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Income Distribution Analysis of Collaborative Forest Management Programme in Mt. Elgon National Park, Uganda: Dual Action for Poverty Alleviation and Environment Management

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Abstract: Forest resources are one of the most overexploited natural resources in Uganda. In order to protect forest resources from such overexploitation, collaborative forest management approach has been adopted by the National Forestry Authority with emphasis on local community involvement. This study examined the level of net economic benefit received from forest produce and it to investigate whether there was a positive effect in poverty reduction. The study further attempted to examine the effects of poverty on the environmental integrity through CFM progrmme in two parishes of Ulukusi and Mutshet, surrounding Mt. Elgon National Park. Using non-parametric statistics, the local community livelihood index was examined on a sample size of 120 respondents. A Cost-Benefit Analysis was applied to estimate the distribution impact and poverty reduction impact. The findings of this study revealed that there was a significant change in livelihood as well as forest conservation status. The income distribution impact analysis showed that the poor people benefited substantially from the collaborative forest management program. The Poverty Index Ratio (0.95) suggest a positive indication of poverty reduction impact. It was found that the involvement of rural poor could be a process of poverty-environment interaction. The collaborative forest management approach is useful to increase the interaction between rural poor and resource management towards environmental sustainability.

Key words: Household income, forest resource, National Forestry Authority, alleviatin, environment, mangement

INTRODUCTION

Forest resource utilisation is as old as humankind and will be increasingly important for generations to come especially in the Third World. Utilisation and management of forestry resources have gone through a dynamic process and each epoch has had its own concerns and method of management. In Uganda for the last 99 years, 57% of the prime forest resource has been under the management of the government. The old policies and legislation for forestry may have been appropriate to sustain a good level of resource base but with increasing population, demand for resources and development, there is a need to re-evaluate the old strategies. The current policies and law may be generic enough to allow changes to take place but the institutional frameworks and thinking of managers needs to be made relevant to changes before any meaningful orientation can be registered. Legislation should provide for transparency in gazetting and degazetting, tenure, collaborative agreements, benefits sharing and private investment to facilitate the process of dialogue (Hulme and Murphree, 2001). Communities neighboring forests and other interested parties, local and international have a vested interest in sharing benefits and responsibilities and if these resources are to survive, these parties must be partners in forest conservation (Boesen *et al*., 2004).

Mount Elgon National Park (114,000 ha) was gazetted as a forest reserve in the 1930s. The area is basically a montane afro-forest and moorland ecosystem and it ranges between 2000-4200 m above sea level. The higher altitudinal range is dominated by heath and moorland vegetation. Between 2400 and 3000 m lie extensive bamboo forests. Mount Elgon has a high conservation value for the global and local communities. It is an important watershed supplying water to thousands of people in Uganda and Kenya (Peter, 1991). The area has several endemic species of flora characteristic of the East African montane ecosystems and provides many products such as bamboo shoots, medicinal herbs, firewood and timber to the local community. Globally, Mount Elgon is important because of its unique species, especially in the alpine and ericaceous zone and its role as a carbon sink. At the national level tourism is now

considered an important component of Mount Elgon. Mount Elgon National Park has gone through the turbulent times of protected area management in the country and severely suffered from agricultural encroachment in the 1970 and 80s.

After the removal of all the encroachers, the forest is slowly regenerating and being replanted but the outstanding issues of conflict between the neighboring communities and the park authorities still linger on and these are the issues that necessitated collaborative management (Peter, 1991). A survey report on Budongo forest reserve revealed that CFM approach increases the net annual income of the participants from Shillings 397,000-620,000 male^{-1} participant and from Ugx. 300,000-450,000 female^{-1} participant (Buyinza and Nabalegwa, 2007). The findings of this study revealed that the CFM increases farm income but does not focus on the standard of living, poverty reduction, benefit distribution and forest resource conservation.

This study therefore, examined the level of net economic benefit received by the NFA, local communities and private sector trading in forest produce. In addition, as the landless people were involved in the program, the study attempts to investigate whether there was a positive effect in poverty reduction. The study further attempted to examine the effects of poverty on the environmental integrity through CFM progrmme in Mt. Elgon National Park.

