Land Husbandry Practices in North Pare Mountains

The Case of TFAP North Pare Project, Mwanga, Kilimanjaro Region, Tanzania

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1. Abstract

TFAP North Pare project was launched in 1992 in order to acquaint the local community with better ways of managing and utilizing their land resources. Proper land husbandry practices as applied by TFAP North Pare Project are discussed with emphasis on people's participation by using village based participatory land use planning. The Land husbandry practices are examined in relation to six constraints existing in the North Pare Mountains. Achievements as a result of the Project activities are given for the past 4 years.
Soil fertility has improved. Phosphorous levels have now increased to more than 4 ppm. Production per unit area has increased by 40 to 70%.
Conclusions on the change of attitude of the farmers are presented. Recommendations are given for further improvement towards proper land husbandry.

Keywords: Land husbandry, Participatory land use planning, Tanzania Forestry Action Plan.

2. Introduction

The North Pare Mountains (NPM) are subject to inadequate land management and misuse of land resources.

The planning of Project activities concerning land use is still done in a 'top - down' approach in which villagers are told what to do.

The traditional way of farming in relation to population pressure, topography and land scarcity has accelerated depletion of the limited land resources. The TFAP North Pare Project has adopted an approach in which villagers are involved and participate in problem identification and solving. Villagers are the ultimate decision makers on how best to plan and manage their land, supported by the technical know how extension staff on how to improve production per unit area through proper land husbandry.

3. Location, Population and Physical Environment

The Project area is situated in Mwanga District, Kilimanjaro Region and is confined to the NPM ranges, which have a topography of 800 - 2000m.a.s.l. The area covers 420 km2 with a total population of 60000 people (National Census 1988) growing at an average of 3.7 % per annum. The population density is high, approximately 200 people per km2. The main ethnic group is Wapare.

The main rock types are granulites and granulitic gneisses (GST 1960). The soils have been described on the soil map of the World as Nitosols (FAO/ UNESCO 1977). The survey done by the Project in 1992 indicated that Cambisols and Fluvisols are also present on the pediments of hill slopes and in the river valleys respectively.

Nitosols have low to medium inherent fertility and have high erodibility. Therefore fertilizers are needed to get higher yields and soil conservation measures are required to prevent soil erosion. Cambisols have low inherent fertility and respond well to fertilizer application. They require conservation measures because they occur on slopes. Fluvisols are generally fertile, but flooding and water logging are major problems so that land use systems have to be adapted to floods, inundation and high ground water. The first two types of the soils have been in use for the past 100 years and more; at present such that agricultural production without fertilizer and manure application is not possible.

The mean annual rainfall sumranges between 850 and 1200 mm. There are two rainy seasons. Short rains (*vuli*) fall from November to December with a dry spell in February and long rains (*masika*) fall from March to May. The temperature range from 14 - 28 C.

4. The Problem Statement

Studies conducted by the Project in 1992/93 on the social - economic situation in NPM in relation with the utilization of the land resources revealed a number of constraints; inadequate food production; low crop productivity; low livestock productivity; shortage of fuelwood, poles and raw material for cottage industries; low cash income; and labour shortage.

The causes and mitigation measures are listed in Table No. 1 (appended). These were determined by using the D and D methodology (ICRAF 1987) and the Users Perspective Methodology (Rocheleau 1987).

5. Traditional Land Uses in NPM

5.1 Traditional intercropping and mixed cropping.

Maize is mixed-cropped with beans and cassava or sweet potatoes for subsistance production. Coffee is normally intercropped with banana (*Musa-ex-paradisiaca*), or shade and fruit tree species such as *Grevillea robusta, Albizzia schimperiana, Cordia africana, Persea americana,* and *Artocarpus heterophylus.* Sometimes food crops are intercropped with leguminous shrubs e.g. cow peas. Although the trend of rainfall was good in the 1960's, rains are being less and unreliable (see figure no. 1 appended) due to the destruction of natural resources.

5.2 Grazing

Livestock wed to be grazed but is stall - fed (zero - grazing) now. This land use is practiced by more than 95 % of the households in the NPMs. Currently, there is hardly any area for grazing.

5.3 Traditional forests ('mpungi')

Forests are traditionally owned by Clans and are found within the settlements on hilltops or near the houses. They are highly valued because of their importance in worshipping, holding circumcision ceremonies and as water sources. Due to population pressure, the destruction and encroachment is alarming. This is triggered by the demand for land, for agriculture fields, settlement and fuelwood collection.

