

Managing natural resources in the West Usambara Mountains: A glimmer of hope in the horizon

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Abstract

Past efforts in the management of natural resources in the West Usambara Mountains have not been successful mainly because the approaches were top - down and did not consider local communities important in natural resource management. Current initiatives active in the area have shown that participatory approaches involving all stakeholders as well as empowering local communities to take charge of natural resource management have more chances of success. Different biophysical, socio-economic, institutional and policy opportunities exist that can be exploited to attain sustainable natural resources management in the area. Scaling up of experiences obtained so far, exploiting indigenous knowledge on conservation, improvement in the information flow and market infrastructure and establishment of appropriate policies and by laws on natural resource management are some of the strategies for the way forward in attaining sustainable natural resource management in the West Usambara Mountains.

Introduction

The West Usambara Mountain ranges in North East Tanzania, forms part of the Eastern Arc Mountains. With elevation ranging from 900 - 2250 meters above the sea level they occupy about 80 % of Lushoto District in Tanga Region. More than 80 % of the population of Lushoto District (estimated at 526,278 (NRI, 2000)) reside in the West Usambara Mountains (Mwihomeke, 2002. Pers.comm.) making it the most densely populated (100 person/km²) in the country.

The importance of the West Usambara mountains as well as efforts in conserving them has been given a lot of coverage (Pfeiffer, 1990; Iversen, 1991; Mwihomeke, 1995; Moshi, 1996; Lyamchai, et al., 1998; Stroud, 2000;

Johansson 2001;). Suffice it here to note that these mountain ranges with their excellent climatic conditions have attracted not only farming communities but also tourists as well as providing various products to populations and industries within and outside the West Usambara. Several streams originating from the West Usambara feed for example the Uмба River, which crosses to Kenya. Water from this watershed is widely used for irrigation in the adjoining lowlands and in generation of hydro-electricity (Iddi, 2000). The West Usambara is also home for different plants and animals several of which are endemic to the area thus having an important role at national and global level in the conservation of biodiversity.

Efforts towards judicious management of natural resources in the West Usambara Mountains stretch many years back. Traditional societies inhabiting the mountains practiced a highly sustainable agroforestry system, used manure to fertilize their fields, practiced sophisticated soil conservation and maintained extensive irrigation systems (Johansson, 2001). However, the top - down approaches to management of natural resources adopted by both pre and post independence Governments were not effective mainly because the farmers were considered recipients of technologies rather than equal partners in their development. Worse still these technologies were not site specific and therefore could not cater for the great biophysical and socio-economic heterogeneity of mountain ecosystems and people.

Projects active in the West Usambara in the last 20 years have adopted participatory approaches in technology development and dissemination. In these approaches all stakeholders are involved and the local communities are considered important partners as well as owners of the process. Experience from these projects show that involvement of local communities is effective because it ensures faster adoption of technologies and adapting them to their local conditions. There is some hope emerging that the declining trend in land quality, forest cover, biodiversity and water levels can be reversed hence restoring the former glory of the West Usambara.

In this paper the major problems in natural resources management in the West Usambara Mountains, how they evolved and their impact are outlined. An overview of recent initiatives in addressing these problems is given by looking at four key projects/institutions active in the area. Finally the paper looks into the opportunities goals and the way forward towards attaining sustainable natural resources management and use in the West Usambara Mountains.

Major problems related to natural resources management and use, their evolution and their impact

Overpopulation is the major problem influencing sustainable natural resource management in the West Usambara Mountains. High growth rates now estimated at 2.2 % (Lushoto District planning office) have led to populations

higher than the carrying capacity of the district. Coupled with this is the inheritance system and ownership of parcels of land in different catchments. The impact of this is seen in increasing land scarcity, fragmentation of lands into small uneconomical plots, limited attention of parcel of lands located away from the households, wide spread cultivation on marginal lands and encroaching into forest lands (84 % of the original forest has been cleared). Based on species-area relationships such loss of original forests suggests that approximately 34 % of the species in the West Usambara have become extinct or are in a danger of extinction (Newmark, 2000).

Land degradation is a common in the West Usambara Mountains. This is attributed to poor land husbandry, increased erosion and decline in soil fertility and no/or limited use of fertilisers. The impact of this is declining crop yields, increased food insecurity and reliance on food aid, poor nutrition and increased dependence on forest resources for livelihoods. Landlessness has also been reported (Mwihomeke, 2001 Pers. Comm.) which has led to some people migrating to the lowlands (Johansson, 2001) and urban centres.