The people living around MENP: The majority of the people living around Mt. Elgon National Park belong to two major ethnic groups, namely the Bagisu (Bamasaba) of Mbale, Manafa and Sironko Districts and Sebei (Sabiny) of the Kapchorwa and Bukwa District. The Ndorobos (Benets), an ethnic dwelling community in the northeastern part of the mountain were allowed to graze and reside inside the reserve. It was envisaged that they would not cause any problems as their population was very small. Their population as well as that of their livestock has however, increased substantially over time and they became a threat to the fragile ecosystem. In view of this, the Government of Uganda made a decision in 1983 to evacuate and relocate them in the lower slopes of the mountain. However, the exercise became a failure due to lack of consultation and as a result, some of them still live inside the Park.

The Bagisu of Mbale and Sironko Districts live on the western and southern slopes of the mountain. They are agriculturalists and live by cultivating the fertile volcanic soils of the mountain. They are known in East Africa for the production of high quality Arabica coffee. The Sabiny of Kapchorwa District on the other hand reside on the northern slopes of the mountain. They are primarily pastoralists. They grazed their cattle, sheep and goats on the pastures within the forest and moorlands (MAAIF, 2001). Today they have incorporated agriculture in their lives and are known for cultivation of maize and wheat. The communities living in and around MENP on the Ugandan side reside in 58 parishes. These communities have a long history of dependence on the resources of the Park such as collection of bamboo shoots, bamboo stems, medicinal plants, pole wood, fuelwood, crop stakes, mushrooms and honey. The forest is also important to them for cultural practices such as circumcision ceremonies.

MATERIALS AND METHODS

Sampling and survey: The studied forest area was situated over the two administrative districts namely Mbale and Kapchworwa, eastern Uganda. The study area was selected purposively based on the maturity of the first rotation of plantation. The sampling frame of the study was the list of the participants of CFM program. The survey was conducted from October-November, 2002.

Analytical framework

Price and discount rate adjustment: Inflation factor is crucial in Benefit-Cost Analysis (BCA). Benefits and costs were expressed in money terms and adjusted for the time value of money, so that all flows of benefits and flows of project costs over time were expressed on a common basis in terms of their present value. The magnitude of net present value and other indicators fluctuate due to an increase or decrease in discount rate. In forestry, mostly the discount rate is slightly higher because of the long production cycle. Moreover, sometimes in community forestry and on-farm forestry programmes it is markedly high because of tenure insecurity. The current analysis has been conducted using 12% discount rate. In order to adjust the market interest rate (nominal rate) the discount rate was converted to its real value by following the Eq. 1 (Boardman *et al*., 1996), the BCA was carried out using value in constant price, 2001. The real discount rate used in the analysis was 5.7% that was derived using the Eq. 1. For converting nominal price to constant price the CPI was used as a deflator.

$$r = \frac{(I - m)}{(1 - m)} \quad (1)$$

Where:

r = Real discount rate
m = Inflation rate (estimated 5% on average throughout the 11 years of program)
I = Nominal discount rate (12%)

In this study, Real rates = Nominal rates minus Inflation and Currency adjustment. The real interest rate in an economy is often the rate of return on a risk free investment minus an index of inflation such as the CPI or GDP deflator. According to Fisher equation:

$$1 + i = (1 + r)(1 + \Pi)$$

Where:

I = Nominal interest rate
r = Real interest rate
Π = Expected inflation rate

Statistical descriptive analysis: Non-parametric mean comparison tests (Kruskull-Wallis test) were used to examine the difference of socio-economic attributes between different income groups. The Mann-Whitney non-parametric comparison test was used to examine the difference of the standard of living indicators between members and non-members of the CFM programme. The reasons for joining the program were ranked based on frequency distribution and mean statistics was used for the conservation measures.

