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The Contribution of Collaborative Forest Restoration and Management to Food Security in Mt. Elgon, Uganda

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Abstract

Mt. Elgon (4,321 m a. S. L.) is an important trans-boundary forest ecosystem that strides the Kenya – Uganda border. The ecosystem is a water catchment area that supports vast agricultural activities of over two million people and serves Lakes Kyoga, Turkana, Victoria and the Nile. In recent decades, the ecosystem has experienced unprecedented human induced degradation in form of deforestation, human settlements, encroachment and poor land use practices. As a way to address these challenges, management negotiated a collaborative forest restoration program with local governments. Memorandums of understanding were signed between management and local communities, allowing them to plant and tend tree seedlings as they practiced crop husbandry. Uganda Wildlife Authority and National Forestry Authority supplied tree seedlings and provided technical support. Assessment of the collaborative program was carried out to establish the contribution of the protected area to the livelihoods and food security of neighbouring communities. Household survey was carried out and participatory rural appraisal tools used to collect data. The findings indicated that collaborative forest restoration contributed to the uplifting of local people's livelihoods, household income and food security. Food worth US \$ 9,848,000 was sold.

Keywords: Bio-sphere reserve, collaborative forest restoration, food security, livelihoods. taungya farming system

Introduction, scope and main objectives

The destruction of current Mt. Elgon National Park (MENP) intensified considerably in 1970s and 80s as a result of political instability and loss of rule law, especially during President Idi Amin military regime. The degradation of the forest ecosystem was also exacerbated by unsustainable human activities, over exploitation of resources, poverty, and corruption (ITTO, 2002). By the end of 2008 the forest had virtually lost much of its structure, productivity and biodiversity (Lamb and Gilmour, 2003).

Subsequently, a collaborative forest restoration (CFR) was initiated in 2009 to accelerate its recovery. The implementation of the scheme was based on the principle of community participation, taungya farming system (TFS) and guided by the vegetation maps. The objectives of the program were to restore the integrity of the ecosystem and improve people's livelihoods by through enhancing household income and food security. This was crucial because the forest is rich in biodiversity. It hosts over 400 species of plants, 300 bird species and a number of wild animals including the African elephant (*Loxodonta Africana Africana*). In recognition of the role of the forest as a water tower and anchor of people's livelihoods, the government gazetted it a national park in 1993 and designated a Biosphere Reserve by UNESCO in 2005.

To avert the dire consequences of degradation as a result of TFS, Uganda Wildlife Authority negotiated and signed a memorandum of understanding (MOU) with Bududa District that allowed

neighbouring communities to actively contribute to the recovery of the forest. The negotiation process was based on the principal of rural people cooperation (Sayer et al. 2004), economic and environmental benefits of TFS (Toni, 2000; Ehiagbonare, 2008; Kalu et al. 2011; Pinto and Florentino, 2014) and the need to improve food security (Bahigwa, 1999; Sewanyana and Kasirye, 2010; Katerere and Smith, 2013; FAO, 2014). The tree species planted include: *Albizia coriaria*, *Bredelia macranthus*, *Croton macrostachyus*, *Khaya anthotheca*, *Olea welwichii*, *Podocarpus gracilior*, *Prunus African*, and *Spathodea campanulata*.

The degraded area was first mapped and zoned into three areas; the core zone (2,400 ha) that had a structured forest and only needed restriction of human activities to fully recover, passive regeneration zone (894ha) with significant forest patches (Lamb and Gilmour, 2013) and TFS zone (767 ha) where farmers were allowed to plant indigenous tree seedlings and seasonal crops for a period of five years. The TFS zone was further subdivided into blocks of about 30 ha and handed over to CFR Steering Committees for allocation to individual farmers. Thereafter, the beneficiaries were provided with tree seedlings and technical guidance.