Excessive deforestation has greatly influenced the natural resource base in the West Usambara Mountains. Apart from increased demand for agricultural land due to increased population, shifting agriculture practised in the past and lack of tradition among the local people for protection of trees are the principle cause for this. The consequence of this is declining amounts and reliability of rainfall (Huwe, 1988), declining amounts of water levels, increased incidences of run-off and floods and loss of biodiversity.

Poor access to information is also an important factor influencing sustainable natural resource management and use in the West Usambara. There is a lack of information on available technological options to natural resource management. Scattered efforts by various institutions working in the area and lack of community based approaches towards natural resource management are among factors responsible for poor access to information by farmers. The impact of this is reflected in the non-use of available technologies natural resource management by farmers.

Poorly developed marketing infrastructure including market information system has affected investment in natural resource management. This is evidenced in the low and unstable prices offered to farmers and exploitation of farmers by middlemen who are always ahead in terms of market information. There is high post harvest loss of the perishable fruits and vegetables due to a skewed production pattern that is not related to demand pattern. The problem is compounded by the lack of post harvest processing to add value and prolong the shelf life of the product as well as exploring a wider market. This has lead to increased poverty and inability to invest in agro-inputs such as fertilizers.

Institutional factors have also been responsible in slowing the pace to attaining sustainable natural resource management in the West Usambara. Although changing gradually, our training did not put emphasis on participatory methodologies, networking, and farmer involvement as equal partners, use of indigenous technical knowledge, exploiting farmers' innovativeness and working with local institutions that have direct influence on the people. The impact of this is lack of the culture of interacting with farmers among most scientists leading to farmers' views not being addressed in the development of technologies and scientists not understanding the farmer's point of view.

Poorly formulated policies have to a great extent hindered smooth implementation of sustainable practices of natural resource management. More often such policies did not involve all stakeholders notably the farmers and are not clear or sufficient enough in aspects of natural resource management. Most policies are no longer appropriate given the prevailing socio-economic conditions and it takes too long for them to be reviewed (again without involving the farmers). Further, there is lack of realistic strategies for implementing some of the policies. The impact of this is presence of conflicts over natural resource use between members of the local communities, and between these communities and those outside the mountains.

Initiatives to address the problems

Three major projects and various research institutions particularly TAFORI and others like the Sokoine University of Agriculture have been active in natural resource management in West Usambara. In the next section the contribution of SECAP (Soil Erosion Control and Agroforestry Project), TIPDO (Traditional Irrigation and Environmental Development Organization), TAFORI (the Tanzania Forestry Research Institute) and AHI (African Highlands Initiative) are discussed.

Soil Erosion Control and Agro-forestry Project (SECAP)

The project was established in 1981 with Germany funding through the GTZ. The main objective is to improve the economic situation of peasant farmers by increasing agricultural and wood production, availability of water and to restore the disturbed ecological balance of the West Usambara (Johansson, 2001). It is one of the projects dealing with ecosystem conservation and management. Many of its activities such as tree planting on hilltops and on farmlands and forest management have contributed to solving the problem of fuel wood shortage and loss of biodiversity (Mgoo and Nsolom 2000).

The project adopted the catchment approach. According to SECAP the catchment is a smaller part of the village (a hamlet) with not more than 100 hectares and up to 80 households. The approach involves six steps namely selection of areas to work, participatory planning, awareness creation and

training, soil and water conservation measures, soil fertility improvement and monitoring and evaluation. The technical package include soil and water conservation, raising and distributing tree seedlings, tree planting on hilltops and farmlands development of village forest management plans, introduction of improved breed of livestock, horticultural production and training (mostly farmers and project extension staff). Activities are carried by a multidisciplinary team of extension staff guided by a steering committee from relevant government institutions and NGOs operating in Lushoto district, individual farmers and target groups.

Within a period of 20 years (1981-2000) about 24% of the households in the West Usambara Mountains have been trained on various aspects (Johansson 2001). The major thrust was on training on enhancing soil and water conservation measures (73%). About 10,000,000 trees have been planted on farmlands, which is about 20% of the required number of trees to meet the growing demand for fuel wood and reduce harvesting pressure on existing natural forests.