Income distribution and economic impact analysis: The primary task of conducting distribution analysis is to carry out financial and economic analysis to calculate the incremental net benefit. The financial and economic analysis was carried out based on with without approach. The members group was analyzed as with and the non-member group was analyzed as without. The encroachers who were not enlisted by the NFA were considered as without. Net incremental benefit is the difference between the net benefit of with and without situation. In the analysis, three entities were considered for receiving the net economic benefit namely NFA by receiving revenue, members by receiving wage and consumers by consuming the major and secondary product of the CFM programme. The steps followed for estimating the income distribution impacts are as follows (MFPED, 2002):

- Both the economic and financial values were changed to present value. The costs were classified into four major groups to estimate the distribution efficiently because the members received a large portion of benefit by employing their labour
- The differences between the economic and financial values were obtained to classify the net economic benefit
- Finally the differences were distributed among the entities involved in the CFM programme

Equation 2 used to estimate the distribution of gains and loses is as follows:

$$NEB = ENPV - FNPV = \sum_{t-1}^{t} \quad (2)$$

Where:

NEB = Net economic benefit
ENPV = Economic net present value
FNPV = Financial net present value

Poverty impact analysis: Poverty Impact Ratio (PIR) is an effective tool to focus on poverty impact reduction of the program. A Poverty Impact Ratio (PIR) is the proportion of the net economic benefits accruing to the poor compared to the total economic benefits of a project or program.

The ratio compares an estimate of the poverty index of the participating entities with that of the local poor population to determine whether there is any impact on poverty (MAAIF, 2001). A greater PIR than the prevailing local poverty line indicates that the program has a positive poverty impact.

The information generated in distribution impact analysis was used to calculate the PIR of the program. The proportion of the benefit of the government to the poor, the proportion of benefit of the participants to themselves and the proportion of the benefit to the consumers were assumed and applied. In this study, the proportion of government expenditure to the settler was assumed to be 50%.

The settlers were paid wages for their labour employment in the program at the initial stage, the full (100%) benefit of which is assumed to accrue to them. In addition, consumers (settlers and locals) were assumed to receive 100% of the timber, crops and other by-products produced by the program and these products are considered to meet fully the demand of the area. A number of applications of the PIR methodology are to be found in the literature of Uganda NPA. The poverty impact ratio is defined as (MFPED, 2002).

$$PIR = \frac{\sum_{t=1}^{t} B_1 P_{B1} + B_1 P_{B2} + B_1 P_{B13} + \ldots\ldots\ldots B_n P_{Bn1}}{\sum_{t=1}^{t} B_1 + B_2 + B_3 + \ldots\ldots\ldots B_n} \quad (3)$$

where, i (= 1 to n) indicates the number of stakeholders, Bi is the net benefit in benefit category i and PB is proportion of benefit in benefit category i that goes to the target group of poor. The calculated R was

compared to the local poverty index 1 to determine whether there was any poverty reduction impact due to participatory forestry program.

RESULTS AND DISCUSSION

Table 1 shows the socio-economic attributes of the respondents. Based on income; three groups namely low, medium and high income were examined for the living standard according to income.

Kruskull walis test was used to examine the difference among the income groups. Family size, financial asset and medical care were found significantly different from each other at 5% level whereas tobacco and fuel were significant at 10%.

The rest of the variables are insignificant across the groups implying that the variables are not influenced by the income level. Age variable was different from each other at a little difference in terms of magnitude and found statistically insignificant. Mean family size was similar for three groups. Physical assets variable presents interesting result by showing that among the three groups the mean value of physical assets was lower than the medium income group. It is because they invested or deposited their money into bank than spending for buying physical assets. In case of beverage, medium group's expenditure is higher than the high income group because of using beverage as a common entertainment item.

Reasons for participation in the collaborative forest management activities: Table 2 shows the opinions given by the respondents regarding the participation in the CFM program. The information was ranked giving priority as 1st, 2nd …..8th.

About 96% of the settlers believe the search employment opportunity and income of the forest activities were the major reason for joining the program at first place. At second place 89% choose the reason of rights to collect intermediary forest products for own use as the motivating factor.

At third place, 93% reported that the reason of access to forest land for cultivation. At fourth place, 87% said that they were interested to protect the environment and regenerate the forest.

