

Promoting Sustainable Agriculture and Natural Resource Management through the Process Approach: Experience from UMADEP Project of Sokoine University of Agriculture, Tanzania

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Abstract

The importance of the Uluguru Mountains in Morogoro Region depends on two aspects: first, productivity of the available non-restricted natural resources, and the ecological balance of the mountains in the restricted areas. Unfortunately, the increasing population pressure, continual indiscriminative slash and burn practices, intensive use of chemical fertilizers and conventional research approaches in the mountains threaten these two aspects in the complexity of the natural resource management. In order to redress the situation, the Uluguru Mountains Agricultural Development Project (UMADEP) has been using the process approach to sustainable agriculture and natural resource management (NRM) in Mgeta and Mkuyuni Divisions since 1993. Studies conducted in the Uluguru Mountains, have assessed the effectiveness of soil and water conservation (SWC) measures in soil erosion control and established reasons for adoption or non-adoption of SWC measures. The role of the process approach in promoting sustainable agriculture and NRM has not been studied. Using qualitative content analysis, this study attempted to highlight the outcome of the process approach in planning, implementation, monitoring and evaluation of NRM activities. A series of activities have been implemented with the participation of rural communities, such as: Stakeholders' engagement and networking, conservation of the environment and natural resources, rural micro-financing, business appraisal and marketing. These activities have been implemented through four iterative and continuous steps: Situational analysis (observation), collaborative planning (communication), action and critical reflection (social learning and negotiation). The lessons from this process indicate that: (i) community members should be actively involved in prioritizing issues and in developing the activity plans and working according to commonly agreed activity plans from the beginning of the project; (ii) sharing of experiences among farmers and between professionals through a process of regular farmers' groups and local networks forums ensures sustainability of project interventions; (iii) the simpler the soil and water conservation and management technological interventions coupled with immediate economic returns (including availability of market) and loans, the faster the farmers can adopt the technologies; (iv) the process approach enables negotiation and social learning among programme actors. Finally, the experience points to the need for continuous re-building of livelihood security and social capital of the farming communities to achieve greater understanding of the importance of maintaining the environment in the long-term.

Keywords: process approach, sustainable agriculture, natural resource management, negotiation, social learning, UMADEP

Introduction

The Uluguru Mountains are part of the Eastern Arc Mountains which are designated as one of the 20 "Global Biodiversity Hotspots"

areas (URT, 1994). The Mountain range covers an area of about 40 km long and 15 km wide, and is covered by the Uluguru Forest Reserve. It is extremely important for the livelihood of

many people in the mountains as well as urban centers particularly the population living in Morogoro, Dodoma, Coast and Dar es Salaam Regions. The Mountains supply substantial quantities of vegetables, fruit, banana and spices to those regions. They also serve as an important catchment area for many rivers and streams supplying water for household use, agriculture and industries.

The importance of the Uluguru Mountains depends on two aspects: first, productivity of the available non-restricted natural resources, and the ecological balance of the mountains in the restricted areas (UMADEP, 2001). Unfortunately, the increasing population pressure, continual indiscriminate slash and burn practices, intensive use of chemical fertilizers and conventional research approaches in the mountains threaten these two aspects in the complexity of the natural resource management (Mattee and Lassalle, 1999). For example, production practices, such as fallowing, traditionally used to regenerate the quality of the natural resources in the non-restricted areas are no longer effective or applied.

One of the solutions to redress this weakness was to devise an integrated strategy that enables various stakeholders to develop a mechanism for sustainable agriculture in the Uluguru Mountains. This strategy puts into consideration the development goals, which are: community empowerment, improving community welfare, tapping the potential of indigenous knowledge, reducing vulnerability and targeting the poor. An integrated strategy is an effective way in natural resources management and environmental conservation (Leeuwis, 2004; Van den Ban, 2005; Swanson, 2006). Using the process approach as a means to achieve meaningful developmental integration and community participation for sustainable agriculture, UMADEP, an integrated and multidisciplinary project under the Department of Agricultural Extension and Community Development of Sokoine University of Agriculture has been operating in Mgeta and Mkuyuni Divisions since 1993.