As the major agroforestry practice SECAP started with the macro contour strip for soil and water conservation consisting of upper-storey trees, shrubs and fodder grass. However, the macro contour strips were not popular with the farmers because the components were competitive to agricultural crops, harboured rodent pests to crops and believed to be potential carriers of plague (Martin, 2000. Pers. Comm.). They were also not very effective in promoting water infiltration. Consequently they were modified to bench terraces with trees on the embankments.

Traditional Irrigation and Environmental Development Project (TIPDO)
The project started in 1989 as Traditional Irrigation Project (TIP) under the Lushoto District Council with support from SNV (the Dutch Volunteer Organisation). At present it operates as an NGO. The main objective is to increase food security and income through improvement of the traditional and small holder irrigation systems based on sustainable use of land and water resources. The main package includes conservation of water sources and irrigation areas, rehabilitation and improvement of the traditional irrigation systems and organisation of irrigation water users to water user associations. Other activities are soil conservation and tree planting on farm to reduce over-dependency on the natural forest reserves.

The project uses the 'Tail to Mouth' approach which starts with interventions at the field (tail) with basic training in leadership, water management, soil conservation measures and gender awareness raising. With this background training the use of both rain and irrigation water on farms is optimised. This is combined with the cultivation of high value crops and application of appropriate agronomic practices leading to increased income (mouth). The approach is sustainable when small-scale interventions are made before

embarking on large- scale interventions. It enables water user groups to select the most appropriate intervention in terms of low investment costs and high financial returns.

TIPDO is operating in an area of 10,000 ha in Lushoto District. In the past 12 years a total of 80 irrigation water users groups have been covered in three irrigation zones namely Umba, Soni and Baga River.

Tanzania Forest Research Institute (TAFORI)

The Tanzania Forest Research Institute was established in 1981. The institute has seven centres distributed over four forest ecozones. The principal role of TAFORI is to generate sustainable methods for conservation of natural forests, develop appropriate agroforestry technologies for smallholder farmers and establish databases on natural forests, agroforestry, and biodiversity and disseminate the same to various interested end-users. The Institute emphasize on demand-driven research, working in multi-disciplinary teams, networking and involvement of all stakeholders in generating technologies.

The Silviculture Research Centre in Lushoto caters for the highlands zone in North Eastern Tanzania. Under agroforestry research a range of highly preferred tree species have been identified in all agro-ecological zones of the West Usambara Mountains (Mwihomeke, 1995). The famous Lushoto arboretum with over 100 different tree species established since 1952 has also provided a reference for selecting promising tree species for agroforestry. *Grevillea robusta* is the most commonly planted agroforestry species by farmers.

Evaluation of the productivity of various agroforestry practices has been done more for the macro-contour strips introduced by SECAP. This has mainly focussed on fuelwood production (Mwihomeke and Chamshama, 2001) and the ecological effects of trees on farm on agricultural production (Pfeiffer, 1990).

The taungya agroforestry practice is being evaluated to find out how to optimise both wood and food production with minimal conflicts with farmers at Shume forest Project. Genetically improved planting materials have also been determined in past tree species, provenances and progeny trials.

In natural forests, achievement has been made in preparing community-based guidelines for management of forests (Forest and Bee keeping Division, 2001).

African Highlands Initiative (AHI)

This is a collaborative eco-regional research program focusing on Integrated Natural Resource Management (INRM) in the highlands of East and Central Africa (including Madagascar). Its main objective is to undertake research and development activities to improve agro-ecosystem and Natural Resource

Management by addressing the multiple goals of farmers and communities in the highlands (AHI, 1997).

Specifically AHI aims to: Strengthen approaches and develop methodologies to improve the effectiveness of research and development on NRM, build the institutional capacity to increase awareness and expertise to address NRM issues, collect, organize and disseminate information, methodology and technology among partners and mobilize and strengthen partnership and links between institutions to address agro-ecosystems and NRM issues more efficiently. AHI activities are based on benchmark sites within the highlands zone.

The AHI benchmark site for Tanzania is Lushoto District with Kwalei as the pilot catchment. Activities started during the second Phase of AHI regional program. The third Phase is running from 2002 to 2004. The project works at the catchment level to enable development of more realistic technologies that takes into consideration the high agro-ecological, social and institutional heterogeneity common in mountain ecosystems.

