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Making community based environmental impact assessment work: Case study of a dairy Goat and Root Crop Project in Tanzania

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Abstract

Community Based Environmental Assessment (CBEA) is an approach used to collate information in order to identify and analyze the environmental impacts of planned, on-going and completed community development activities. This study was conducted with four villages in the Kongwa and Mvomero Districts of Tanzania where dairy goats and root crops were introduced as project interventions. The study addressed three key research questions. (1) What are key environmental challenges in the project villages? (2) What are the likely environmental impacts from this project? (3) What could be the community-perceived mitigation and enhancement measures for such impacts? Participatory appraisal methods including focus group discussions, participatory village resource mapping, transect walks and pair wise ranking were used in the field research. Research revealed several environmental challenges and depicted a number of environmental impacts (both negative and positive) including shortage of pasture, deforestation, conflicts between farmers and pastoralists and loss of biodiversity. In contrast to conventional regulatory environmental assessments that are required for larger-scale industrial projects in many countries, this study offers experiences from a small-scale development project where environmental impacts are assessed. Such methods could be applied to other small-scale development initiatives where positive or negative environmental impacts can be enhanced or ameliorated.

Keywords: Community Based Environmental Assessment; Environmental Impact Assessment; Participatory Rural Appraisal

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1. Introduction

Environmental assessment (EA) is an internationally recognized approach for comprehensive assessment of project impacts, policy changes or broader strategic initiatives. Within Tanzania, EA is regulated through the National Environment Management Council (NEMC) and assessments are normally triggered with larger-scale development projects such as hydro-electric dams, pipelines, mines or roads that are likely to have significant impacts on environmental resources.

In this study, a small-scale development project is the focus of the environmental assessment, where dairy goats and root crops are introduced to approximately 120 farmers in the Kongwa and Mvomero Districts of Tanzania. Given the small scale of this project and anticipated environmental impacts, this study was not intended to meet the regulatory requirements for environmental assessment as outlined by NEMC, as goat houses and crop-related project interventions were not deemed to trigger an environmental assessment under Tanzanian law. Therefore, the work described in this paper was conducted to meet the commitments of the project in our efforts to understand more fully the intended and unintended environmental consequences of these farming interventions, and to implement project enhancements or correctives in order to maximize environmental benefits.

EA is typically a forward looking exercise, with a focus on the impacts that are anticipated as a result of certain actions. EA is also considered to be comprehensive as it extends to issues beyond the immediate physical environment (such as land and water) to socio-economic issues, human health, and participatory decision making. Discussions about CBEA have been a component of the development literature for several decades (Pallen 1996; Neefje 2001; Spaling *et al*. 2011). This approach to environmental assessment is also formalized in several handbooks for community practices, including a publication by the Canadian International Development Agency (CIDA 2005). According to Spaling (2003) there are a number of reasons for the ongoing focus on CBEA as a component of project activity. First, within donor countries, there is greater attention to environmental assessment as a regulatory requirement at the outset of a project. Therefore, laws in donor countries have precipitated more attention to issues of the environment in recipient countries. Second, development organizations are gaining a stronger understanding of the inter-relationships between sustainable local resource use and sustainable project interventions, particularly in stressed environments. Third, because of the link to sustainable outcomes, like gender, environmental sustainability has become a core value in many development agencies and projects. Fourth, CBEA is closely tied to other popular development concepts such as community-based wildlife conservation (Sinclair *et al*. 2011), resulting in greater overall attentions to methods and strategies for participatory development practices.

Within this list, this paper focuses on Spaling's (2003) second point regarding the inter-relationship between sustainable local resource use and sustainable project interventions. Given the close connection in this project between interventions such as dairy goats and root crops and the local environment in terms of soil, water and local natural resources to feed goats, the paper is particularly interested in understanding environmental impacts as they emerge, bringing environmental challenges and opportunities more explicitly into community-based interventions and enhancing the long-term viability of local livelihood strategies.