In the context of this study, sustainable agriculture is an agricultural system which involves production practices that are

socially, economically and environmentally acceptable in the sense that they rely on the natural resources to meet the needs of the current generation without compromising the possibility of the future generation to meet their needs. Given the steep terrain of the Uluguru Mountains, crop production efforts ought to go hand in hand with deliberate efforts to manage natural resources if we are to attain sustainable agriculture. Therefore, the natural resource management practices, which in this context are the sustainable agriculture practices, promoted in the area include soil and water conservation measures coupled with production of high value crops, agro-forestry and tree planting. Cross cutting activities implemented include rural micro-financing and formation of farmer organizations.

The process approach is based on “endogenous” process of development as described by Ki-Zerbo (1992) cited by Lassalle and Mattee (1995), that development starts from recognizing the local capacities of the people. Farmers’ participation in local development must be seen and analyzed from various angles to support overall development process, very much like the various branches of an umbrella are able to support it. Thus participatory development involves various activities that have to be carried out in concert to support and complement each other. However, the various activities have to enhance the following five processes that are necessary in an endogenous development:

- (i) Observation: The basis of local development is its environment-physical, social and economical aspects. Observation of that environment is the first activity whereby farmers and professionals interact.
- (ii) Organization: The development process is also a motion that needs actors. The farmers are the main actors but they have to organize themselves so that they can negotiate as equal partners with professionals, policy-makers and service providers.
- (iii) Innovation: Rural societies are constantly being challenged with new problems and constraints that innovations can solve. Innovations may be technical or social. They constitute an area where farmers

- and professionals play different but complementary roles.
- (iv) Collaboration: For the success of any innovation, professionals from different groups must define common objectives and have a clear understanding of their individual roles as being complementary to the development process.
- (v) Communication: In order to collaborate, an exchange of ideas and experiences is necessary amongst a particular group, or between one group and another.

Thus, only when they all function well - observation to take into account space and time, organization to take into account the actors, innovation to take into account the changes, collaboration to take into account the existing potentialities and communication to take into account the rest of the world - will truly endogenous development take place.

The approach aims to increase the role of the rural society, such as small scale farming communities in the Uluguru Mountains and adjacent lowlands, in their own development and advancement within the context of changing socio-economic environment with the major focus in improving both productivity and natural resource management. In the Uluguru Mountains, the approach has been following four iterative and continuous steps: Situational analysis (observation), collaborative planning (collaboration and communication), action and critical reflection (social learning and negotiation). The steps resemble the learning cycle model as suggested by Hiyama and Keen (2004) and Kolb (1984 cited by Leeuwis, 2004), which depicts learning in development projects as a continuous process of situational analysis, collaborative planning, action and critical reflection. Studies conducted in the Uluguru Mountains, for example Lulandala *et al.* (1995), Mkoba (2001) and de Leeuw (2009) focused on effectiveness of soil and water conservation technologies in soil erosion control. Others, for example Magayane (1995), Carswell (2005) and Malisa *et al.* (2016) endeavoured to establish reasons for adoption or non-adoption of soil and water conservation measures. It is clear from these studies that the approach adopted

matters. However, none of the studies provide an account of the role of the process approach in promoting sustainable agriculture and natural resource management.

As part of the approach the following activities have been implemented in the Uluguru Mountains: stakeholders' engagement and networking, conservation of the environment and natural resources, rural micro-financing, business appraisal and marketing. This paper attempts to highlight the outcome of the process approach, lessons learnt, practical implications of the findings and conclusions based on the experiences of the Uluguru Mountains Agricultural Development Project (UMADEP).

Methodology

The study used qualitative research approach, specifically qualitative content analysis involving analysis of various documents to examine the implementation of sustainable agriculture activities in the Uluguru Mountains along with the application of the process approach. Documents analyzed include published articles, books and reports obtained from the internet, Sokoine National Agricultural Library and UMADEP office. Key words used in information searching include sustainable agriculture, process approach, natural resource management, Uluguru Mountains and UMADEP. Information from the literature were interpreted and discussed in line with the main subject of the research.

Application of the process approach

Implementation of UMADEP activities followed a series of steps which evolved with time depending on the outcomes that were being registered at each step. The following constitutes the major steps that defined the process of project implementation.

Situational analysis as an entry point to the community

Observation was facilitated through a process of Participatory Rural Appraisal (PRA) which also served as an entry point to the community. In Mkuyuni Division, the first PRA exercise was conducted in 1994. The first step was to inform the community, including

the Chief Kingalu as the traditional leader, on the goal of UMADEP and the objectives of the PRA exercise. The process of selecting key informants through the village assembly took place in January, 1994 where about 150 villagers attended the meeting including Chief Kingalu. The meeting appointed 7 villagers, one from each hamlet in Tandai village to join in a PRA team which also included four project staff.