The inhabitants of NPMs used to irrigate their agricultural crops in a traditional way by using overnight reservoirs known as '*ndiva'* in the Pare language. Clan leaders ensured proper management and distribution of the water to clan members. There were no soil and water conservation structures such as bench terraces, which led to considerable wastage of water due to the location of farm plots on slopes. Also as a result of the destruction of the catchment areas, most reservoirs have dried up and/ or are left unattended.

Formerly, river and stream banks were given due respect and inhabitants were not allowed to cultivate up to the river/ stream banks. At present due to population pressure and insufficient law enforcement the farmers are cultivating up to the river/stream banks.

There are about four catchment forests that were respected by the inhabitants due to their importance as water sources and reserved as National Forest Reserves by the colonial governments. For the past few years, there have been illegal activities going on leading to destruction of these National forests.

Since irrigation of agriculture crops in the eastern lowlands depends on the water from the highlands, these catchment forests and other catchment areas require proper protection and conservation for sustainable production of water.

6. The TFAP North Pare Project

The constraints mentioned above and the need to improve the traditional land uses in the NPM have necessitated the Project to be launched in 1992. It is executed by the Ministry of Natural Resources and Tourism with financial support from the Federal Ministry for Economic Cooperation and Development through GTZ.

6.1 The objective and approach of the Project

The main objective of the TFAP North Pare Project is to advise farmers and other stakeholders on sustainable use of the natural resources through proper land husbandry.

In order to overcome the causal factors (refer table no. 1) which lead to over-utilization of the natural resources and to achieve the above-mentioned objective, an integrated approach is used. The approach is *Village Based Participatory Land Use Planning* (VBPLUP). This approach focuses on identification of the problems and needs of the population. It builds on local knowledge and experience and participation of the local community (both male and female) in the sustainable management of the natural resources and on maximum decentralization of land use planning (Graaf 1993). This approach encourages the target group to practice sustainable land husbandry.

Land husbandry in this context may be defined as: sound management of land resources for sustainable production. It focuses on improving people's standard of living. Land husbandry is not just terracing. It requires an integrated approach to farming including livestock, forestry and agroforestry. Land husbandry means care, management and improvement of land resources such as soils, water, vegetation and animals.

The procedures and details of the whole approach shall not be discussed here but instead, its application by the Project to ensure sustainable land management in the NPMs shall be discussed in depth.

6.2 Application of the approach

The VBPLUP approach is applied in villages situated in the near vicinity of the national forest reserves. The program is based on the 'buffer zone' principle: reducing the pressure on

these forests by supporting sustainable land use practices by the villagers bordering the forests.

As a first step, a RRA is conducted in selected villages together with the villagers, the project and collaborating staff from relevant District departments.

The project assists the village community the establishment of a Village Land Use Planning Committee (VLUPC). These committees initiate public debate at village level focusing on the villager's perception of problems or constraints related to natural resources in the village area and potential solutions to overcome them. This important process eventually results in a ' proposal for action'.

For every committee a three dimensional model is constructed, depicting the village environment including all physical features. The project, in cooperation with the villagers, has produced a video film recorded in the NPMs, which explains the way villagers may ' plan the use of their land'. Both the model and video film have proved to be effective tools in the discussions (public debate) at village level.

The proposal for action is screened to become a work plan in which important principles for the promotion of land husbandry are taken into consideration. These are interdisciplinary approach; participation of land users (villagers), and sustainability. Farmers are advised on soil and water conservation measures through construction of bank over ditches, bench terraces, contour ridges, live fences, tree planting etc. Farmers form groups and help each other, especially in making soil and water conservation structures. They are advised on where to construct bank over ditches and as well as bench terraces depending on the slope and rooting depth.

However, soil conservation is a component of all farming activities and sustainable land husbandry means that there is long term security in biological and economic productivity as well as security in ecological functions. This implies that functions and conditions of the landscape should not be changed drastically and that natural resources are used with respect because future generation will also need them.

Essential aspects looked into by the project for securing sustainable land husbandry are:

- Soil fertility: The soils are poor, deficient in phosphorus (P < 4ppm) and also acidic (see table no. 2).

  NB: The mean for available Phosphorus (1.25 mg/kg) was attained after 3 years of application of organic manure on soil and water conservation structures.