To identify and understand likely environmental impacts, this project developed a research component on environmental impacts at the village level. The approach to environmental assessment taken in this project is distinct from a more formal approach to large-scale EA that might be conducted under the national regulatory framework in Tanzania. In contrast, this approach is small-scale, at the community level, and is focused on participatory methods of environmental assessment to strengthen our understanding of local environmental impacts from the project. The approach is also intended to enhance our capacity to identify environmental challenges and deal with them within the scope of the project. The CBEA approach is therefore closely linked to methods such as Participatory Rural Appraisal which is characterized methods that seek "to make people and communities subjects and active participants rather than objects" (Roche 2000: 545). The paper also identified positive impacts from project interventions that could be promoted and enhanced.

In Tanzania, CBEA is a new approach to EA and there is inadequate experience to date in demonstrating its utility to assess environmental impacts from donor funded projects. Therefore, this paper provides an approach that can be taken up by other donor funded projects with a view to enhancing the environmental sustainability of development interventions. Furthermore, the paper offers an alternative to conventional EA research that often pays less attention to community based ways of knowing in favour of outsider and expert based knowledge systems. Toward this end, the paper offers a template for identifying:

- on-going environmental challenges at a village level,
- the potential environmental impacts from a donor-funded project described below and
- the potential mitigation measures for negative impacts and enhancement measures for positive impacts.

At the end of the paper, we reflect on the CBEA approach as a way to examine environmental issues in donor funded projects, with insights and recommendations on how to facilitate such work in other projects in the East African region.

2. The study area

Data for this study is based on research conducted in conjunction with a food security project funded by the International Development Research Centre, under the Canadian International Food Security Research Fund. Project partners include Sokoine University of Agriculture, University of Alberta, and the International Livestock Research Institute. Research activities took place from May to October 2012. The study is based in the Kongwa (Ihanda and Masinyeti villages) and Mvomero (Kunke and Wami-Luhindo villages) Districts of Tanzania where approximately 120 project farmers participated in the local food production initiative. This initiative involved the delivery of two dairy goats to project farmer and the construction of a goat house that was constructed and paid for by the project farmers. In addition to this confined dairy goat operation, project farmers also participated in planting sweet potatoes and cassava, with root crops intended to feed farmers and some parts of the plant intended to provide more nutritious packages of food to dairy goats. The project is known locally within the project villages as "CGP Tanzania" (Crop and Goat Project). Figure 1 is an example of a goat house from one of the project farmers and Figure 2 is a field of sweet potatoes intended for

production in conjunction with dairy goat production. Three of four villages contained a large number of agro-pastoralists who have a tradition of grazing animals rather than maintaining a confined feeding operation.

Figure 1. A goat house

Figure 2. A sweet potatoes field

3. Data collection and analysis

Data collection involved participatory rural appraisal (PRA) methods including focus group discussions, village resource mapping, transect walks and pair wise matrix ranking. Focus group discussions (FGDs) were conducted with members of Village Environmental Committees (6 females and 6 males in each village) project farmers and non-project farmers (6 female and 6 males per group per village). In all cases with very few exceptions, the number of female and male participants was equal. This method was designed with the following assumptions:

- The project farmers and non-project farmers have different perspectives on the environmental impacts of the project.
- Men and women in both project and non-project villages had different opinions on environmental resources, challenges and impacts.

With this understanding, the FGDs with project farmers and non-project farmers were scheduled separately. However, no separate FGDs were arranged for men and women. Instead, an attempt was made to observe gender differences within the FGDs. In events when only men or women gave responses, the facilitator prompted the other side to give their opinions which could either be an addition to what has been said or a confirmation of what the other side has commented.

