

Human Ecology and Household Socio-Economic Determinants of Community Forestry Projects in Uganda

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Abstract

Forests and culture have been intertwined throughout human history. Forest landscapes are formed and are strongly characterized by cultural beliefs and management. This paper is an output of a study carried out to investigate the socio-economic factors that influence the performance of community forestry projects in Uganda. The socioeconomic analysis was done to evaluate the effect of local participation to the performance of the community forestry projects. This study has provided insights and confirmation that human ecology and household dynamics greatly influence the performance of community forestry projects. The results revealed that the major household socio-economic factors that influence to success or failure of community forestry projects include literacy, major occupation, farm size, annual gross household income, private forest holdings, accessibility to the forest site, and source of households earning.

Keywords: Community forestry, participation, socio-economic, Uganda

1. Introduction

Forests are an essential foundation for Uganda's current and future livelihood and growth. Sustainable management of these forests, however, poses great challenges given that the population is heavily dependent on them for timber, agriculture, and energy production (Hamilton, 1987). Forests and woodlands covered 45% of the total land area of Uganda in 1898; however, it has been reduced to only 20% of the total land area (NEMA 2001). About 30% of the tropical high forests are degraded and the degradation trend continues. Without effective institutions to limit and regulate harvesting levels and management practices, forest resources can be over-harvested and even irreversibly destroyed, as is the case in "open access" forests (Lise, 2005; Place and Otsuka, 2000).

Groups are equipped for implementing sustainable forest management through facilitation of organisational development, leadership, communication, conflict management and negotiation skills training, and facilitation of a process to establish equitable group structures with competent executive members, especially where several groups are brought together within a village or across several villages. Institutional capacity building focuses on the ability of groups to manage and monitor their group and the results they achieve, through regular reviews, planning together, agreement on information needs and participatory monitoring. The aim is that the process approach described below would be progressively adopted and led by the community and their local groups. Community participation in all the steps should then increase gradually, to enable a transition to their leadership, with corresponding letting-go of control by the Project (Buyinza, 2002).

The National Forest authority (NFA) in Uganda, like many other government forest departments in the developing countries has been notably unsuccessful in its effort to design an effective and uniform set of rules to regulate forestry resource use across a broad domain (Lise 2005).

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Following the centralization of the management of forests in 1967, institutional arrangements that local people had devised to limit entry and harvesting forest resources lost their legal standing (Gombya-Ssembajjwe 2000). Government appoints forest guards to look after state-owned forest reserves. However, it lacks both financial and human resources to monitor the use of these resources effectively. It is prohibitively expensive for government to guard forests by hiring forest guards when forest patches are small and scattered over a large area as is the case in Uganda because of a large number of guards required to police them (Buyinza, 2002). In addition, forest guards do not have any personal stake in protecting the forest effectively. The result has been unimpressive forest management over the last thirty years.

Many contemporary forestry policies in both developed and developing countries are therefore seeking to shift control of forest resources to the community level in an attempt to improve management of local forest resources. Empowering local communities to monitor and enforce forest rules significantly lowers monitoring costs and improves effectiveness because, according to Buyinza (2002), forest users living in or near the forest have an interest in the long-term sustainability of that forest as long as they know that they can continue to enjoy the benefits of the forest; local people with established practices of moving through the forest and a strong interest in preventing others from abusing the forest have the greatest capabilities and motivation to monitor and regulate effectively, and traditional forest users living in or near the forest site are more likely to have developed practices and cultural norms that are compatible with the long-term survival of the forest (Kaudia, 2000).

Often, when compared to central government institutions, local institutional arrangements are considered better at providing, *inter alia*, rules related to access, harvesting, and management; a forum that can respond to conflict quickly and cheaply; and monitoring and sanctioning methods that are efficient (Gombya-Ssembajjwe, 2000). This is expected to result in improvement of the forest conditions. Human ecology helps to identify the negative experiences with the "Fortress Approach" created pressures for rethinking policies on biodiversity management. Experiences were in particular linked to that people did not recognize or accept the exclusion policies, as they experienced substantial direct costs of being close to the biodiversity resource and they were also deprived of resources and substantial incomes. Local people encroached valuable habitats and areas, took out wildlife species through poaching, cut forest resources and harvested other resources "illegally". The biodiversity resources were threatened. In addition, the restrictions and policing activities and behaviour of public officials and local people's activities created a general tension between public bodies and civil society. There was a strong degree of mutual distrust.