At 5th place, 98% stated that it was because of promised sizable cash benefits from the non-timber forest products. At 6 and 8th place, all the settlers reported that they participate in the CFM program to have the land title and build their human resource capacity.

At 7th place, 92% of the settlers reported improved standard of living as the main reason for participation in CFM program. The analysis of reasons to join the program shows that the settlers were hopeful for the better livelihood by joining the program as well as contributing to the environment by protecting the forest resources.

Table 1: Socio-economic attributes of different income groups

	Income groups (mean)				
Variables	Low (UGx. 1,028,840)	Medium (UGx. 1,922,984)	High (UGx. 3,315,172)	Chi-square statistics	Sign
Age	54	49	52	1.384	0.501
Family size	7	7	7	6.964	0.031**
Financial assets	37800	124600	260400	9.838	0.007**
Physical assets	18704	213948	40012	1.258	0.533
Food	448924	665000	798000	6.184	0.045**
Beverages	21000	29400	25900	2.741	0.254
Tobacco	18676	21700	16296	5.304	0.071*
Fuel	38696	63700	91000	5.296	0.071*
Clothing	77000	73500	101500	12.269	-0.002**
Medical care	9800	14700	19600	0.642	0.725
Education	21000	28700	12600	2.803	0.246
Construction	22400	86100	31500	0.786	0.675
Travel	35000	23800	25900	2.658	0.265
Social	98000	66500	105000	1.805	0.406

*Significant at 10% level; **Significant at 5% level

Table 2: Reasons for joining the participatory forestry program

Reasons	1st	2nd	3rd	4th	5th	6th	7th	8th
Employment opportunity and cash incomes	82.0 (96.0)	1.0 (6.3)	2.0 (2.9)	1.0 (4.8)	-	-	6.0 (6.1)	-
Access to forest products for own use	2.0 (2.3)	14.0 (89.0)	-	2.0 (9.7)	-	-	1.0 (1.0)	-
Improved standard of living	2.0 (2.3)	-	-	-	-	-	91.0 (91.9)	-
Cash benefits from NTFP	-	1.0 (6.3)	2.0 (5.9)	-	53 (98)	-	-	-
Access to forest land for cultivation	-	-	31.0 (92.0)	-	-	-	-	-
Protect the environment	-	-	-	18.0 (87.0)	-	-	-	-
Obtain land title	-	-	-	-	1 (1.9)	13 (100)	1 (1.0)	-
Human resource capacity building	-	-	-	-	-	-	-	38 (100)

Living standard of the surrounding communities: A number of indicators were chosen to assess the living standard of the communities surrounding the forest (Table 3). By carrying out Mann-Whitney test between CFM members and non-members, the statistical significance was examined in terms of living standard. Most of the indicators were found significant at 1% level implying that the standard of living is significantly different between the two groups. In case of quality of drinking water not ok option was significant at 5% level implying that members and non-members have different opinion.

Conservation measurement: The survey sought answers related to the change in conservation factors such as forest cover, fuelwood, soil erosion and wildlife. Table 4 shows the change in conservation factors. Most of the respondents (95%) reported that forest cover was increased in terms of replanting that helped to reduce encroachment of natural forest.

About 91% of the non-members agreed that forest cover increased too. In case of fuel wood both groups reported the same effect. The overall field observation was that soil erosion had been controlled thought replanting activities which led to increased vegetative cover whereas a few of them (about 6%) reported that because of new plantation at the beginning there was soil run off at the basal area of the plants. Most of the respondents agreed that wildlife also changed due to plantation activities whereas a few of them disagreed with the opinion.

Table 5 shows a list of the facts that cause a decrease in forest cover, fuel wood and wildlife but an increase in soil erosion. The responses are extremely small in numbers that hardly make some sense. The survey revealed that a decrease in forest cover were mainly caused by overexploitation, illicit felling and poor protection by the guards. In case of fuel wood and soil erosion poor silvicultural management and encroachment for agriculture was reported only. The causes identified for decreasing wildlife reveals some meaningful information. The highest number of respondent stated that over-exploitation and week law and order are the major reasons for decrease in wildlife. In addition, setting cluster village in the forest disturbed wildlife was mentioned by the settlers, too.