Participatory methodologies are employed in understanding the dynamics and causes of changes in NRM, the components of the farming systems (their current and past interrelationship), identifying organisations and policies which can support the improvement of NRM, identifying the major constraints limiting crop and livestock production and identifying opportunities in addressing them, and to set priorities in order to target research and development activities. Networking, multidisciplinary, involvement of all stakeholders and working with farmer groups are important aspects of AHI operations.

During the last phase of AHI (1997 - 1999) AHI Lushoto conducted activities under three major themes namely soil fertility improvement, diversification and intensification and dissemination. Under soil fertility improvement major activities were on use of multipurpose trees and shrubs in soil and water conservation, use of improved fallow and use organic-inorganic nutrient resources in soil fertility improvement. Under diversification and intensification improved crop varieties, high value crops and better livestock management practices were introduced. Under dissemination the use of traditional dances as a dissemination tool as well as exchange visits were studied. Efforts were also directed towards facilitation of formation of credit association to enable farmers acquire the necessary inputs in agricultural production.

Impact attributed to these initiatives

Through these initiatives there are encouraging changes taking place with regard to natural resource management in the West Usambara Mountains. Key catchment forests have been protected, re-forested and put under community-based forest management teams (Johansson 2001). There has been an increase

in the population of trees on farm, in some areas being too high for efficient crop production (Fig. 1). For example, Mwihomeke, 2002 (Pers. Comm.) counted up to 900 trees per hectare on farmlands in Ubiri village close to Lushoto township. Mbae et al. (2001) noted that for efficient maize production under agroforestry with *Grevillea robusta* species the number of trees should be 200 per hectare.

Figure 1. Trees on farm at Ubiri Village near Lushoto Township. High population of trees on farm lands creates unfavourable competition with crops

The use of different soil and water conservation measures (e.g. terraces, ‘fanya juu’), use of organic and inorganic fertilizer combinations, and adoption of improved crop varieties has led to increased production. For example Meliyo et al. (2000) reported increases of maize grain yield of up to 218 % from conserved compared to non-conserved fields. Meanwhile, irrigation has not only improved yields but has led to a shift by most farmers to production of high value crops (fruits and vegetables) as opposed to traditional crops like maize (Table 1). In the humid areas, free grazing is gradually being replaced by zero grazing (Johansson 2001).

Table 1. Average yields (kg hectare-1) of selected crops from irrigated and non-irrigated fields in Kibaoni - Longoi valley (1985 - 1987). (Source: Johansson, 2001)

Fields/Products	maize	potatoes	cabage
Non-irrigated (mean of 84 fields)	865	1113	70
Irrigated (Mean of 59 fields)	908	5175	6410

There has been an increase in trade and income. However, food security (meaning maize) is decreasing as more land goes to production of high value crops. Another interesting trend in some villages is a decreasing trend in the number of students in school as vegetable export increases (Fig.2) indicating that more children are joining the market economy at a younger age.

There is greater recognition now of the need to work in multi-disciplinary teams, networking between institutions and projects, work with local institutions and with farmers as equal partners and exploiting farmers’ indigenous technical knowledge.

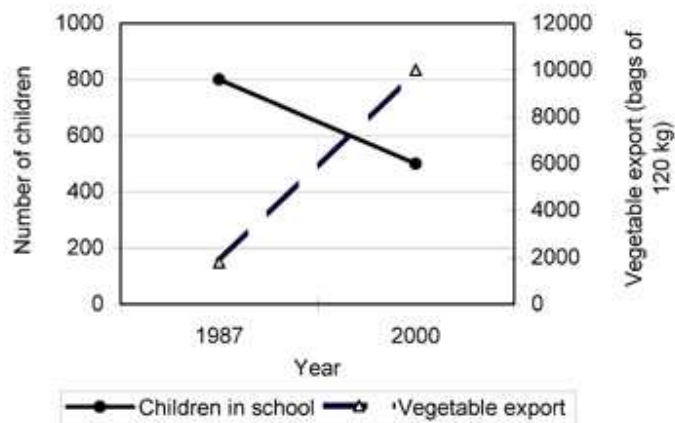


Figure 2. Number of children in school and export of vegetables in Kibaoni-Longoi Village in 1987 and 2000 (Abridged from Johansson, 2001)

Opportunities, Goals and the Way Forward

From the experience of the different initiatives considered above several opportunities exist that can be exploited to attain sustainable natural resource management and use in the West Usambara Mountains. These are considered under biophysical, socio-economic, institutional and policies opportunities. Biophysical opportunities includes the of use of organic and inorganic nutrient resources, soil and water conservation, use of improved crop varieties and high value crops, use of multipurpose trees and fodder species on farmlands (agroforestry) tree planting on hilltops and degraded lands, irrigation, and exploiting crop/tree/livestock interactions.