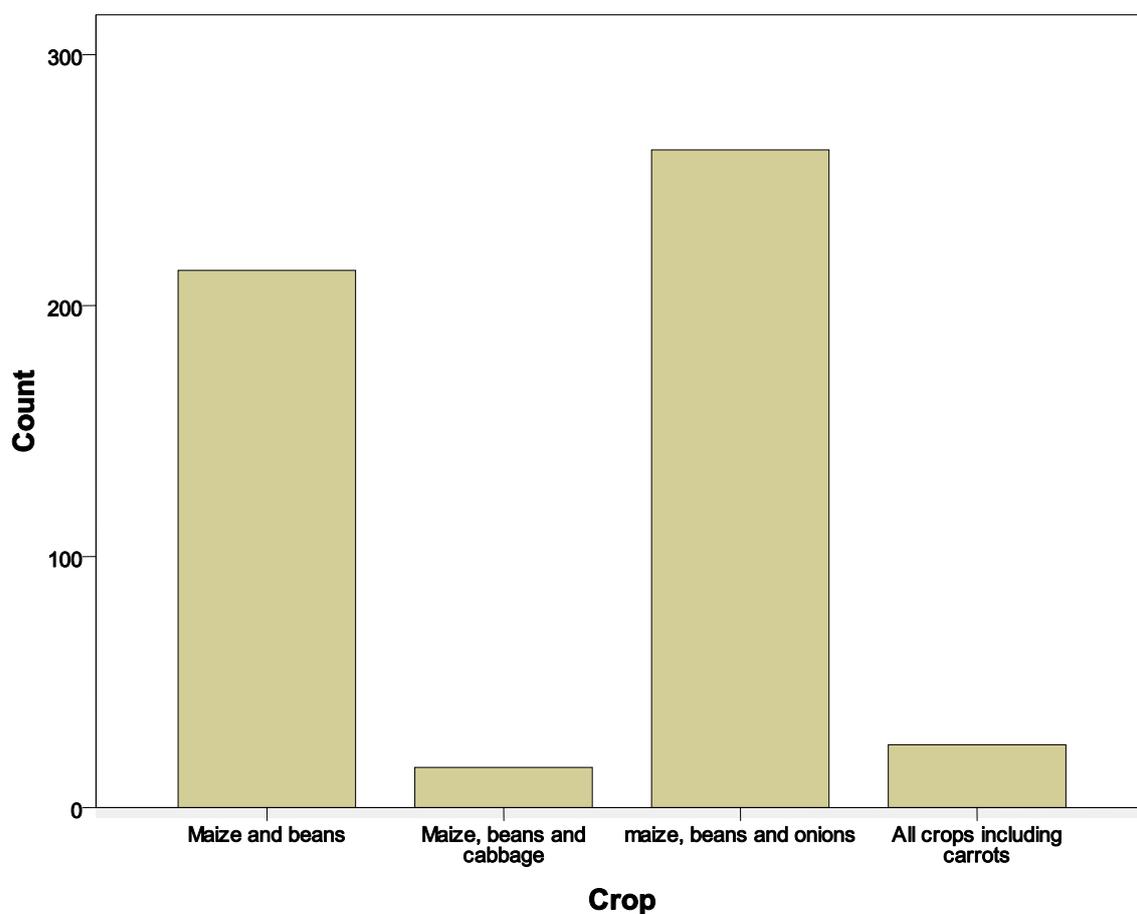
Most of the literature on TFS tend to over concentrate on its contribution towards the improvement of livelihoods, reduction of forest management costs, employment (Kalu et al. 2011; Oluwadare, 2014; Pinto and Florentino, 2014), gender equity (Abugre et al. 2010) and diversity of woody materials (Budowski, 1980; Akinbisoye et al. 2014). Not much credence is given to the role of TFS on food security. Furthermore, the actual benefits accrued to local people under CFR are largely unknown. Information was lacking to show whether the restoration of natural forest ecosystem based on TFS and MOUs works. Although TFS was not new in Uganda as it has been used in the softwood plantations in Sebei region, no study has attempted to assess its impact on mountainous forests and food security in Uganda.

Therefore, it was the need to bridge this knowledge gap that this study was undertaken to determine the contribution of CFR to people's livelihoods, food security and conservation. The study was based on three key questions: Did the CFR based on TFS contribute to food security and conservation of MENP? Did resource access scheme play any significant role in enhancing food security? Did the use of MOUs, improve compliance to the agreed terms and conditions of CFR?