The local participation approach emerged as a response to mitigate such problems. The general philosophy in society behind natural resource utilization gradually changed from conservation to sustainable use, and from purely public management to increased use of markets and to privatization. One also anticipated that by making local people more responsible through involvement and inclusion, the biodiversity management would be improved and conflict levels would be reduced. This study is aimed at examining the household socio-economic characteristics that influence the performance of community forestry programmes in Uganda.

Materials and methods

The study was carried out between July and October 2014 in Mayuge and Mutai forest sites of Mayuge and Jinja districts respectively. A cross-sectional descriptive research design employing both quantitative and qualitative methods was employed. The forest sites were purposively selected because they were managed using the community-based forest management approach. A two-stage random sampling technique was used to select a sample size of 120 respondents for the interview. The survey household selected in the two districts was characterized according to their social and economic status. Participatory rapid appraisal (PRA) tools which included open interviews, focused group discussions, and semi-structured questionnaire was administered to the respondents. Information was collected on local people's participation in forest management.

Mayuge district has a total human population of 341,700, with a high population density (> 300 persons/km² in the west and approximately 200 in the east, UBOS 2002). Subsistence agriculture has remained the major economic activity contributing 48 percent on districts gross production. Approximately 83 percent of the population depend on agriculture for their livelihood with a small landholding size (0.48 ha per family). Given the limited opportunities for rural employment and low agricultural production, a few households have migrated to other adjoining districts.

According to the land-use pattern, permanent crops cover (24%), savanna and pasture cover (11%), woodland and forest (28%) and others (43%) (MAAIF, 2002). Susceptible to accelerated soil erosion and declining soil fertility, the sources of livelihood of the rural people have been threatened. Fuel wood is an important form of rural energy in Mayuge and Jinja districts, nearly 97 percent of all household cook with fuel wood at least part of the time. The average household fuelwood consumption is 65 kg/week/family; in addition, rural households burn small amounts of charcoal and agricultural residues (Kalumian and Kisakye, 2001).

The methodologies used included survival analysis (on the macro level) of selected project averages based on secondary information and plantation performance of the two case studies. The socioeconomic analysis was done to evaluate the relationship between community participation and the performance of the community forestry project. The study sites were selected based on the perspectives and recommendations of forestry officials in the area, and on the conditions that the program was launched in the same year and same reforestation species were planted. Despite the attempt made by the concerned authorities, the general performance of these two sites was reported to be different. The projects represented extreme cases, one having regular disputes and the other as an ideal project area, more institutionalized in achieving development activities through the community's labor contribution. To analyze the relationships between socio-economic factors and the extent of participation, two methods were employed: (1) Simple comparative analysis of socio-economic variables and extent of community participation in Mayuge (D1) district and Mutai (D2) of Jinja district; (2). Chi-square tests were carried out to analyze the significance of the relationship between the socioeconomic factors and the extent of participation.

Results and Discussion

The strategy of the CFP is to involve local people, from planning to implementation in the development, protection, and conservation of forest resources, its success was measured in terms of knowledge, awareness, attitude, perception, and participation of the community in the forestry activities. In Mayuge, the Chairman Local Council (LC 1), the dominant source of information on the program, was influential in motivating 57% of total participants. In Mutai, in addition to the LC 1, the forestry official was a major source of information on the CFP. The majority of respondents (56%) in Mayuge were motivated by the Community Development Worker (CDW). In Mutai, 41% were self-motivated to participate owing to acute problems of fuel and fodder. This indicates that people get involved in forest project activities when they derive direct benefits from the project.