From February to May, 1994 the team conducted transect walks. The team recorded the history, farming systems, natural resources, weather, traditions and customs, opportunities and problems existing in the area as they went along the route. In September 1994 the PRA team presented its findings in a village meeting where Chief Kingalu was also present. The team performed a role-play to demonstrate important historical events in the area. Other results presented were on village resource maps, land use and diagrammatic representation of opportunities and problems in the area.

Farmers' action groups and local networks for collaborative planning and as a tool for fostering networking and sustainability of activities

Based on the results of the PRA exercise, UMADEP encouraged farmers to form action groups with the following objectives:

- (i) To enhance farmers' participation in planning, implementation and monitoring of development activities
- (ii) To establish sustainable information exchange organs for communication among farmers and between farmers and experts or change agents
- (iii) To empower farmers to institutionalize development activities and to foster sustainability of project interventions.

Farmer groups working with UMADEP formed local information networks. Networking at local level allows synergy between the activities of different actors. The networks provide avenues for exchange of information and experience among farmers and between farmers and change agents (Mattee and Lassalle, 1996). The network members organise monthly forums to discuss issues related to environmental and

natural resources management, including issues such as sensitizing on the use of energy saving stoves to reduce firewood consumption, planting of tree species that provide environmental services (water discharge, soil stabilization and water conservation) along water sources, boundaries and terraces, and advising farmers not to cultivate near water sources, planting of multipurpose plants such as sesbania (*Sesbania sesban*) and grevillea (*Grevillea robusta*) for terrace stabilization and water loving trees like khaya (*Khaya nyassica*) and fig trees (*Ficus* sp.) along the river banks as a way of controlling river erosion and maintaining water levels.

More than 900 copies of UMADEP publications (booklets, brochures and leaflets) on environmental conservation and management were distributed to the villagers through those local groups and networks. Other issues of interest to farmers are usually discussed during the farmer groups and local networks meetings.

Actual implementation of sustainable agriculture and natural resource management activities

UMADEP used the process approach in the Uluguru Mountains to promote sustainable agriculture through a number of technical innovations. One such innovation was the use of pineapple contour strip-cropping as soil and water conservation measure in Mkuyuni Division. Pineapple plants in a traditional field were scattered at a spacing of about 1m between plants. Experience shows that after three or four seasons, pineapple yields drop drastically from about 3 kg per fruit to about 0.5 kg. Assessment of that practice indicated that the yield drop was due to the decline in soil fertility that resulted from severe soil erosion. In 1994 UMADEP established trials at different sites in the area to develop improved practices for pineapple production in Mkuyuni. The pineapple suckers were planted in double rows along the pre-determined contour lines at spacing of (20 cm x 30 cm) x 3 m to demonstrate such advantages as prevention of soil erosion, moisture conservation and easiness to carry out farm operations and intercropping while also increasing yields. During the second season of trials in 1995, UMADEP started to demonstrate the innovation

to farmers. Farmers were involved at each stage of the trials through practical training. Other farmers replicated the trials in their own fields. During a period of six years (1995 to 2000) UMADEP trained about 332 farmers through practical sessions on the project's demonstration plots, on farmers' fields and through farmer to farmer exchange visits in which farmers shared experiences on improved pineapple production practices. Based on the experience gained, UMADEP prepared a recommendation package on improved pineapple production practices in the form of a booklet and a poster as training materials. This booklet was distributed to farmers and copies of posters displayed at various places in the project area.

Farmers who have adopted this technology reported more income from sales of pineapple (Tshs1.5 million per acre) than what they used to earn before (Tshs 150, 000 per acre). Also many fields that were previously abandoned or left fallow in the area are now planted with pineapples. In addition, the practice of contour strip planting has resulted into progressive leveling forming bench terraces between the contour strips. This indicates that the soil, which is eroded from the lower side of upper contour strips, is held at the upper side of the lower contour strips.

As a result of the clear environmental and financial benefits of the technology, many farmers have adopted it. It is estimated that more than 4,000 farmers are currently using pineapple contour strip planting in their fields. However, while the improved practices have significantly increased production of pineapples in the area, it has raised farmers' concern about marketing of the increased output.