Participatory village resource mapping was conducted with the aim of spatially displaying environmental resources found in a village. The resources include farm fields, water sources, grazing areas, forests and

bushes. The maps were drawn on the ground and later transferred onto papers by a group of members from the village environmental committee (Figures 3 and 4). The researchers facilitated the exercise but the mapping was done by the villagers themselves. The mapping activity was followed by transect walks which aided in confirming the resources displayed on the map. Both village resource mapping and transects walks served to confirm the environmental resources mentioned during FGDs. The transect walks were conducted to verify the resources shown on the maps. Moreover, during walking along transects researchers interviewed the participants on various issues relating to environmental resources, challenges and likely impacts from the project. Participatory pair wise ranking was used in ranking the environmental challenges and the identified impacts were carried out with the aim of capturing people's perceptions on the environmental challenges and project impacts. The matrices were drawn and the participants were led to compare pair-wise the environmental challenges or impacts, one after another resulting in the issue that out-weighed the other being chosen. At the end of the exercise, scores were compiled for each item. Then ranking was done based on the scores. Arrows were used to assign the weight across the matrix in which the horizontal arrows indicate that more weight was given to the corresponding issue/item on the first column of the matrix on the left, while the vertical arrows show that the item/issue on the topmost-first row of the matrix was given more weight than the other in the pair. In events where the two items in a pair had equal weight then two arrows stood together, one pointing horizontally and the other vertically. Scores were obtained by counting the number of arrows pointing to a particular issue/item in the matrix. The more the arrows, the stronger was the weight accorded by the community members. The total number of arrows for each issue was regarded as its total score in the matrix. Then ranking was done based on the scores with the highly scored issue/item taking the first position and serving as the first priority of the community followed by others. Data from the method are represented in the tables presented in the following sections of this paper.

Figure 3. Village resource map drawn on the ground

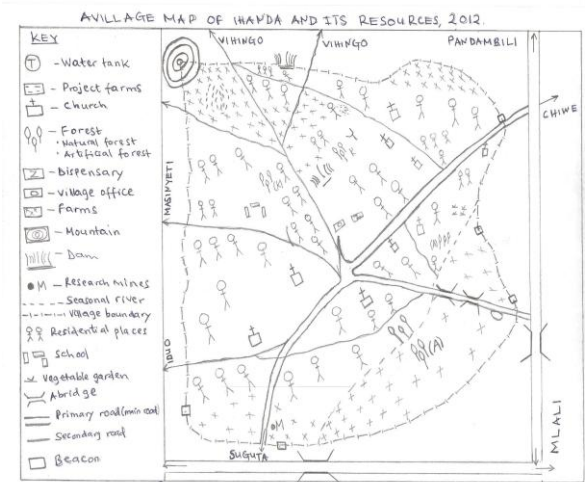

Figure 4. Village resource map transferred on paper

4. Results

4.1. Environmental challenges

The dairy goat and root crops project was introduced in the four villages facing several environmental constraints. These include water shortage, inadequate pastures, unreliable climate, shortage of firewood, deforestation and conflicts between farmers and pastoralists (Table 1-3). Such constraints were more likely to exacerbate the negative impacts from the project and hamper the realization of the positive impacts. Water shortage ranked highly in Ihanda and Masinyeti villages, while in Kunke and Wami-Luhindo villages, conflicts between farmers and pastoralists was the highly ranked challenge. Such conflicts were aggravated by diverse factors including the migration behaviour of pastoralists who move their livestock herds through cultivated farm fields due to lack of stock routes, shortage of pastures and inadequate water availability during dry season forces pastoralists to target wetlands where they are fresh grasses and water for their livestock. At the same time farmers during the same period engage in irrigation farming in the wetlands. Such competing uses culminate into local conflicts between farmers.

Table 1. Environmental challenges in Ihanda and Masinyeti villages

	Shortage of water	Deforestation	Uncontrolled fires	Shortage of pasture	**Rank**
Shortage of water		←	←	←	**1**
Deforestation			←	←	**2**
Uncontrolled fires				↑	**4**
Shortage of pasture					**3**
Scores	**3**	**2**	**0**	**1**	

4.1.1. Water shortage

There was no reliable and adequate supply of water throughout the year in all villages. The problem gets severe during dry season when water supply is climatically reduced. This creates competition among various water uses. For example in Kunke village, brick making compete with other water uses thus increasing the scarcity. Moreover, pastoralists have to move with large herds of cattle to streams and rivers in search of

water. This leads to degradation of river banks, which was very evident in Wami Luhindo, Ihanda and Masinyeti villages.