In both projects, very few natives were consulted during the inception of the program. The consultation made during the afforestation planning had a great bearing during the implementing stage. Awareness of potential benefits from the community forestry project, particularly the benefits to be derived from it, also prompted the people to get involved in it. In both project areas, for instance, almost all the respondents took seedlings from the NFA after they were informed that these were for distribution at no cost. Almost 90 percent of the respondents were aware of existing forestry rules but they still perceived that only the LC 1 and CDW were responsible for enforcing them and in managing the forest. The respondents in both projects, however, had a strong feeling that there should be a strict punishment system for forest rule breakers, otherwise the problem of deforestation is difficult to overcome. The respondents tended to perceive the community forest as an important source of water, fuel, and fodder, Only a small percentage reported that government forest had value for environmental protection and the community forests were given due importance for fuel and fodder needs only.

Literacy levels and extent of participation

The hypothesis was based on the assumption that the higher the literacy, the higher is the participation rate in forestry and tree planting activities. The findings showed that the extent of participation was significantly affected by the literacy of respondents. Table 1 shows that in both projects, participation was higher among the literate respondents (Mayuge 66 %; Mutai 61 %) than the illiterate respondents (Mayuge, 35%; Mutai, 25%). The combined analysis shown in Table 2 shows that that of the 90 literate respondents in both project areas, 70 (78 %) of them participated (58 had high participation and 12 low participation). Only 15 of the illiterate respondents participated (10 had high participation and 5 low participation). In addition, the literate respondents had higher level of performance (65%) than the illiterates (33%). These findings supported the hypothesis that literacy has a positive effect on the performance of community forestry projects.

Table 1: Extent of participation by literacy in two project

Category	Mayuge Participation (N=80)				Mutai Participation (N=40)			
	High	Low	None	Total	High	Low	None	Total
Literate	36(66.6)	9(16.7)	9(16.7)	54(68)	22(61)	3(8)	11(31)	36(90)
Illiterate	9(35)	4(15)	13(50)	26(32)	1(25)	1(25)	2(50)	4(10)
Total	45(56)	13(16)	22(28)	80(100)	23(58)	4(10)	13(32)	40(100)

Note: Figure in parentheses indicates the percentage of each category.

Table 2: Relationship between literacy level and extent of participation

Category	Extent of participation (N=120)			
	High	Low	None	Total
Literate	58 (65)	12 (13)	20 (22)	90 (75)
Illiterate	10 (33)	5 (17)	15 (50)	30 (25)
Total	68 (57)	17(14)	35 (29)	120 (100)

Note: Figure in parentheses indicates the percentage of each category.

$X^2 = 9.96$, d.f. = 1, Significant at 0.01

Major Occupation and Extent of Participation

The hypothesis was based on the assumption that occupation affects the extent of participation in community forestry projects. In Mayuge, 59 (74%) of the 80 respondents were employed in farming whereas in Mutai project area, only 15 (38%) of the 40 respondents were engaged in farming (Table 3). However, the combined participation (for high and low) in both project areas revealed higher participation among non-farm respondents (Mayuge 90%, Mutai 72%), compared to that of the participants whose major occupation was farming (Mayuge 66%; Mutai 60%). The majority of the farm and non-farm respondents (37 and 31, respectively) registered a high level of performance.

Table 3: Extent of participation by occupation

Category	Mayuge Participation (N=80)				Mutai Participation (N=40)			
	High	Low	None	Total	High	Low	None	Total
Farming	40(68)	10(16.7)	9(14.7)	59(74)	15(38)	3(8)	11(31)	36(90)
Non-farming	11(35)	4(15)	7(50)	21(26)	1(25)	1(25)	2(50)	4(10)
Total	45(56)	13(16)	22(28)	80(100)	23(58)	4(10)	13(32)	40(100)

Note: Figure in parentheses indicates the percentage of each category.

The combined analysis of both projects showed that farming (agriculture) was the main occupation of the respondents 74 (62%) while 46 (38%) were engaged in non-farm activities such as service and business sector. The combined participation of the non-farm respondents (high and low levels) was proportionately higher (80%) than those whose occupation was farming (65%). The number of non-participants with farming as their main occupation was higher (35%) than that of non-participant whose occupation was non-farm (20%). From the discussions with the local people, however, it was found that agricultural activities usually took place during the rainy season (March to June and September to November), thus creating a conflict in the allocation of available labor for community forestry activities. However, since the farm work was done during off days, a great number of the local people were able to participate. Hence, to increase participation, community forestry activities should be carried out earlier than or after the agricultural season.

