis indica)* is the most dominant forests. Sal *(Shorea robusta)* is mostly found on lower slopes; Chir Pines *(Pinus roxburghii),* Blue Pines *(Pinus wallichiana)* on many south facing slopes; evergreen Oaks *(Quercus spp.)* with Rhododendrons *(Rhododendron arboreum),* the National Flower of Nepal, on higher slopes and ridge tops; Laurel or Asna or Saj (*Terminalia tomentosa.),* Cutch tree or Khair *(Acacia catechu),* Sissou *(Dalbergia sissoo),* Karma *(Adina cordifolia),* Jamun *(Syzygium cumini),* Banjhi *(Anogeissus latifolia),* Wood Apples *(Aegle marmelosa),* Kusum *(Schleichera trijuga),* Screw-pine or Ketuki (*Pandanus nepalensis),* Lampate (*Duabanga grandiflora),* Simal or Silk Cotton *(Bambax ceiba)* on valley and riverine bottom lands. Alder or Utis (*Alnus nepalensis)* is mostly found on landslide prone areas and where once there was landslides. Monsoon climate with heavy annual rainfall between 1,000-2,000 mm, 80% of which falls between June to September. Mean temperature varies widely with maximum of 28°C and minimum of 21°C in July and maximum of 18.6°C and minimum of 8°C in December. Absolute maximum/minimum: 33°C in May and 4°C in December (TWP, 1980). Drainage system of the watershed is dendritic.

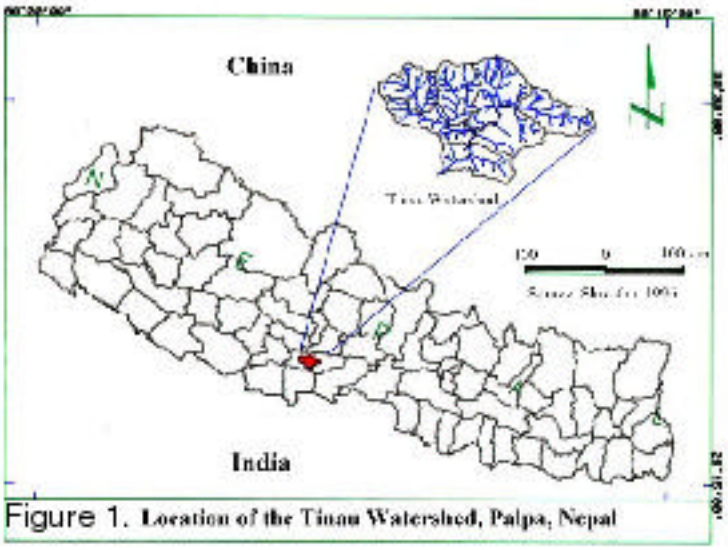

Figure 1. Location of the Tinau Watershed, Palpa, Nepal

Source: Shrestha, 1996 and HMG-N/JICA, 1993.

METHODOLOGY:

Based on the major variable affecting soil erosion factors such as land use/land cover, slope gradient, slope aspect orientation, drainage density and soil types; high, medium and low, erosion potential areas were identified. Climatic factors, being the same for the study area, are not considered for this relative qualitative study of sub-watershed prioritization.

Biophysical, socio-economic condition and implementation capacity were analyzed mainly concentrating on the resources that belong to forestry, agriculture and water sectors. Maps, aerial photographs, satellite data, ancillary data and GIS information were extensively used. PRA tool was used to carry out the field survey. Focus group discussion in representative areas of different erosion potential areas, semi-structured interview with key informants, transact walk in the study area and interaction with the concerned authorities revealed many information regarding the formulation of participatory watershed management planning.

Socio-economic condition of sub-watersheds - people's demands, need and their participation to SCWM programs and other information such as bio-physiographical as well as implementation capacity is gathered during the field survey. To get the detailed information of the area, a intensive field observation was performed with designed checklist. One-day workshop was organized in selected wards of VDCs or municipality in each sub-watershed and discussed with the group of villagers to fill the semi-structured questionnaire. Conducting such workshops in each site, necessary socio-economic data were collected. The survey sites or ward numbers of VDC or municipality were selected randomly.

People's priority was evaluated from the socio-economic survey. Watershed priority was judged from the bio-physiographical survey. In the same time, implementation capacity of the district and the area was noted down and the samples of soil were collected.

Identified demands of local people from different erosion potential areas were translated into a five-year plan, which is called "**Participatory Watershed Management Planning for the Sustainable Development of Tinau watershed, Palpa, Nepal "**. Successful implementation of this plan will add milestones in the sustainable development of the resourceful Tinau watershed of Palpa, Nepal.