Table 2. Environmental challenges in Kunke village

	Invasion of pastoralists	Bricks making	Deforestation	Uncontrolled fires	Agricultural activities in water sources	**Rank**
Invasion of pastoralists		←	←	←	←	**1**
Bricks making			←	←	←	**2**
Deforestation				←	←	**3**
Uncontrolled fires					←	**4**
Agricultural activities in water sources						**5**
Scores	**4**	**3**	**2**	**1**	**0**	

Table 3. Environmental challenges in Wami-Luhindo village

	Uncontrolled fire	Degradation of water sources	Conflicts between farmers and pastoralists	Deforestation	**Rank**
Uncontrolled fire		↑	↑	↑	**4**
Degradation of water sources			↑	↑	**3**
Conflicts between farmers and pastoralists				←	**1**
Deforestation					**2**
Scores	**0**	**1**	**3**	**2**	

4.1.2. Unreliable climate

Due to climate variations there was no reliable rainfall throughout the year in the project villages especially in Ihanda and Masinyeti villages which are located in semi-arid areas. This has led to prolonged dry periods which affect agricultural productivity. Despite the fact that the root crops provided by the project to farmers are drought resistant, the escalating dry periods could potentially affect the plant vigour and hence poor performance. Moreover, there was likelihood for water sources to dry up. These environmental issues have implication for a project such as CGP Tanzania where water for plants and animals is an important factor sustaining project interventions.

4.1.3. Disturbance of vegetation

Vegetation cover in most parts of the project villages was heavily disturbed leading to shortage of key ecosystem goods and services. There was shortage of forage especially during dry season for feeding livestock. In this period the land was mainly overgrazed when livestock farmers scramble for available grazing resources. It was noted that over-grazing has resulted in sheet erosion in Masinyeti village. Moreover, in Kunke village, there were very severe land use conflicts between farmers and pastoralists during times of pasture shortage where pastoralists allow their animals to graze on farm crops. There were at least 3 reported cases of this kind in Kunke village and presented a likely source of conflict in the CGP project when the same pastoralists release their animals to graze on cassava and sweet potato fields. However, farmers were found to be losers due to rumors of corruption by decision makers and litigators who were suspected of being bribed by pastoralists. This issue has devastated many farmers and seems to escalate poverty levels in the region. During the dry season there was also a pasture problem in Wami-Luhindo village whereby most of the pastoralists move their animals to Wami River to graze on the river banks inhabited by grasses. In Masinyeti village, the 170 acres reserved for grazing is threaten by overgrazing due to high influx of livestock from outside the village. Ihanda village has no grazing areas as much of the land was converted into farmlands. Hence pastoralists graze their animals in Masinyeti village.

While there was no significant firewood problem in Kunke and Wami-Luhindo villages; Masinyeti and Ihanda villages face a firewood shortage. Village members, especially women, spend up to 7 hours to collect firewood from places far away from the village. This time-intensive work has implications as women seem to have many responsibilities with the added burden of caring for dairy goats and root crops. Time spent to collect firewood may reduce the time needed to attend the dairy goats especially if the household has few members. In the native forests especially in Kunke village, fallen wood and standing live and dead trees provide habitat for many native plant and animal species. When people harvest firewood by cutting down trees or collecting woody debris, they directly and indirectly affect biodiversity. Firewood collectors may only collect fallen wood and must leave logs with hollows and logs growing moss and fungi. Over the long term, illegal removal of live and dead trees and the repeated legal removal of un-decayed fallen material means there will be no more old fallen logs. This has implication on ecosystem structure and function as there is a likelihood of interrupting the nutrient cycling, which is vital for the integrity of a forest ecosystem.