Methodology

A total of 517 beneficiaries of TFS (household heads) comprising of 443 men (85.7%) and 74 women (14.3%) were randomly selected and administered with a pre-tested questionnaire. To assess the contribution of CFR to food security, the respondents were asked to estimate the crop yield, revenue earned from food stuff, utilisation of revenue, their exit plan and other wild food harvested from the forest. The survival rate of tree seedlings was used as an indicative parameter for measuring the contribution of the scheme to conservation. The confidence level of 95% and acceptable margin of error 5% was used to determine the sample size. Participatory Rural Appraisal techniques such as group discussion and structure interviews were used to generate a deeper understanding of socio-economic impact of CFR on the livelihoods of communities. Focused group discussions with CFR Steering Committees and resource users were carried out. The group discussions were kept focused by the use of semi-structured guide. The guide was first pre-tested using 8 members of beneficiaries from a parish that was not targeted for the final assessment exercise. The pre-test of the guide was done purposely to test its effectiveness in generating desired information and also to determine the length of time required to obtain adequate and meaningful information. After the pre-test, a few alterations were made to make the questions clear and well understood by the group. In total six group discussions were held, one at district level (n= 8), and five at parish level (n = 5 per group). In addition, interviews were held with CFR committee members.

Fig. 2: Seasonal crops that were planted in TFS zone

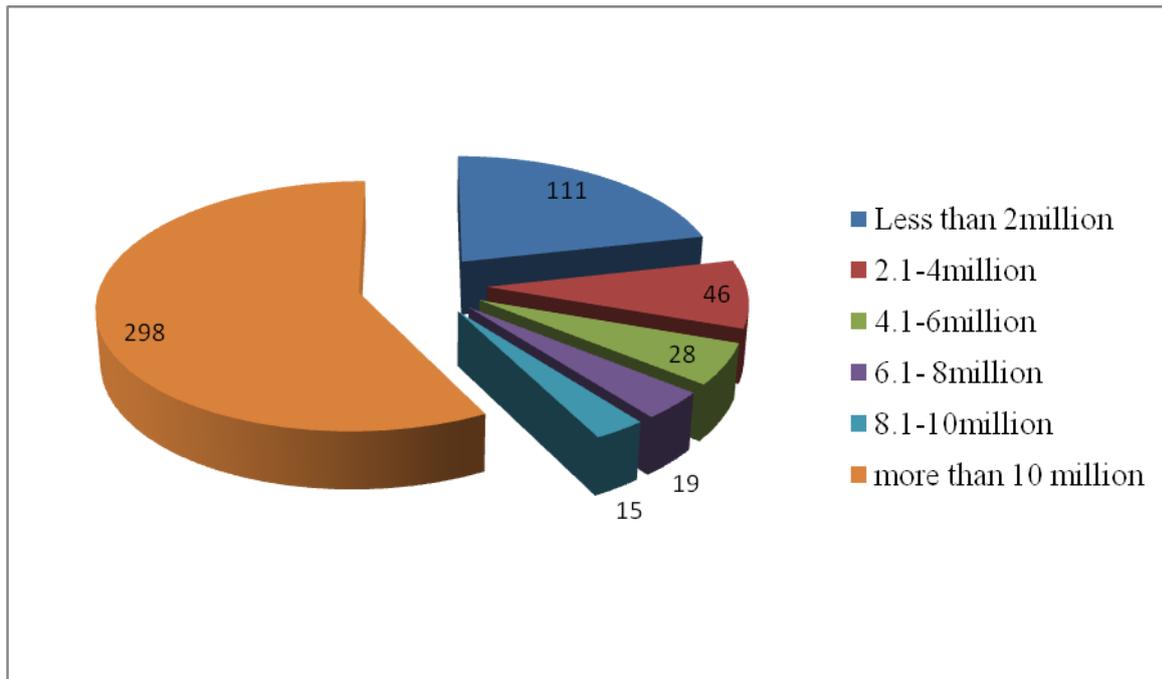


Assessment of crop harvest revealed that 60.2% (n = 311) of the respondents harvested more than 400kg of maize and onion, the main income earning crops. About 7.2% (n = 37) of the respondents did not exceed 100 kg, while 18.2% (n = 94) had their harvest in the range of 101- 200 kg, 9.7 (n = 50) between 201 and 300 and only 4.8% (n = 25) obtained 301- 400kg (Table: 1).