Distribution impact woodlot program: The distribution impact analysis classifies the costs in a number of groups such as the operating cost, other costs (fertilizer and materials, fuel and power, construction, land acquisition

Table 3: Living indicators of the settlers

Indicator of standard of living	Mann-Whitney statistics	Probability
Source of energy		
Fuelwood	-13.964	0.000**
Solar	-11.916	0.000**
Electricity	-5.196	0.000**
Sleeping on		
Floor	-6.403	0.000**
Bed	-13.784	0.000**
Source of domestic water		
Private pump	-12.207	0.000**
Communal well	-3.317	0.000**
Others	-7.416	0.000**
Quality of drinking water		
Good	-14.071	0.000**
Poor	-2.449	
Type of latrine		
Septic	-8.888	0.000**
Pit latrine	-10.247	
Open field	-8.775	
Latrine subsidies received		
No	-9.110	0.000**
Public	-5.831	0.000**
NGO	-7.616	0.000**
Traditional	-6.834	0.000**
Medical care		
Self-care	-9.110	0.000**
Trained doctor	-11.136	0.000**
Healthcare centre	-5.745	0.000**

Conservation measurement

Table 4: Change in conservation measurement due to participatory management

	Forest cover		Fuelwood		Soil erosion		Wildlife	
Status	AF	NS	AF	NS	AF	NS	AF	NS
Increasing	112.0 (94.9)	91 (91)	83.0 (70.3)	85 (85)	8 (6.8)	5 (5)	112.0 (94.9)	67 (67)
Decreasing	2.0 (1.7)	3 (3)	7.0 (5.9)	3 (3)	76.0 (64.4)	63 (63)	3.0 (2.5)	25 (25)
No change	4.0 (3.4)	6 (6)	9.0 (7.6)	10 (10)	8.0 (6.8)	6 (6)	3.0 (2.5)	8 (8)
No answer	-	-	19.0	2	26.0	26	-	-

Table 5: Causes of reduced conservation effort in study area

Causes	Forest cover decreasing	Fuelwood decreasing	Soil erosion increasing	Wildlife decreasing
Overexploitation	1 (0.5)	-	-	7 (3.2)
Illicit felling	1 (0.5)	-	-	-
Encroachment for agriculture	-	-	6	3
Poor protection by the guards	3(1.4)	-	-	-
Weak law and order	-	-	-	7 (3.2)
Conversion of natural forest	-	-	-	5 (2.3)
Poor silviculture management	-	10 (4.6)	-	-
Location and establishment of cluster village	-	-	-	6 (2.8)
No answer	8 (3.7)	19 (8.7)	19 (8.7)	3 (1.4)

Distribution impact woodlot program

Table 6: Distribution of the net economic benefit of the program (UGx. '000 present values at 12% discount rate)

Item	FNPV	ENPV	ENPV-FNPV	NFA	Local community	Private sector traders	Total
Benefit	6,470.52	24,038.56	17,568.04	-	-	17,568.04	20,368.040
Labour	949.48	367.08	-582.40	-	582.40	-	58.240
Operating cost	342.72	4.76	-337.96	-337.96	-	-	-33.796
Other cost	1,559.32	20.16	-1,539.44	-1,539.44	-	-	-153.944
Opportunity cost	1.12	25.20	24.08	-24.08	-	-	24.080
Total cost	2,852.92	417.20	-2435.72	-	-	-	-
Net befit	3,617.60	-	-	-	-	-	3,617.600
Gains and losses	-	-	-	-1,901.48	582.40	1,756.80	19,866.560

Poverty reduction impact

and development, electrification or gas or water supply, vehicle, equipment, training and fellowship, staff salaries and miscellaneous cost) and the opportunity cost of the program. The net economic benefit was calculated by deducting financial benefits and costs from the economic benefits and costs (ENPV-FNPV).

The net benefit was distributed among the three entities of the program. Table 6 shows that government's loss is 7,680 per ha, respectively. Consumers and participants gain Shs. 7,080 and Shs. 394,000 per ha. Among the three entities, the consumers were the most benefited entity of the program.