  Farmers are advised to apply rock phosphate in order cure soil acidity and make phosphorus available. In addition farmyard manure is applied. Farmers who are capable of purchasing it apply inorganic fertilizer. For the purpose of nutrient recycling, farmers are advised to mulch after harvesting and if the stover is used to feed the livestock, then the manure should be applied back on the structures. This is supplemented by the use of compost manure. However, the farm yard manure is not enough because only a little number (less than 2-3) of cattle are kept per household. Fodder availability is a problem and farmers are advised to stabilize the soil and water conservation structures by using suitable grass species like S*ettaria guatemala pennisetum purlpureum* (napier) and multi purpose tree species like *Calliandra calothyrsus, Leucaena diversifolia,and Gliricidia sepium.*

- Site-specific crop and tree management

The farmers are advised to grow agriculture crops with consideration of the suitability of the site. Aspects of soil type, altitude and precipitation are considered. In the effort to advise farmers to diversify cash crops, *Elettaria cardamomum, Cinamomum aromatica and Marcadamia* are emphasized. The same applies to timber and agroforestry tree species. Management according to the use is highly encouraged.

- Rainfall, surface run-off and water management
  Farmers are advised to minimize surface run-off by constructing structures like bank over ditches and bench terraces. Other measures include intercropping, mixed cropping, grass strips, trash lines, contour farming, minimum tillage, mulching, crop rotation, and contour hedges. These structures help to harvest rainfall water and thus increase the moisture content to the soil. Water losses from the overnight reservoirs are reduced by renovation of the canals. This activity is done through peoples participation by the Traditional Irrigation Programme (TIP) funded by the Dutch government through SNV.

- Buffer zones management (overnight reservoirs, river banks, hill tops and clan forests)
  The catchment areas to the overnight reservoirs are protected by the owners by planting suitable tree species which retain water like *Ficus sp., Bridelia micrantha, Arundinaria alpina and Cytostachys renda.* No grazing or cultivation is allowed in these areas.

Table 2. Soil Chemical Properties of 12 on Farm Sites in the NPMs

Soil Property	Mean	SD	Minimum	Maximum
pH water	5.2	0.31	4.8	5.8
Org. C%	2.1	0.58	1.4	3.1
Total N%	0.19	0.05	0.12	0.27
Available P mg/kg	1.25	0.03	0.0	4.0
CEC me/ 100g	12.98	2.4	9.3	16.9
Exc. Ca me/ 100g	5.3	2.5	2.6	11.0
Exc. Mg me/ 100g	2.55	0.64	1.6	3.6
Exc. K me/ 100g	0.32	0.19	0.13	0.62
Exc. Na me/ 100g	0.22	0.13	0.05	0.4

Source: Agroforestry section TFAP North Pare Project.

Riverbanks are currently protected by farmers with plots adjacent to the riverbanks. A strip of 5 meters is left uncultivated on both sides. They are as well advised to plant suitable tree species, shrubs and grass species. According to the National Forest ordinance, a strip of 30 meters on both sides of the riverbank should be left untouched but practically this is not possible due to problem of land scarcity.

7. Sustainable Use of Land Resources

In order to attain sustainability in the use of land resources, the project has found it necessary to:

- understand and know tools needed for examining complex and interacting systems.
- develop site specific land use systems

Qualitative assessment of land and comparison of the land qualities with the type of use intended are the key issues under consideration. Some of the land qualities are:

- moisture availability (rainfall)
- soil drainage
- nutrient availability (soil type, thickness of top soil)
- rooting conditions (soil depth, stones and gravel, rock outcrops)

- conditions affecting germination and establishment (soil texture, stones and gravel)
- terrain factors (slope, relief)
- erosion hazard (soil type, texture, soil permeability, slope angle)
- tolerance to vegetation degradation (present vegetation type and condition)
- presence of valuable plant and animal species.

For example a piece of land with a lot of stones and shallow rooting depth is not suitable for agriculture but for woodlots because the roots of trees are able to penetrate the rocks.

Farmers are advised to consider any improvement of to the land. They participate in assessment and analysis of those improvements of the environment as well as their social and economic impacts. Impact assessment is an analysis of the causes and effects of activities implemented by the farmers, which affect the environment, and influence their economy and social status. Impacts may be positive or negative in nature.

8. Achievements

Since the project started in 1992, there have been some achievements by the project, which ensure participation of the local community, cooperation with the relevant District departments, collaboration with other projects and Non-Governmental Organizations.

The achievements are basing on the supervision provided by the project support unit comprising of Forestry, Agroforestry, Participatory Planning and Extension, and Monitoring and Evaluation.

8.1 Participatory Planning and Extension

- 7 land use planning committees have been established in seven villages.
- 7 village models were prepared.
- 23 catchments have been selected in which over 79 self-help groups comprising about 1078 farmers in total are participating.