Table 1: Estimated weight of crops (maize and onion) harvested

Weight of crops harvested (Kg)	Frequency	Percent	Accumulative frequency
1-100g	37	7.2	7.2
101-200	94	18.2	25.3
201-300	50	9.7	35.0
301-400	25	4.8	39.8
Above 400	311	60.2	100.0
Total	517	100.0	

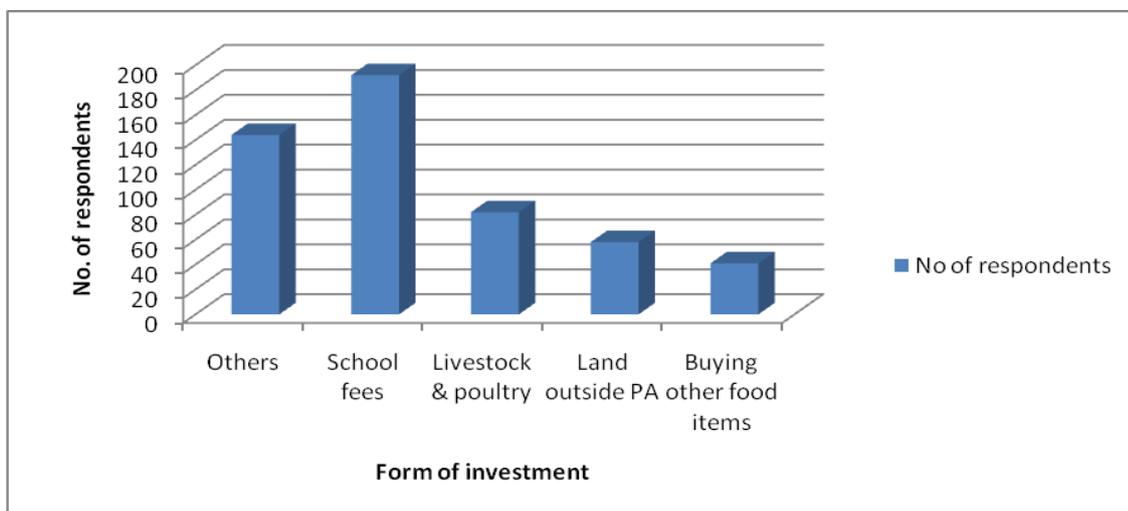
Fig. 3: Revenue earned from crops grown (Ug. Shs)



The survey also revealed that CFR scheme improved the household income of the beneficiaries as shown in Figure 3. The majority of the respondents (57.6%/ n = 298) earned more than 10 million Uganda Shillings (US \$4,000) per annum. Only 21.5% (n = 111) generated less than two million Uganda Shillings (US \$800). It was established that in five years, crops worth 24.62 billion shillings (US \$ 9,848,000) was harvested.

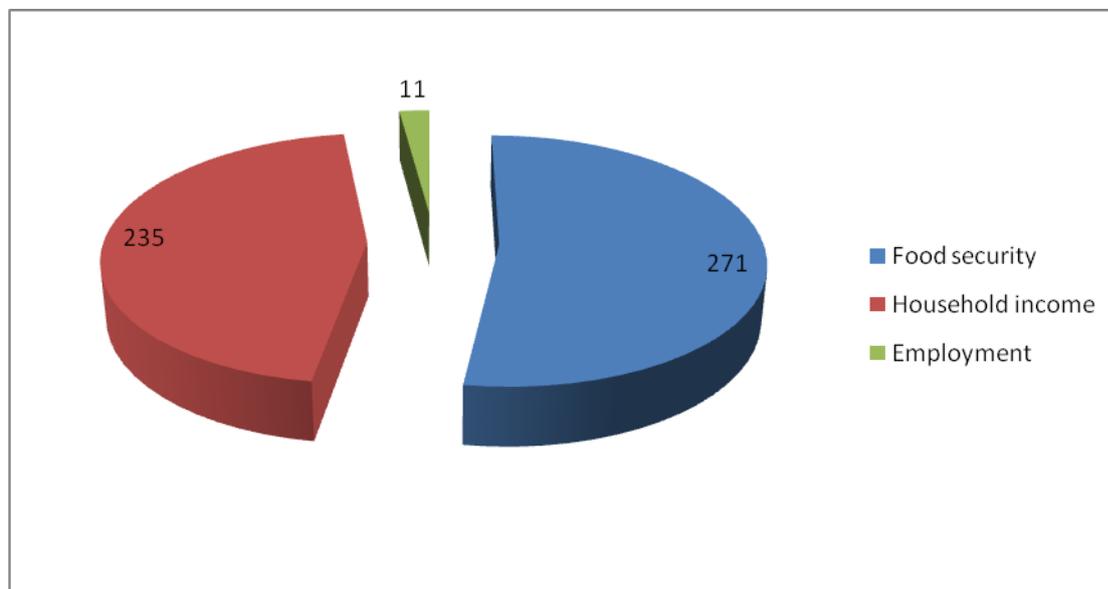
The way respondents spent the money earned from the crop sales is summarised in Figure 4. A significant percentage of the beneficiaries (37.1%/ n = 192) spent the money on scholastic materials and school fees of their children. Approximately 27.9% (n = 144) utilised the revenue to construct houses, start village shops, clear loans, purchase of farm inputs and acquire motorcycles. This form of expenditure was categorised as “others”. A small percentage of the respondents used the money in acquiring Livestock (15.9%/ n = 82) and parcels of land (11.2%/ n = 58). A negligible percentage of (7.9%/ n = 41) spent the money on purchasing other food and household items like plates and cups.