Poverty reduction impact: Table 7 shows the result of poverty impact analysis of the CFM program. The information appeared in the Table 7 was derived from the distribution analysis. Proportion of the poor represents the share of net economic benefit of each entity goes to the poor.

In case of NFA it was assumed that 50% of the expenditure was utilized for poverty reduction. As settlers were paid for their labor, 100% labour wage was received by the settlers as benefit. By consuming the output of the program, the settlers and the locality had benefited.

The share of benefit to the consumers was assumed to be 100% too. The PIR of the CFM program was estimated at 0.96. It was compared to the poverty line of the study area to determine whether there was any poverty reduction impact. The PIR was found larger than the prevailing poverty line (0.52) indicating a poverty reduction impact of the CFM program was significantly high.

The assumption of the proportion of net economic benefit to the poor that was made in the earlier section could be flexible based on national policy and other factors. Thus, the study carried out a sensitivity analysis on the flexibility of PIR to the proportion of net economic benefit to the poor.

By using different proportions of the net economic benefit to the poor, the PIR was found to be greater than the prevailing poverty line in most of the cases. If private sector traders proportion of the net economic benefit was considered about 0.50, the PIR decrease substantially. Table 8 shows the result of sensitivity analysis for PIR.

Table 7: Poverty reduction impact of the CFM program (UGx. '000) present values at 12% nominal discount rate

Item	NFA	Local community	Private sector traders	Total
Benefit	1716	582	17568	19867
Proportion of poor	14	28	28.00	62
Benefit to poor	858	582	17568	19009
Poverty impact ratio	-	-	0.9568	-

Table 8: Sensitivity analysis of Poverty Impact Ration (PIR)

NFA share	Local community	Private sector traders	PIR
0.5	1.0	1.00	0.9568
0.75	0.5	0.50	0.5200
0.75	0.5	0.75	0.7427
0.5	1.0	1.00	0.9568

CONCLUSION

In light of the results, the authors conclude that CFM could play a positive role in poverty alleviation and environmental management Collaborative forest management approach has proved successful in terms of poverty reduction and environmental sustainability. The forest products and non-forest products produced by the program sufficiently met the expectations of the local community and private sector traders. In income distribution analysis, traders in forest produce were found to have benefited highly. Besides, the enhancement of livelihood was found positive based on PIR. The sensitivity analysis showed that PIR was responsive to the flexibility of the proportion of benefit that goes to the poor. Based on the findings of this study it is recommended that government replicates the same approach to the other degraded forest reserves and national parks in the whole country.

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REFERENCES

Boardman, A.E., D.H. Greenberg, A.R. Vining and D.L. Weimer, 1996. Cost-Benefit Analysis: Concept and Practices. Prentice Hall, New Jersey.

Boesen, J., R. Miiro and S. Kasozi, 2004. Basis for poverty reduction? A rich society, farmer innovation and agricultural service provision in Kabale, Uganda. DCISM Working Paper. Copenhagen, Denmark.

Buyinza, M. and M. Nabalegwa, 2007. Peoples attitude towards promotion of agroforestry practices in Buffer zones area of Mt. Elgon, Uganda. J. Forest Sci., 1: 17-23.

Hulme, D. and M. Murphree, 2001. African Wildlife and Livelihoods: The Promise and Performance of Community Conservation. James Curry Publication, London, ISBN-13: 978-0325070599, pp: 336.

MAAIF, 2001. National agricultural advisory services programme: Master document of the NAADS task force and joint donor groups. Ministry of Agriculture, Animal Industries and Fisheries, Entebbe, Uganda, pp: 32-39.

MFPED, 2002. Uganda participatory poverty assessment report: Deepening the understanding of poverty, UPPAP. Ministry of Finance, Planning and Economic Development, Kampala, Uganda, pp: 22.

Peter, H.C., 1991. Nature Conservation in Uganda's forest Reserves. Gland Switzerland and Cambridge, UK., ISBN: 2-8317-0085-X, pp: 313.