The adoption of pineapple contour strip cropping was due to the fact that it is appropriate for the area and requires low investment capital with immediate economic returns. Furthermore, the use of demonstration plots and farmer managed plots to test new ideas where many farmers could directly participate and gain confidence to become their own "experts" who facilitated and assisted in mobilizing and motivating others to adopt the practice was another factor. This process took close to ten years from the introduction of the idea to the

point where widespread adoption of the practice is now spontaneous and sustainable. Another technical practice that was tried in the project area is agro-forestry in in Mgeta Division, where land is literally bare with some areas planted with exotic tree species creating patches of woodlots. These patches cover hardly 10% of the land in Mgeta. Individuals, religious institutions and schools own woodlots. The woodlots provide about 30% of wood and timber requirement in the area. Majority (about 60%) of households buys firewood from woodlot owners or walk over 5 km to the forest or woodland areas in search of firewood or timber. Time spent for that activity is estimated to be 25% of the available working time of household members (UMADEP, 2001).

In 1999 UMADEP started to promote tree planting in Mgeta Division. Seven farmer groups with a total of 46 members were engaged in tree nurseries and tree planting activities promoted by UMADEP. Six schools and five religious institutions were also involved in the activities. Tree species promoted by UMADEP were cypress (*Cupressus* spp.), grevillea (*Grevillea robusta*) and acacia (*Acacia* spp). Tree planting requires capital and the benefits from trees are realized after several years. UMADEP facilitated availability of a credit facility to farmers engaged in tree planting. A revolving fund amounting to TZs 1,000,000 was deposited into Savings and Credit Cooperative Societies (SACCOS) operating in the area. The members could borrow and repay 70% of the loan, while 30% was taken as subsidy to the beneficiaries. In a period of two years, the utilization of revolving fund resulted in a total of 30 nurseries that raised a total of 117,000 tree seedlings. Trees planted in the field in the first two years (1999-2000) were 67,000, involving primary schools (17%), religious institutions (13%), secondary schools (10%) and individuals (60%), while about 5,000 cypress trees were estimated to have been sold during Christmas time in the year 2000 to customers in Morogoro and Dar es Salaam regions. Farmers' accessibility to loans provided by the local SACCOS through the environmental revolving fund established by the project has influenced the adoption of tree planting in Mgeta Division.

According to a study conducted by Omorogbee and Onemolease (2007) in Edo State in Nigeria, access to financial capital motivates farmers to adopt recommended innovations and practices. Likewise, economic benefits from tree planting gained by farmers who planted tree in past years motivated other farmers to engage in the activity. In addition, tree species that were suggested by the project were considered appropriate to the area by the community members.

UMADEP developed and promoted the use of Participatory Action Research (PAR) as a key methodology for achieving change, improvement, gaining understanding and knowledge for managing interlinked socio-economic and technical dimensions of integrated natural resource management. Through PAR, reflections and feedback process, the results or lessons learnt were presented back to and feedback collected from beneficiaries. According to German *et al.* (2006), Leeuwis (2004), and Rutachokozibwa (1995), action research includes an iterative series of steps aimed to enable change, including participatory problem identification, planning, implementation, monitoring, evaluation and re-planning. The programme established two plots for trials and demonstration, one in Nyandira village in Mgeta Division and another at Tandai village in Mkuyuni Division. Trials and demonstrations are also conducted in fields of participating farmers. Farmers are involved in all stages of the trials and demonstrations of innovations as co-researchers to project staff. Farmers' field days on the plots are organized to give farmers opportunity to evaluate the results from trials or demonstrations. The research results form the basis for training on the recommended package.

Business development

Following marketing challenges as a result of increased productivity and production of both cash crops and improved chickens, UMADEP came up with an intervention to promote rural socially and environmentally responsive business through market search and business appraisal. To start with, territory diagnosis and market opportunity analysis was done to gather social, cultural, political, environmental and economic related information in the areas.

Meetings were held at village and hamlet levels to share the results and were used as the forums to select committed entrepreneurs who formed Local Interest Groups (LIGs).

The project staff participated in study visits and training on market and value chain development, market linkages and entrepreneurship after which they used the learnt skills in building the capacity of LIGs. Feasible sub-sectors were identified through participatory methods such as Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis, Return on Investment (ROI) and Gross Margin Analysis (GMA) on the basis of which LIG members undertook a participatory market survey to identify potential markets.