Wildfire was found to be another factor contributing to vegetation disturbance. Fire is an important source of energy for cooking in homes. Fire is also used for preparing agricultural plots and for prescribed burning, but fire destroys forests and kills living organisms. Moreover, uncontrolled fires were another long term challenge to the forests. The long dry seasons experienced over recent years in the country have caused the forests in the study areas to dry up and make them prone to bush fires. The menace is particularly intense during the period prior to cultivation, when fires are set to burn trash and clear agricultural fields. In Wami-Luhindo village, it was noted that natural forests are frequently affected by fire from the burning of adjacent farm fields. Similarly, Wambiki natural forest in Kunke village was also found threatened by frequent wild fires. However, if well handled, fire can be used as a management tool to produce forages during dry season. After the burn, grasses will sprout to produce young shoots which are very suitable fodder for animals including dairy goats.

4.1.4. Soil erosion

It was noted in Masinyeti village that soil erosion has led to siltation of the water reservoirs which have since dried up. The erosion occurs in hill slopes found to the other end of the village, whereby the vegetation has been severely degraded due to overgrazing. Moreover, the farmers use poor technological practices (such as flat cultivation) which cannot contain the soil erosion problem. During the rainy season, the running water from the hilly areas pass in the farm fields carrying a significant amount of silts which are eventually deposited in the water reservoirs. This may affect cassava crops which are normally planted without construction of contour strips (an aid to reduce water speed and soil erosion).

4.1.5. Absence of livestock grazing rules and regulations

In all villages there were no set regulations for animals grazing though pastoralists from outside the particular village were invariably not allowed. Nonetheless, village environmental committees were not operational to address issues related to environmental management. Most of the members did not know their responsibilities. The committees was organized primarily to meet political and administrative requirements of the village, but were not actively involved or addressing environmental issues at the village level. There was no pragmatic existence of the committees thus making it difficult to enact rules and regulations to address environmental challenges. For examples in Masinyeti village, 170 acres had been designated for communal grazing. Only village members are allowed to graze. But there was an influx of cattle from Ihanda village and other places to the area. Due to a lack of clear rules, the Masinyeti village failed to control the pastoralists from neighbouring villages. Moreover, even within the village there were no rules and regulations to ensure adherence to carrying capacity and stocking rates.

4.2. Impact identification and implications for the Crop and Goat Project

4.2.1. Negative impacts

From the focus group discussions the participants were of the opinion that dairy goat introduction may lead to shortage of forage for livestock especially during the dry season. Throughout this period dairy goat keepers are compelled to travel for about 5 hours to swampy areas to search for livestock forages. This leads to increased costs and workload at the household level.

> *"There is no pasture in dry season. We have to travel to nearby villages, Kwa-Dolia and Kisala to collect pastures. We spend 4-6 hours by bicycle to these villages where they are seasonal streams of water with fresh grasses*" (A male project farmer from Kunke village).

> "*I own both dairy cattle and dairy goat. When I had the dairy cattle only I used to pay the labourer Tanzania Shillings 20,000/month but now I pay Tanzania Shillings 50,000/month"*(A female project farmer from Kunke village).

The summary of impacts is presented in Table 4.

Table 4. Summary of negative environmental impacts

Project item	Short term Impacts (2-5 years)	Long term Impacts (5-10 years)
Dairy goats	1. Increased shortage of pasture and water resources in dry season 2. Increased household workload and costs	1. Severe pasture shortage throughout the year 2. Resource competition with other livestock 3. Depletion of wood resources due to goat milk processing
Goat houses	1. Mild loss of wood resources 2. Increased household costs for purchase of building poles and labour for house construction	1. Depletion of wood resources 2. Loss of wildlife habitats 3. Loss of biodiversity
Cassava	1. Potential for increased conflict with pastoralists	1. Depletion of wood resources 2. Loss of Wildlife habitats 3. Loss of biodiversity
Sweet potatoes	1. Potential for increased conflict with pastoralists	1.Depletion of wood resources 2. Loss of Wildlife habitats 3. Loss of biodiversity

4.2.2. Impact Analysis and ranking

The participants were facilitated to analyze the significance of identified impacts by themselves and were guided to rank the impacts using pair-wise ranking method. Moreover, the analysis looked at the likelihood of the impact occurrence looking at the activities involved in the project. Tables 5-6 summarize the results.