The goal here is to use available technologies to optimize management and use of natural resources in West Usambara and to develop different technological options to cater for all categories of farmers according to their resource endowment.

Socio economic

Socio-economic opportunities include use of collective action of the local community in managing natural resources. The use of farmer associations in marketing, the establishment of a market information system and improvement of market infrastructure are among the opportunities that can contribute to better natural resources management. As farmers' incomes increase the need to rely on natural resources such as the natural forests is reduced. The income generated through improved production can also be channeled to financing migration to the lowlands where there is ample land and hence ease population pressure in the mountains. A project called BAPPA (Beyond Agricultural

Productivity to Poverty Alleviation) jointly undertaken by CIAT and TIPDO will look into and advice on how best income generated from improved agricultural production can be used to improve the living conditions of the people in West Usambara. Reduction of family size in the West Usambara through properly instituted family planning will in the long run ease the current pressure on the available natural resources.

The goal is to have in place an efficient natural resource management team at the community level, an efficient market system, attain efficient access to information and maintain a population in the West Usambara commensurate with available resources.

Institutional

Opportunities in this area include the use of farmer organisation formed during the projects time (e.g. Farmer Research Groups, Community Based Forest Conservation Groups etc.) in scaling up. The capacity built through training of researchers, extensionists and paraprofessionals can be properly utilized in continuing the activities of the project after external assistance is over. The spirit of professionals working together in a multidisciplinary team and with different stakeholders and institutions is an important opportunity which could be exploited in furthering sustainable management of natural resources in the West Usambara Mountains.

The goal is to have strong organisations at the community level that can be used as agents of change. Additional goals are to have professionals who are convinced that working in a multidisciplinary team and involving all partners is a more rewarding way in technology development and transfer (Malley and Temu, 2001) and to attain stronger institutional linkages.

Policy

Once policy makers are convinced that the interventions are working they will see the need to formulate policies and by laws towards better natural resource management and use. All stakeholders should be involved in the formulation of policies and by laws.

The goal is to have proper policies that will be adhered to by all stakeholders and by laws that can be enforced.

Way forward

To attain sustainable management of natural resources in the West Usambara Mountains the encouraging results from the few initiatives should be scaled up to the rest of the district as well as to other similar areas. This can be achieved by exploiting the experience gained by farmers in project areas through exchange visits and farmer to farmer learning. The use of demonstration plots

located on strategic sites where many people can see and competitions between villages/catchments are also strategies that can enhance scaling up.

The approaches used by the projects should be promoted and built-in in those institutions responsible for the training of professionals both in research and extension. For example participatory approaches should be given more emphasis in the curriculum. Linkages between institutions at national, district and local levels should be strengthened.

Improvement in the flow of information to and from farmer/local community (technology and market information) can be achieved through establishment of rural information centres. The purchasing power of most farmers in West Usambara is low. There is therefore a need to facilitate the establishment of credit facilities at the local level to enable farmers acquire the necessary farm inputs they need.

No matter how well the natural resources in West Usambara are managed, the population which is already higher than the carrying capacity of the area (Moore, 1971) and increasing at a high rate (Msoka, 2002. Pers. Comm.) will always frustrate these efforts. There is therefore a need to look critically into practical ways of reducing the pressure on the land due to population. Both the local and central Governments should look into possibilities of encouraging out-migration to the low land areas where there is ample land and promote family planning efforts that match available resources.

Conclusion

Past efforts in the management of natural resources in the West Usambara Mountains have not been successful. Current initiatives active in the area have shown that participatory approaches involving all stakeholders as well as empowering local communities to take charge of natural resource management have more chances of success. Different biophysical, socio-economic, institutional and policy opportunities exist that can be exploited to attain sustainable natural resources management in West Usambara. Scaling up of experiences obtained from pilot areas, improvement in the information flow and market infrastructure and facilitating establishment of appropriate policies and by laws on natural resource management are some of the strategies for the improvement of natural resource management in the West Usambara Mountains.

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Notes to readers

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