Through this process, viable sub-sectors were identified and each of the LIG members chose a sub-sector of interest from the available options. Individuals in a particular sub-sector were facilitated to form Small-Scale Producers Groups (SSPGs) comprising of men, women and youth to ensure reliable supply of adequate quantity and quality of produce to potential markets and to increase their bargaining power. Each SSPG formed a number of committees responsible for ensuring quality, for ensuring adequate quantity and for marketing and they worked according to developed business plans. At the same time, the loan committee members of the local SACCOS were trained and were responsible for appraising the business plans for the purpose of securing loans from SACCOS for production and marketing. This strategy has proved to be useful for successful market linkage and marketing.

Critical Reflection: Basis for Social Learning and Negotiation

Day to day management of UMADEP was the responsibility of the team led by the project coordinator. The team meets once a month whereby all activities are planned discussed and reviewed by the team. During the monthly meetings, each member presented a brief report on the activities conducted and plan of actions for the coming month. The member also highlights major successes, challenges and lessons learnt in the course of implementing activities. This creates an opportunity to closely monitor the

implementation and attainment of programme objectives, and to make any adjustments which may be necessary.

In the effort to forge strong linkages between project staff and target farmers and to promote communication among farmers as well as to encourage collective decisions and action (Mattee and Lassalle, 1996), the project facilitated the emergence of farmers' groups and networks around common issues, interests and activities. The farmers' groups and networks provide opportunities to UMADEP to get feedback from farmers and to evaluate the activities carried by the programme in the area. Some project activities such as seminars, exchange visits and new innovations are initiated from farmers' networks. The local networks also provide important avenues for local stakeholders' negotiations. They give room for negotiations between smallholder farmers and external institutions. The networks through MVIWATA-Tanzania Network of Farmers' Groups also provide avenue for multi-stakeholders negotiations on various issues of interest to the community.

The lessons of experience in application of the process approach

Experience in the use of the process approaches to project planning, implementation, monitoring and evaluation offers a number of lessons that are noteworthy:

Situational analysis through participatory rural appraisal (PRA)

- Meaningful rapport needs to be established with the community before the introduction of the project on natural resource management. Conducting PRA is time intensive. In this case the PRA process took nine months including planning and execution. What does it mean as far as natural resource management is concerned? The process enables the community members to own the project initiatives and ensures their sustainability. According to Chambers (2005) and Lassalle and Mattee (1995), the PRA process helps in building partnership between the project and beneficiaries (farmers), hence professionals

need to spare enough time for the process.

- The PRA team must be comprised of multi-disciplinary team. In addition, gender categories of the community (women, men and youths) and traditional leaders must be involved in the process to ensure support. For example, the involvement of Chief Kingalu and other influential people played a big role for successful PRA process in Mkuyuni Division.

Collaborative planning and networking

- Sharing of experiences among farmers and between farmers and professionals through a process of regular farmers' groups and local networks forums and farmer to farmer exchange visits ensures sustainability of project interventions. These activities facilitate collective decision making and action, risk sharing and peer pressure towards sustained adoption.

Implementation of soil and water conservation technologies

- The simpler the soil and water conservation technological interventions coupled with immediate economic returns, the faster the farmers can adopt the technology.
- An early and close involvement of local government authorities ensures greater support in implementation of soil and water conservation practices. For example, activities are more successfully implemented when the village chairperson is directly involved in the implementation process by becoming a member of the group.
- Farmers' access to loans coupled with the immediate benefits (like marketability of their produce) influences the adoption of tree planting and other natural resource management practices in a particular area.

Process approach in facilitating social learning and negotiation

- Adoption of the process approach allows flexibility to accommodate challenges emerging in the project implementation process, monitoring and evaluation. The process allows negotiation and social

learning among programme actors which allows the implementation process to evolve in line with the experience gained.

Conclusion

Adoption of the process approach works on the basis that environmental management and rural development are two congruent processes both of which require constant checks for attainment of the objectives. In this respect rural development process is not a straight forward process. The process approach allows flexibility to accommodate challenges emerging in the planning and implementation processes, monitoring and evaluation. Basing on UMADEP experiences in the Uluguru Mountains, there is a need of continuous rebuilding of livelihood security and social capital of the farming communities to achieve a greater understanding of the importance of maintaining the environment in the long-term. Thus, it is important to strengthen the capacity of farming communities and support income generation activities in the Uluguru Mountains through sustainable agricultural and environmental management and conservation activities. This is because it enables farming communities to effectively manage their environment at the same time meeting their basic needs, in a way that maintains the health of the wider ecosystem.

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