Table 5. Negative impacts pair-wise ranking matrix

	Shortage of pasture	Deforestation & loss of vegetation	Conflicts	Loss of Biodiversity	**Rank**
Shortage of pasture		←	↑ ←	←	1
Deforestation &loss of vegetation			↑ ←	←	2
Conflicts				←	1
Loss of Biodiversity					3
Scores	**3**	**2**	**3**	**0**	

Table 6. Impact Significance Analysis

Impact	**Impact Significance** *(High, Medium, Low)*	**Likelihood** *(Very likely, likely and unlikely)*
Shortage of pasture	High	Very likely
Deforestation & Loss of vegetation	High	Very likely
Conflicts between farmers and pastoralists	Medium	Likely
Loss of Biodiversity	Medium	Likely

4.3. Positive impacts

In all villages, the project was perceived to benefit resource poor farmers. The participants were of the opinion that the introduction of new varieties of root crops will increase their agricultural productivity and food security. Likewise, the introduction of dairy goats and root crops would create more opportunities for self-employment and income generating activities through selling dairy goat products and root crops (sweet potatoes and cassava).

4.4. Mitigation and enhancement measures

4.4.1. Impact mitigation

The introduction of CGP Tanzania is likely to have both positive and negative impacts on the environment and surrounding communities. The highly significant negative impacts can be successfully mitigated, by incorporating specific on-site mitigation measures. The following section highlights the most significant impacts and their mitigation measures. A summary of impacts and their respective mitigation measures is given in Table 7.

Table 7. Summary of impacts and their respective mitigation measures

Project Item	Impact	Mitigation measure
Dairy goats	Severe pasture shortage throughout the year	1. Limit number of dairy goats per household to a manageable size. 2. Planting of forage trees such as *Leaucena* and *Gralicidia* 3. Training of farmers on pasture conservation and preservation. This will enable farmers to preserve pasture for use during dry season. This needs training on Hay and Silage making. 4. Provide pasture establishment measures. This will involve training of farmers on pasture husbandry
	Resource competition with other livestock	1. Limit number of dairy goats per household to a manageable size 2. Encourage sale of excess dairy goats and assist farmers to access markets
	Depletion of wood resources due to goat milk processing(boiling)	1. Promote use of fuel efficient stoves 2. Promote the establishment of woodlots of multipurpose trees to ensure sustainable supply of fuel wood
Goat houses	Depletion of wood resources	1. Training of farmers on community based natural resource management with a emphasis on environmental sustainability 2. Promote the establishment of woodlots of multipurpose trees to ensure sustainable supply of building poles
	Loss of Wildlife habitats	1. Training of farmers on community based natural resource management with a emphasis on environmental sustainability
	Loss of biodiversity	1. Training of farmers on community based natural resource management with a emphasis on environmental sustainability and biodiversity conservation

5. Discussions

The paper demonstrates a CBEA approach to determining environmental impacts (positive and negative) in a small-scale donor funded project. Farmers (with facilitation of the research team) were able to identify possible impacts and discuss corresponding mitigation measures. In this section the results of this research are discussed, focusing on the three research questions mentioned in the introduction section. Moreover, as researchers we reflect on the application of the CBEA approach, revealing successes and challenges encountered in trying to make the approach operational.

5.1. What are on-going environmental challenges at a village level?

Participants identified a range of environmental challenges in their respective villages. One consistent issue that was identified by all focus group participants relates to a sustainable supply of fodder for dairy goats, particularly during the dry season. Water represents another significant natural resource constraint in several project villages. Limited access to land has implications for poorer (landless) farmers who may be unable to participate or benefit from project interventions due to a lack of capacity to grow cassava and sweet potato. From a planning perspective, this study identified a lack of long-term planning at the village level, and a lack of functioning within the village environment committees in particular. There were long-term planning issues in relation to pastoralists in particular.