RESULT AND DISCUSSION:

Government initiatives in the soil conservation and watershed management work programs can not last long if local do not accept and support them. Local people's participation is obtained in (i) decision-making and planning of the project (ii) implementation of the project and (iii) maintenance of the project. In order to facilitate these aspects of people's participation, the watershed planning should be implemented with close cooperation with local people. Among the 48 groups surveyed, most of the groups have given first priority of people's participation to the trail improvement and forest conservation and management. Similarly, most of the groups have given second priority of people's participation to degraded land rehabilitation, gully and landslide treatments. Hence, the highest weightage is for forest conservation and management (Table 1). The result shows that the poeple are more interested in and involved in community forest conservation and management, which is realistic too in this present scenario.

Although their maximum participation in the forest conservation and management, priority has been given to irrigation channel improvement and gully and landslide treatments (Table 2). On the basis of their participation and priority, a Sub-watershed Management Plan for the Tinau watershed, Palpa was prepared with close cooperation of District Soil Conservation Office (DSCO) and other relevant line agencies.

While prioritizing the activities, SES value of the sub-watersheds were calculated. Identified people's needs were further prioritized in accordance with the situation that is felt critical in the village. Prioritized activities vary by type and location but are similar to the type and nature of work being undertaken by DSCO in the district. Besides these criteria, potentiality of the source to the beneficiaries, number of gross beneficiary households, effect due to source protection, level of participation, and anticipated sustainability issues were also taken under consideration.

According to above criteria, **estimated** total needs of some major activities are listed in Table 3 for the sustainable development of the watershed natural resources.