Landholding size and extent of participation

For purposes of analysis, the households were categorized according to the size of their landholdings. The hypothesis was based on the assumption that the extent of participation is affected by the size of landholdings.

In both projects, although the sample households were drawn from all categories of landholdings, the extent of their participation significantly differed according to the size of their landholdings (Table 4). In both projects except the marginal landholders, there was comparatively more participation in the high levels of performance. In Mayuge, the majority of the marginal farmers (40%) had low levels of participation (stall feeding and acceptance of seedlings); in Mutai, the majority (60%) did not participate at all. However, 40 percent of those who participated were on the high performance level (labor contribution). In both projects, the level of participation of households with large and medium landholdings was higher than that of the small holders. This indicates that landholdings were the major determinants for respondents' participation in the community forestry projects.

The combined analysis indicated that households with large landholdings proportionately participated more both in the higher (73%) and lower (27%) levels, compared to other households with medium (15%) and small (57%) landholdings. The Chi-square test revealed a significant effect of landholdings on the participation. Participation among households with large farmholdings was high basically because of their influential social status, which prompted them to get involved more in plantation activities. However, small and medium holders participated mainly owing to earning opportunities during afforestation, pit making, and weeding. In addition, availability of free seedlings could be one of the reasons.

Table 4: Extent of participation by farm size

Category	Mayuge Participation (N=80)				Mutai Participation (N=40)			
	High	Low	None	Total	High	Low	None	Total
Large holders	5 (71)	2 (29)	-	7 (9)	3 (75)	1 (25)	-	4 (10)
Medium holders	25 (62)	4 (10)	11(28)	40 (50)	11 (65)	1 (6)	5 (29)	17 (43)
Small holders	12 (52)	3 (13)	8 (35)	23 (29)	7 (50)	2 (14)	5 (36)	14 (35)
Marginal holders	3 (30)	4 (40)	3 (30)	10 (12)	2 (40)	-	3 (60)	5 (12)
Total	45 (56)	13(16)	22 (28)	80 (100)	23 (58)	4 (10)	13 (32)	40 (100)

Note: Figure in parentheses indicates the percentage of each category.

$$X^2 = 9.96 \quad \text{d.f.} = 1 \quad \text{Significant at 0.01}$$

Annual gross household income and extent of participation

Households were categorized into three income groups: high, medium, and low. The hypothesis was based on the assumption that the higher the income, the more is the participation. Table 5 shows that in Mayuge a high level of participation was observed among all the high, medium and low-income groups. However, for the case of Mayuge the degree of participation differed among the different income categories (60%; 58%; 52% respectively). Similarly, in Mutai, both high and low income groups showed high participation (80%; 60%, 13%) in the community forestry projects, whereas the majority of low-income groups did not participate (67%) (Table 5).

Table 5: Extent of participation by annual gross household income

Income level/month	Mayuge Participation (N=80)				Mutai Participation (N=40)			
	High	Low	None	Total	High	Low	None	Total
High (> 50,000)	3 (60)	1 (20)	1 (20)	5 (6)	4 (80)	-	1 (20)	5 (12)
Medium (10,000 - 40,000)	29(58)	6 (12)	15(30)	50 (63)	19 (60)	3 (9)	10 (31)	32 (80)
Low (10,000)	13(52)	6 (24)	6 (24)	25 (31)	1 (13)	-	2 (67)	3 (8)
Total	45 (56)	13 (16)	22(28)	80(100)	23 (58)	4 (10)	13 (32)	40 (100)

Note: Figure in parentheses indicates the percentage of each category.

The combined analysis revealed that participation was highly dominated by the high-income group (70%), followed by the medium group (59%), and the low group (50%). The participation of the low-income group was proportionately higher on the low and non-participation levels (21 and 29%, respectively), compared to the low levels of the medium (11%), high (10%), and non-participation levels of high income (20%). The Chi-square test indicated that income had effects on the extent of local participation in community forestry projects.