Fig. 4: Expenditure of money revenue from crop sales



The survey of respondents' perception on the significance of CFR scheme to their livelihoods (Figure 5), revealed that a significant percentage (52.4%/ n = 271) of them confirmed that it contributed to food security at the household level. Another 45.5% (n = 235) indicated that the scheme had improved their income. A small percentage of the respondents said the program provided employment opportunities to the youth who used to be idle and redundant in the villages

Fig. 5: Respondents perception on the importance of CFR program



As far as the exit plan of the beneficiaries is concerned, the majority (79.7%/ n = 412) were ready to depend on their private parcels of land for food production, while 15.9% (n = 82) had a plan of hiring parcels of land from their colleagues to grow crops. Only a small percentage (4.1%/ n = 21) of the respondents had not yet come up with exit plan. Two respondents were still considering the possibility of setting up village shops once they pulled out of the scheme.

Table 2: Exit plan of beneficiaries of TFS

Exit plan	Frequency	Percent	Cumulative percent
Own land	412	79.7	79.7
Hire land	82	15.9	95.6
None	21	4.1	99.6
Others	2	.4	100.0
Total	517	100.0	

Survival rate of indigenous tree seedlings planted in TFS zone

The physical count of tree seedlings that were planted in plots allocated to respondents revealed that most of the farmers (53%/n = 274) registered a good survival rate of 71-100%). The highest number of the respondents (118/22.8%) had the survival rate of 71-80% (Figure 6). A very small percentage (2.1%/ n = 11) obtained a survival rate of less than 40%.