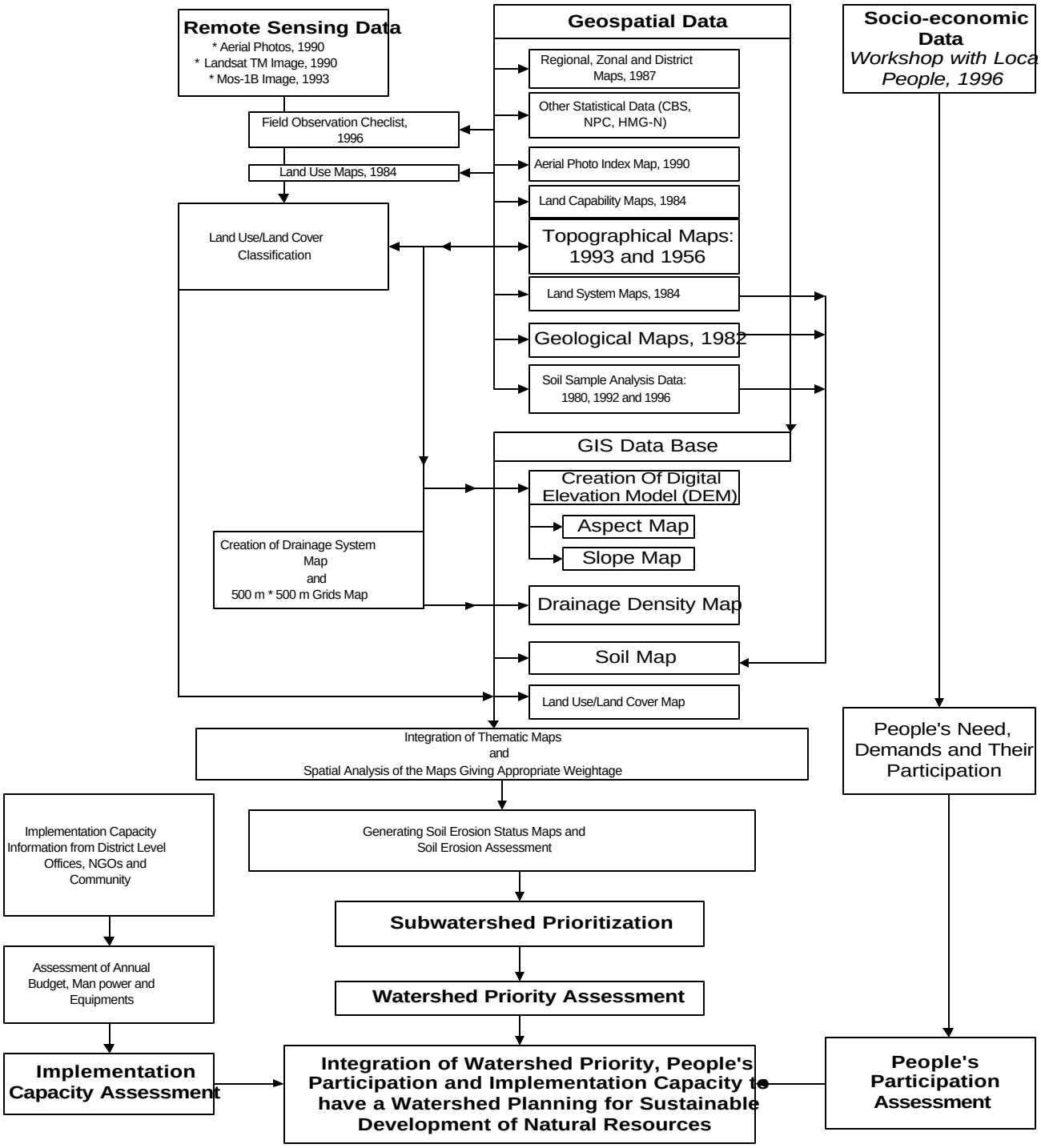

Figure 2. Flow Chart of General Methodology.

Table 1
People's Participation

SES Area	People's Participation			
Activities	I	II	III	Wt*
On farm Conservation	9	17	22	1.73
Fruit/Fodder Tree Plantation	3	3	37	1.08
Irrigation Channel Improvement	18	12	17	1.98
Afforestation or Degraded Land Rehabilitation	12	26	10	2.04
Silvi-pasture Improvement	13	8	20	1.56
Forest Conservation and Management	28	5	13	2.23
Water Source Protection	9	10	20	1.40
Gully and Landslide Treatment	16	20	12	2.08
Road slope Stabilization	7	11	26	1.44
Stream bank Protection	14	10	23	1.77
Trial Improvement	24	9	13	2.15
Torrent Control	6	6	32	1.29
Conservation School Education	16	3	27	1.69
Conservation Training and Tour	18	4	24	1.79
Conservation Meeting and Workshop	13	3	30	1.56

III = < 30% People's Participation
II = 30 - 40% People's Participation, and
I = >40% People's Participation.
* Weightage = (I * 3 + II * 2 + III * 1)/Frequency of Cases

Table 2
People's Priority

SES Area	Whole Watershed					
Activities\Priority	1	2	3	4	5	Wt*
On-farm Conservation	4	3	2	2	2	1.00
Irrigation Channel Improvement	9	8	9	3	2	2.33
Afforestation or Degraded Land Rehabilitation	5	5	8	7	3	1.67
Gully and Land Slide Treatment	8	9	4	5		2.04
Stream Bank Protection	2	4	1	1	3	0.71
Trial Improvement	3	7	10	5	4	1.81
Torrent Control	2	3	2	1	2	0.67
Conservation School Education	2	3	5	5	8	1.15
Conservation Training and Tour	4	2	1	6	5	1.00
Water Sources Protection	9	2	2	1	4	1.35
Forest Conservation and Management		1				0.08
Silvi-pasture Improvement		1				0.08
Conservation Meeting and Workshop			1		1	0.08
Road Slope Stabilization			1		1	0.08
Safe Drainage				1		0.04
Total	48	48	46	37	35	

* Weightage = (I*5+II*4+III*3+IV*2+V*1)/Frequency of Cases

Source: Shrestha, 1996.

Table 3
Estimated Total Needs of Some Major Activities in Priority Sub-watershed

Activities	Need	Unit
On-farm Conservation	96	ha
Conservation Pond	21	no
Fruit Tree Planting	48	ha
Fodder Tree Planting	48	ha
Nursery establishment and operation	7	no
Microwatershed Conservation Demonstration	3	no
Conservation Farmers Training/Tour)	260	person
Conservation Women Training/Tour	290	person
Users Group Training/Tour	550	person
Irrigation Channel Improvement	22	km
Trail Improvement	46	km
Water Source Protection	20	no
Shelterbelt/Greenbelt	46	km
Gully Treatment	80	no
Landslides Treatment	100	no
Torrent Control	26	no
Stream Bank Protection	12	km
Degraded Land Rehabilitation or Afforestation	115	ha
Enrichment Plantation or Reforestation	115	ha
Forest Conservation and Management	330	ha

Source: Shrestha, 1996

Besides these, activities related to skill development, income generation and extension were also incorporated in the plan to enrich the knowledge and skill of the local community and encourage them for their sustainable living.

On the basis of people's participation and their priority total needs of some major activities of the Tianu watershed were estimated. With reference to this estimated total needs of some major activities, five year's watershed management planning for the sustainable development of the Tinau watershed were developed.

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