8.2 Agroforestry and soil conservation

- about 48306 meters(50ha) of bank over ditches, 113907 meters(53ha) of bench terraces and 6981 meters(15ha) of contour hedges have been constructed.
- stabilization of terraces and bank over ditches with trees, shrubs and grass.
- continuous trials on 10 farms.
- training of 700 farmers on soil and water conservation measures.

8.3 Forestry

- support to 143 individuals, contracted, schools and group nurseries which have produced more than 500000 seedlings.
- 350 ha. have been planted on-farm including river banks and water sources.
- 80 ha. have been planted in afforestation sites.
- 4 joint management plans for village forests have been prepared.
- 1 management plan for 230 clan forests have been developed.

9. Conclusions and Recommendations

Practicing proper land husbandry in the NPMs had shown a positive impact towards changing the target group's attitude from inappropriate farming practices to appropriate ones. They have realized that terracing alone does not improve production per unit area without application of inputs like organic and inorganic fertilizers.

Water run-off and soil erosion have been curbed considerably, thus increasing the infiltration and moisture content of the soil for fast growth of crops.

The number of farmers in NPMs adopting soil and water conservation measures, agroforestry and afforestation practices is increasing. More extension services from the project and collaborating District departments are a pre-requisite.

However, the income of the farmers is still low and there is a need to promote off-farm income generating activities. Coffee is the only cash crop in the NPMs. There is a need to diversify cash crops. The area has potential for growing different fruit tree species and vegetables. Improved varieties have to be introduced and promoted as well as marketing systems.

Cooperation existing between the TFAP North Pare project, relevant district departments, collaborating projects, NGOs and village authorities should be strengthened for sustainable management and utilization of the land resources.

10. List of acronyms

TFAP	Tanzania Forestry Action Plan
VLUPC	Village Land Use Planning Committee
VBPLUP	Village Based Participartory Land Use Planning
NPM	North Pare Mountains
NGO	Non-Governmental Organization
SNV	Netherlands Volunteer Service

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12. Appendices

RAINFALL DATA FOR 1996/97 IN NORTH PARE

	Chomvu	Vuagha	Shighatini	Masumber	Mwaniko	Mwanga
July	2	3	3	13	15	0
August	4	12	16	29	16	0
Septembe	8	10	32	26	19	0
October	39	31	36	43	20	2
November	141	126	88	130	91	26
December	24	41	57	83	80	0
January	0	0	0	0	0	0
February	3	0	0	0	0	0
March	17	3	32	23	29	36
April	138	161	340	248	310	140
May	206	190	296	174	264	109
June	52	55	63	60	57	18

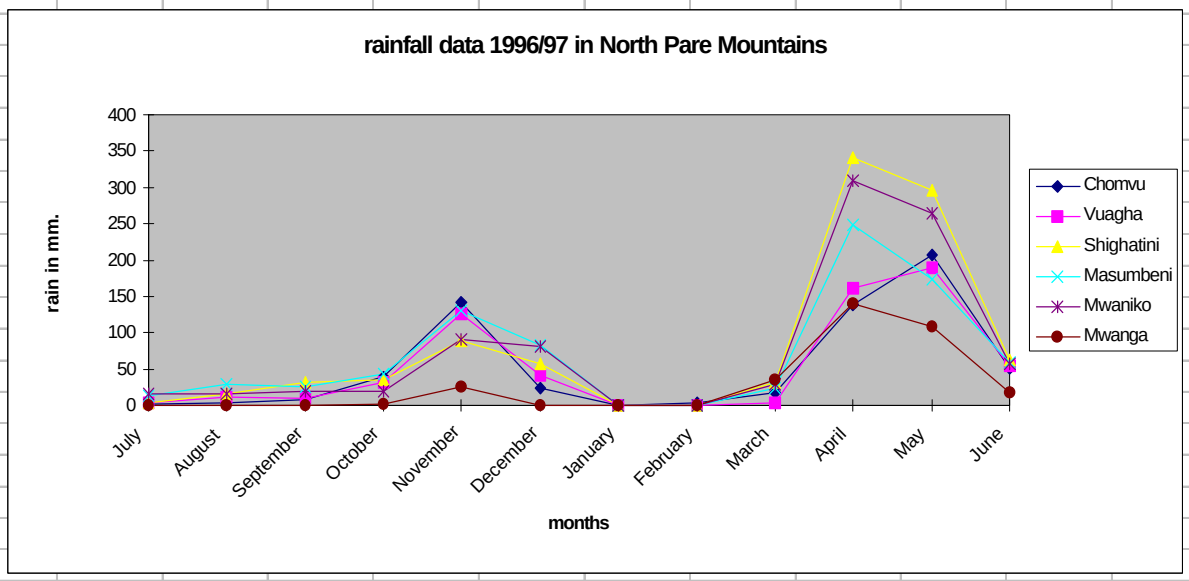

Figure 1. Rainfall data for 1996/97 in North Pare.