Fig. 6: Survival rate of indigenous tree seedlings planted in TFS zone

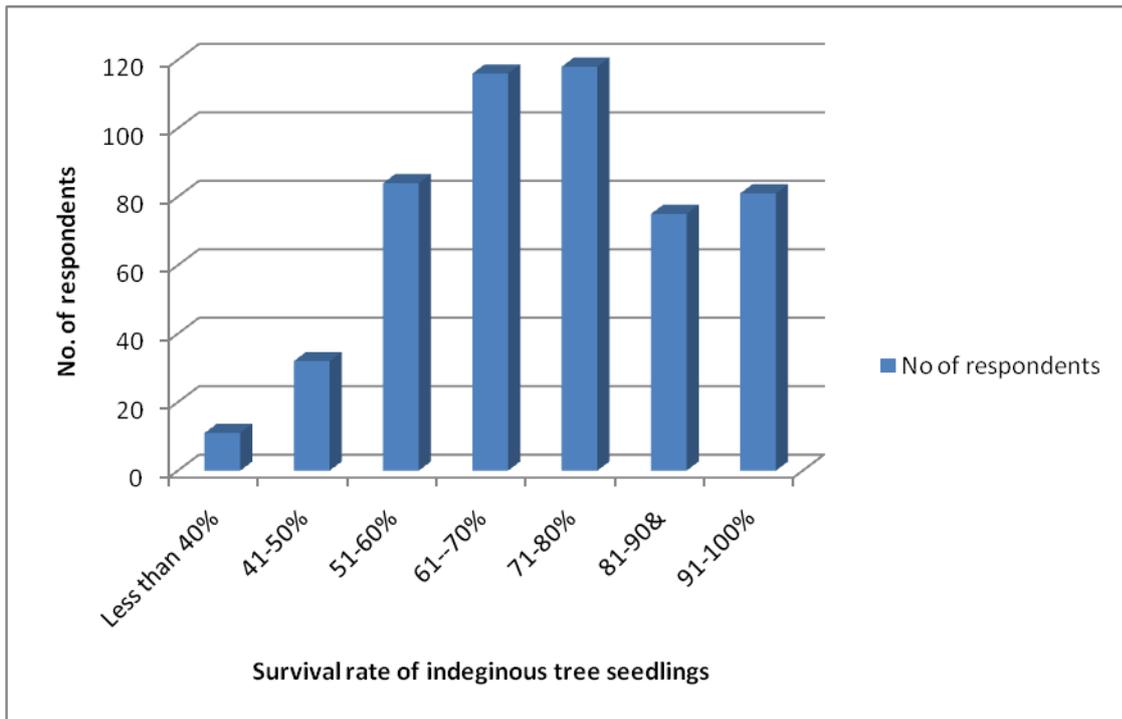


Table 3: Cross tabulation of the tree seedlings survival rated and amount of crops harvested

Survival rate	Weight of harvested crops (Kg)					Total
	1-100	101-200	201-300	301-400	>400	
Less than 40%	0	1	1	0	9	11
41-50%	2	1	0	0	29	32
51-60%	2	9	2	1	70	84
61--70%	3	15	6	2	90	116
71-80%	6	18	11	11	72	118
81-90&	6	21	12	6	30	75
91-100%	18	29	18	5	11	81
Total	37	94	50	25	311	517

When the survival rate was cross – tabulated with amount of crops that were harvested from CFR, it was evident that farmers who obtained more than 400 kg of crops registered less survival rate than their colleagues who harvested not more than 100 kg (Table 3). Out of 311 of the farmers who obtained a yield of more than 400 kg, 198 registered a survival rate of less than set target of 71%. However, (30 out of 37 respondents/ 81.1%) who obtained not more than 100 Kg registered a survival of 71% and above.

Similarly, the cross-tabulation of survival rate of tree seedlings and the utilisation of the revenue earned from crop gives the same trend (Table 4). Most of the respondents in the category of others (101 out of 144/70.1%) performed poorly by registering a survival rate of less than 71%. On contrary, 125 out of 195 of the respondents who spent the money on school fees and scholastic materials for their children obtained survival rate of 71-100%. The same applies to farmers who invested their money in buying land (58.6%) and domestic animals (53.7%).

When Pearson Chi-square (X^2) was applied, the observed significance level of 0.001 was obtained. This implies that hypothesis that survival rate of tree seedlings and utilisation of revenue earned crops is independent is rejected.

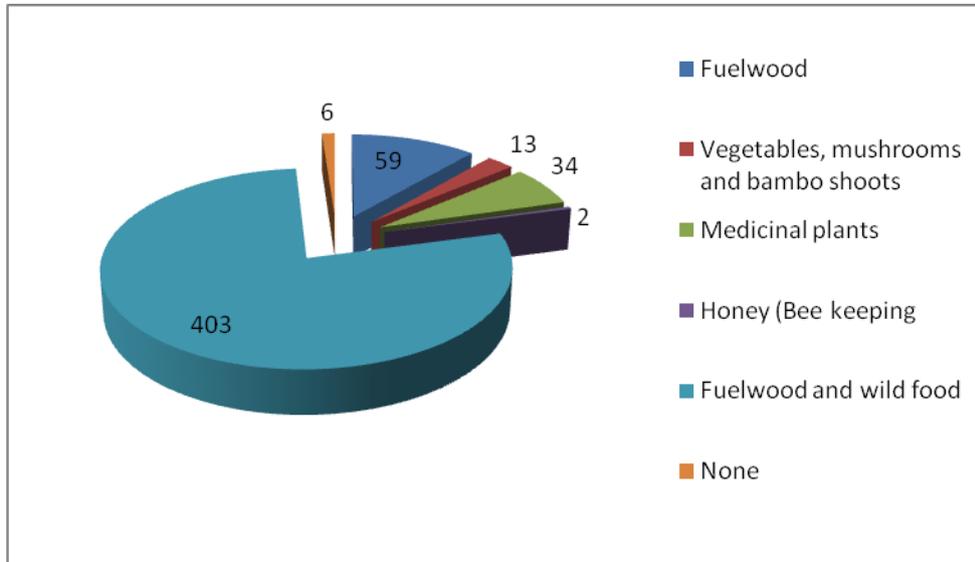
Table 4: Cross-tabulation of survival rate of tree seedlings and the utilisation of revenue earned from CFR