Although conflicts with pastoralists and local politics are not commonly a part of environmental assessment and natural resource assessment more specifically, focus group participants consistently identified challenges in managing local resources such as cassava and sweet potato farms when pastoralists consistently utilize these plots to graze livestock. In this situation, where jurisdiction and regulation are at the heart of the matter, local technical solutions to resolving conflicts between farmers and pastoralists are not likely to be effective. Likewise, some authors have been critical of community-based indicators and community development protocols because of their lack of attention to the broader political context, and the conditions under when local empowerment occurs (Terry 2008). In this regard, in order to enhance the long-term viability of this project, it may be important to engage community and regional government structures in addressing the conflicts between pastoralists and project farmers, as it relates to goat and crop production at the village level.

5.2. What are the potential environmental impacts from the Crop and Goat Project?

Results indicate that with methods used in this study participants were able to identify and analyse the likely impacts of the dairy goat and root crops project. A large number of impacts were expected to emanate from the dairy goat component of the project; no distinctive environmental impact from root crops component (sweet potatoes and cassava) was envisaged by the participants. While shortage of pasture was the existing environmental challenge in the project villages, the introduction of dairy goats escalates the problem. The participants were of the opinion that the project is more likely to increase pasture shortage in future especially during drying reason. Moreover, with the likely increase of confined dairy goat in the project

villages, it is likely that the damage to wood resources due to goat house construction will increase. Therefore, the increased pressure on these resources could result in their depletion, if they are not managed properly. Moreover, use of fuel wood as a main source of energy will, over the long term, severely degrade the wood vegetation. Degradation is likely to increase especially when there will be an increase in goat milk production which will require the use of wood energy to process the milk. It was further noted that livestock keepers do cut foliage from trees as animal fodder. Both activities can be a significant source of localized deforestation. In addition, increased goat production on rangelands is likely to negatively impact fauna and flora especially through increased competition for vegetation and water resources. In all villages, water resources were often limited. Without strict control, increased number of goats can contribute to depletion and pollution of these resources.

5.3. What are the potential mitigation measures for negative impacts and enhancement measures for positive impacts?

In mitigating loss of vegetation and deforestation that could be caused by the dairy goat component, the participants suggested that people should avoid unnecessary cutting of trees, clearing of land and excavations of large areas. Another proposed measure is to avoid keeping large numbers of animals, particularly in semi-arid regions. Livestock keepers should limit their livestock number to not exceed more than 10 dairy goats. This will reduce competition of forage among farmers and between farmers and pastoralists. To reduce or compensate loss of vegetation due to goat house construction, farmers should be enabled to establish woodlots of multipurpose trees which can be used for forage, building poles and other uses. Toward this end, the dairy goats can be fed on many types of fodder including Napier grass, pasture grasses, sweet potato vines and household vegetable waste. Some respondents indicated that special fodder such as Leucaena and Moringa are fed to the goats. However, farmers don't have enough knowledge on how to establish these fodder systems and have no access to seeds.

> *"Pasture establishment will help to reduce pasture shortage problem. But we need some training on how to do it"* (Project farmer from Wami-Luhindo village).

In this context, famers should be encouraged to establish pastures on their individual farmlands. Communal pasture establishment could be attempted at a later stage.

> *"More emphasis should be put to individual grazing lands. Farmers should be educated on pasture management and establish their own pastures on private lands"* (Richard Lembua, a non-project farmer from Masinyeti village).

Another concern was that, knowledge on how to conserve forage including silage and hay making was highly needed. This would be one of the solutions to mitigate forage shortage and reduce conflicts among farmers.