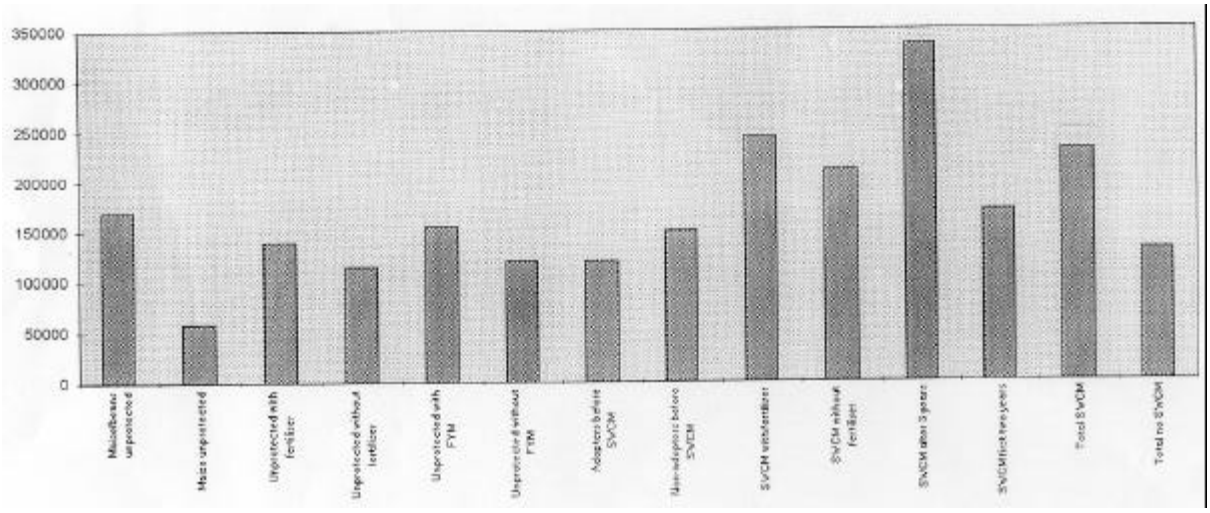

Figure 2. Gross margins without costs for SWCM for maize/beans cropping systems before and after the introduction of SWCM.

Table 1. Constraints, causal factors and mitigation measures in the land use system of North Pare Mountains

Constraints	Causes	Mitigation measures
1. Inadequate food production	Very small farm size(< 1ha) for an average family of 5.6 people, High population density(200 people/km2), unreliable rainfall(800-1300mm/a)	Cultivation of maize, beans and rice in the Eastern lowlands, supplementary irrigation, water harvesting technologies.
2. Low crop productivity	Continuous cultivation on steeper slops without soil conservation measures, low soil fertility (avail. P<4ppm, acidic soils), Nutrient losses through erosion and crop harvests, Insufficient production and subsequent use of manure, Insufficient use of inorganic fertilizers, Use of acidifying chemical fertilizers, Lack of cash to purchase needed inputs.	Implementation of soil and water conservation measures, Use of animal manure in combination with chemical fertilizers, Use Minjingu rock phosphate and CAN, Increase fodder production by planting Napier and calliandra calothyrsus on terrace risers and bank over ditches, Use of improved seed varieties.
3. Low livestock productivity	Fodder shortage especially during the dry season, Poor quality of fodder grasses.	Increase fodder availability and quality by planting Napier and setaria grasses and calliandra calothyrsus on terrace risers and bank over the ditches, Plant fodder species on the road sides, farm boundaries and foot paths.
4. Shortage of fuel wood, Poles and Raw material for the cottage industries	Slow growth rates of trees, High demands for wood based materials, high rates of deforestation, Lack of substitutes for wood based materials.	Increase wood availability through afforestation, tree planting on farm, field boundaries, on terrace risers and bank over the ditches, Use of wood saving stoves.
5. Low cash income	Low coffee production due to low prices offered by buyers compared to the high prices of inputs like pesticides and fungicides, Poor management of coffee.	Diversification of cash crops by planting Elettaria cardamomum and cinnamomum aromaticum.
6. Labour shortage	Division of labour between man and woman, Migration of youths to cities, high prices for hired labour	Sensitization on gender issues for both man and woman