Survival rate of tree seedlings	Utilisation of income earned from crop sales					Total
	Purchase of land outside protected area	Purchase of livestock and poultry	Paying school fees	Buying other food items	Others	
Less than 40%	2	2	2	0	5	11
41-50%	1	4	7	3	17	32
51-60%	9	11	17	5	42	84
61--70%	12	21	41	5	37	116
71-80%	13	26	42	5	32	118
81-90&	8	8	42	8	9	75
91-100%	13	10	41	15	2	81
Total	58	82	192	41	144	517

Other resources obtained from Mt. Elgon Forest

The survey also established that 403 (77.9%) of the beneficiaries collected firewood and wild food from Mt Elgon forest ecosystem (Figure 7). Resources harvested were vegetables, mushrooms, young edible bamboo shoots and honey. Fuel wood was the most extracted resource. It registered 462 (89.4%) respondents. Only six respondents did not collect any other forest resource.

Fig. 7: Farmers who utilised other forest resources



Compliance of the beneficiaries

Whereas, the major measurement of compliance to the set guidelines was the survival rate of the tree seedlings, peaceful pull out of encroachers from the core and passive restoration zones was a sign of compliance.

Discussion

The results from the assessment show that CFR based on TFS significantly contributed to the food security. Given the four dimensions of food security, availability, access, utilisation and stability (Katerere and Smith, 2013), the findings of this study demonstrate that TFS did not only improve food security in all aspects but also enhanced household income and the livelihoods of local communities. The analysis of utilisation of revenue earned from crop sales reveals that CFR significantly improved the quality of life of rural people. The beneficiaries were able to invest their income in the education of their children, acquisition of parcel of land, domestic animals as well as construction houses.

The stability component of food security was achieved because of MOUs which stipulated that beneficiaries would use income generated to secure alternative land outside the protected area for food production once the program ended. The compliance and enforcement of the MOUs were coordinated by two forest technicians and backed up by a set of guidelines that compelled beneficiaries to respect and protect river banks, steep slopes and planted tree seedlings. Nevertheless, the results of the analysis of the survival rate of tree seedlings revealed that beneficiaries who got better crop yields or their ultimate goal was not food security registered worse performance than their colleagues who perceived the program as a rare opportunity for them to realise food security. When Pearson Chi-square was applied, the observed significance level of the expenditure and the survival rate of tree seedlings was 0.001 which is less than 0.005. This implies that the hypothesis that the utilisation of revenue from the program and the survival rate of tree seedlings is independent is

rejected. Similarly, the cross-tabulation of crop yields and survival rate of tree seedlings gives the same results.

The case study also highlights the important role of other forest resources in supplementing the food security. The local people around Mt. Elgon depend on young bamboo shoots as a delicacy as well as mushrooms, vegetable and honey. Fuel wood is still the major source of energy that is used to cook food. However, due to financial and time limitation it was not possible to measure economic contribution of these resources to food security.

The major achievement of the program in terms of conservation is that encroachers pulled out of the core and passive zones without confrontation, giving the forest time to regenerate. It is anticipated that once CFR ends, the forest is likely to regain its integrity and be able to provide ecological and socio-economic goods and services better than before the implementation of the program.

Finally, the analysis of this case study highlights some lessons that have been learnt as; a) collaborative restoration of a natural forest using TFS is possible. It provides opportunity to demonstrate the role of protected areas in improving food security and the livelihoods of local communities, b) The use of memorandum of understanding provides a strong contractual framework that promotes dialogue between protected managers and the neighbouring communities, resolves conflicts and brings various stakeholders on board, c) the poor who perceive CFR as a rare opportunity to improve their household food security are better implementers of the initiatives than the rich or people whose ultimate objective is to boost their income. The vegetation and species distribution maps are useful tools for guiding the forest restoration.

Conclusions

The results of the survey show that CFR hinged on TFS and guided by a well negotiated memorandum of understanding can significantly contribute to food security, improve household income and promote the recovery of forest ecosystem. However, to promote compliance and enforcement of the signed agreements, it is important to provide technical support to beneficiaries of the program and zone the degraded areas to save forest patches which are not yet severely damaged from further human damage. Furthermore, it is important to guide and support farmers to understand their roles and responsibilities

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