It is important to note that a number of mitigation measures suggested by the participants required financial support such as training in forage conservation, multipurpose tree planting and establishment of pasture farms. While the proposed mitigation measures were very pertinent and relevant, the project was unable to support some of them because during its inception and formulation such costs were not conceptualized and hence not included in the overall budget for the project. This shortcoming is a common problem in donor funded where mitigation of unforeseen environmental impacts is not adequately assessed in advance or during the outset of a new initiative.

5.4. Did the CBEA approach work?

The application of PRA methods was pivotal in the success of this study. Focus group discussions played an important role in gathering information. To make this effective we ensured that we got the right people, people who were willing to spend their time discussing with the research team. We limited the number of participants to 12 (6 men and 6 women) to have a manageable and interactive discussion. However, our challenges included delays by village leaders in sending invitation notifications to the participants thus causing some of them to miss the discussion. We also had challenges managing the dominance of few individuals in responding to questions. For example we could ask a question to women but a man responded on their behalf. In such a situation we had to be very diplomatic and strategic ensuring that we requested the man to give a chance for the women to speak. The fact that we did not have separate FGDs for men and women helped us to learn more about the dynamics of group discussions and indicated that both women and men can work together within a single group discussion. This approach requires a trained facilitator, however, who is sensitive to gender dynamics in the discussion.

Participatory village resource mapping was also an effective strategy for data collection. The interactive exercise allowed participants to discuss and correct each other during the construction of the map. Participants were very knowledgeable about village boundaries and some could accurately provide the locations of various resources found in the village. In all villages both men and women participated in the drawing of maps. It was interesting to see that the villages liked the maps and retained copies because they didn't have village maps which were as good as the ones developed for this study.

Transect walks were very useful as a way to confirm and consolidate learning that took place during the mapping exercise. We asked the village leaders to select the transect routes which could enable us to see most of the village resources. However, the exercise was challenging due to the fact that some of the resources were quite far from the village centre -- 2km from the village office. The village leaders and participants were not willing to walk 4km return, thus we ended up viewing fewer village resources than was initially envisioned.

Pair wise matrix ranking helped in understanding local perspectives on environmental challenges and likely impacts envisaged from the project. The challenge in this method was how to decide which issue should be chosen in favour of the other within a matrix pair. For example in comparing two environmental impacts namely, shortage of pasture vs. conflicts between farmers and pastoralists it was not easy to reach a compromise as there was a long discussion coupled with differing opinions. The matter was even more

challenging when women had different opinions from men. This necessitated a voting procedure within the FGDs where the issue with more votes was chosen by putting an arrow in the matrix table, pointing in its direction. Overall, this collection of participatory methods offered a way to consolidate information that was gathered within a single study and a way to reconfirm with participants the environmental challenges and benefits that are likely to ensue from this donor funded project.

6. Conclusion

This paper describes a community based approaches to undertaking environmental impacts within small-scale development projects. The involvement of local people in the assessment allows for emphasis on local and contextual knowledge in identifying and analyzing environmental impacts. This approach is complementary to conventional environmental assessments that involve outsider and expert based systems of data collection. Community members identified the impacts, analyzed them and suggested various mitigation measures. However, some challenges were experienced which helped to better understand the communities. The lessons learned from this study provide some insights into future studies of this nature particularly in donor funded projects.

7. Recommendations

Two key messages from this study include the need to integrate environmental assessment in project planning and implementation of donor funded community development projects and the application of CBEA approach for the same. The inclusion of environmental assessment and monitoring in the project design and budgeting will ensure sustainable output of the development interventions in question. A good understanding of PRA methods is deemed necessary for successful undertaking of CBEA. Although this study used groups of participants comprising of both men and women, we recommend that future studies should set up separate groups (i.e. women alone and men alone, to enhance the gender based perspectives on environmental impacts). This is because in FGDs it is sometimes difficult to capture concerns of women when they are mixed with men. Moreover, the challenges we faced in pair-wise matrix ranking exercise suggest that women should have their own pair wise ranking group separate from men.

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