The field observation on the prevailing social structure also supported the findings that households earning high and medium incomes were influential in the conduct of various community-related activities. Therefore, high level of participation in forestry activities. On the other hand, the participation of lower income households was proportionately higher on the low (21%) and non-participation (29%) levels, compared to high-income groups whose participation on the low (10%) and non-participation (20%) levels was comparatively lower.

Land ownership status and extent of participation

It was assumed that secure land ownership in form of land titles affect the extent of participation in community forestry projects. There was a significant relationship between the extent of participation and land ownership. In Mayuge, the majority (90%) of the respondents had private land titles compared to the 62 percent in Mutai project area. However, in both project areas, a high level of participation was observed among the respondents with private land ownership rights (Table 6).

Table 6: Extent of participation and land ownership rights

Category	Mayuge Participation (n=80)				Mutai Participation (n=40)			
	High	Low	None	Total	High	Low	None	Total
Private land titles	40(56)	13 (18)	19(26)	72(90)	18(72)	4 (16)	3(12)	25 (62)
Customary land	5(63)	-	3(37)	8(10)	5(33)	-	10(67)	15(38)
Total	45(56)	13(16)	22(28)	80(100)	23(58)	4(10)	13(32)	40 (100)

Note: Figure in parentheses indicates the percentage of each category.

A high percentage of non-participants was observed among households without private land ownership rights in Mayuge (37%) and Mutai (67%), compared to non-participating respondents with private land titles in Mayuge (26%) and Mutai (12%). A high level of participation (60%) of the 97 household with private land titles. Moreover, they participated in the lower levels as well (18%); however, none of the households with customary land took part on this level. On the other hand, 57 percent of the households without private land title did not participate; the rest (43%) participated in the high level of performance. Field observation indicated that private land title holders were mostly large or medium-size farm holders, with high influence in the project area as informal leaders, and were involved in community forestry activities. On the other hand, households without private land titles were mostly smallholders with less livestock populations and did not accept seedlings from the project mainly because of lack of sufficient lands for private forest plantations. However, their inclination toward the high level of performance was substantial owing to the wage-earning opportunities in community forestry activities. Hence, the extent of participation was significantly affected by the existence of private land ownership titles.

Respondents' accessibility to plantation sites and participation

The hypothesis was based on the assumption that community participation is affected by the accessibility of the respondent's residence to the plantation sites. A significant relationship was observed between the respondent's accessibility to the plantation sites and his extent of participation. Although the program involves the whole population in the project area, the households near the plantation sites had a higher degree of participation than those in other wards. The reason could be that households that are more distant felt less assured of deriving benefits from the project.

A combined analysis of all respondents showed that although the majority (68%) of the respondents had access to the plantation sites, only 68 percent had a high level of participation. On the other hand, 45 percent of households with less access were found not participating. Among them also, however, 32 percent and 20 percent had high and low levels of participation, respectively. The reason could be the involvement of local elites, school teachers, and local council leaders in the forestry activities; the low level participation was only due to the households' practice of stall feeding and acceptance of seedlings for private plantations. They reported that nursery and plantation sites were located at the other corner of the district, thus it encouraged them to go there and get even the unpreferred seedlings and participate in pit making and nursery making. However, they managed to participate in a forestation activities.

Households with/without off-farm earnings and extent of participation

It was assumed that the lower the number of off-farm earl members per family, the higher is the participation and vice-versa. Despite the same distribution of household in both categories in the projects, the greater rate of high-level performance was observed among households without off-farm earning members in Mayuge (59%) and Mutai (61%), as against the 44 percent of those with off-farm earning members in the former and 20 percent in the latter (Table 7). However, more participation of households with off-farm earning members was observed on the low levels. This means that the households that failed to participate in the high level at least participated in the protection level (stall feeding) and accepted the seedlings for private plantations.

Table 7: Participation of households with/without off-farm earnings

Category	Mayuge Participation (N=80)				Mutai Participation (N=40)			
	High	Low	None	Total	High	Low	None	Total
With off-farm	7 (44)	4(25)	5(31)	16(20)	3(43)	2(29)	2(29)	7(18)
Without off-farm	38 (59)	9(14)	17(27)	64(80)	20(61)	2(6)	11(33)	33(82)
Total	45(56)	13(16)	22(28)	80(100)	23(58)	4(10)	13 (32)	40(100)

Note: Figure in parentheses indicates the percentage of each category.

In Mayuge, the majority of non-participants were households with off-farm (31%); in Mutai, it was those without off-farm earning members (33%). The combined analysis also indicated more participation of households with no off-farm members (60%), compared to those with off-farm (43%) earnings. On the low level, higher performance was observed among households with off-farm earning households. The findings indicate that the off-farm earning households that could not participate in high levels were active on the protection level (stall feeding and accepting species for private plantation). Among the nonparticipants, households with off-farm earning members were more than those without off-farm earning members. However, provision of reasonable benefits (such as wages and other incentives) for the off-, farm earning members could be an effective alternative in diverting their participation in community forestry activities.

Ethnicity and extent of participation

The hypothesis was based on the assumption that ethnicity affects the extent of participation in community forestry projects. Despite the various caste compositions in the study areas, no significant difference in participation was observed among the caste groups (Table 8).

Table 8: Extent of participation by ethnicity

Category	Mayuge Participation (n=80)				Mutai Participation (n=40)			
	High	Low	None	Total	High	Low	None	Total
Literate	36(67)	9(17)	9(17)	54(68)	22(61)	3(8)	11 (31)	36(90)
Illiterate	9(35)	4 (15)	13(50)	26(32)	1(25)	1(25)	2 (50)	4(10)
Total	45(56)	13 (16)	22 (28)	80(100)	23(58)	4(10)	13 (32)	40(100)

Note: Figure in parentheses indicates the percentage of each category.

The rate of combined participation in the low and high levels did not differ significantly among the Batembe (72%), Bazaya (77%), and others (60%). However, in Mutai, a difference was observed in the rate of participation (high and low) among the Batembe (76%), Bazaya (50%), and other tribes (60%). However, in both projects, participation within the tribes was satisfactory, except that among Batembe (50%) in Mayuge and others (60%) in Mutai. The combined analysis of Chi-square test showed that the effect was significant only on the 20 percent level. A minimal rate of participation differences was observed among the Batembe (73%), Bazaya (69%), and others (68%), both in the participation and non-participation categories. In other words, all tribes had equal contribution to the community forestry projects.

The tribe variation was very rare, particularly in community-level activities. Mutai was observed as an exceptional cohesive community insofar as community participation and development orientation are concerned. This type of institutional arrangement was lacking in Mayuge. This implies that although a community has different tribes, cooperation is needed for the maintenance of established-community forestry projects.

Age of respondents and extent of participation

The hypothesis was based on the assumption that the extent of community participation is affected by the age of the participants. For this analysis, respondents were categorized as "young" and "old". The ages of respondents below and above the mean ages were considered as young and old ages, respectively. No significant difference was observed between the age groups and their participation in other words, both ages had equal levels of participation (Table 9).

Table 9: Participation according to age

Category	Mayuge Participation (N=80)				Mutai Participation (N=40)			
	High	Low	None	Total	High	Low	None	Total
Young	28 (65)	5 (12)	10(23)	43(54)	8(47)	1(6)	8(47)	17(42)
Old	17 (46)	8 (22)	12(32)	37(46)	15(65)	3(13)	5(22)	23(58)
Total	45 (56)	13(16)	22(28)	80(100)	28(58)	4(10)	13(32)	40(100)
Mean age	40.8 years				43.5 years			

Note: Figure in parentheses indicates the percentage of each category.

Attitude toward planting trees in barren land and extent of participation

In both projects, none of the respondents had a negative attitude toward planting trees in barren land. However, those with a positive attitude did not necessarily participate in the activities. Moreover, no significant relationship was observed between the respondents' attitude and participation.

The combined analysis revealed that participation in community forestry took place irrespective of respondents' attitude toward planting trees in barren lands. On the high level, the rate of participation was higher among respondents with moderate attitude, while on the low and nonparticipation levels, no significant difference was observed despite the fact that the majority (73%) of them had a positive attitude. However, the positive attitude had more bearing on the protection levels. The findings signify that massive extension activities intended for the respondents with a positive and moderate attitude certainly can increase participation in the project's implementation and protection phases.

Effect on livestock raising and feeding practices

From an interview with respondents, information regarding the program's effect on livestock raising and feeding practices was obtained. The livestock rising became difficult because of insufficient fodder and controlled grazing. However, a 17% increase in the number of families raising livestock was observed in Mayuge and 3% in Mutai. The main reason for the increase in Mayuge was the establishment of a dairy development center in the area. The households started raising imported goats from South Africa instead of cattle, and this increased the livestock unit (LSU) per family in Mutai from 98.9 to 149.8 LSU. In Mutai, a decrease in LSU was observed from 82.8 to 70.4 because of the decrease in the number of livestock (cows) due to lack of grazing land in the project area. However, the effects were more profound in livestock feeding practices. An increase in stall feeding practices in the two projects was observed, along with a decline in the number of households grazing animals in common land and those practicing both grazing and stall feeding. These changes have substantially affected the project's protection level.

Effect on fuel consumption through the use of improved cooking stoves

One of the main aims of the program was to reduce fuel consumption through maximum use of improved cooking stoves. Although an average of 35 percent of annual fuel savings was reported by the present users, a sharp drop in Mayuge (19%) and in Mutai (25%) took place mainly because of technical problems and the time-consuming nature of the work. Only about 30 percent of respondents in both projects were presently making use of the stoves.

However, nonusers reported that they did not know where to get the stoves and also had heard that these were not that useful, indicating that there was not much extension activities and regular project monitoring. An increase in the use of stoves is likely to bring positive impact both at the household level and on the surrounding environment. However, this can be attained only if there is a change in the present social system and improvements in stoves can be made according to the local need. Thus, there is a need for massive extension activities in this regard.

Effect on private forest plantation

The program aimed to increase private plantation through distribution of free seedlings. It was observed that selection of species was affected by social constraints and perceptions toward certain species. For instance, *Pinus roxburghii* is well adapted to degraded sites in the middle hills but it was not preferred because the broadleaf species is difficult to establish in that same environment. Of the total sample households, 68 in Mayuge and 25 in Mutai reportedly owned an average of 90 trees. But this figure was said to be inflated owing to a prolific growth of native species (*Alnus nepalensis*) in both sites. It could be that the site conditions were favorable to the species. It was also reported that 39 percent of the respondents in Mayuge and 50 percent of those in Mutai were motivated to plant more trees after they had received free seedlings from the Community Forestry Project. These findings indicate that provision of preferred species motivates more people to establish private tree plantations.

Effect on the society

The community plantation has widened the forest areas in both project sites. In addition, it has increased the sites' aesthetic value and environmental protection. Despite the project's role in bringing about several changes, such as livestock feeding practices, use of cooking stoves, and private plantations, the local people in the Mutai plantation indicated that the local community became more responsive because of frequent conflicts arising from local political issues on forest demarcation, controlled grazing, and others. The main reason reported was, even after they had appropriated the only grazing land they had for community plantation, frequent disputes still arose, discouraging them to participate further in the activities. The situation in Mayuge was different in that the local community was highly cooperative in community activities. Their cooperation contributed significantly to the building of basic infrastructures and other development activities during the past 15 years. These activities are now benefiting the local people.

Conclusion and Recommendations

The performance of the community forestry projects suggests that biophysical factors affect the survival and growth of plantation species while socio-economic factors affect the nature and extent of participation. The biophysical factors have profound effects during the establishment stages, while community participation is significant on the protection level. Specifically, the average rainfall, altitudinal range, main aspect (facing), and existence of original vegetation are some of the biophysical factors that significantly affect establishment of the plantations.

The major factors that affect the nature and extent of participation are literacy, major occupation, farm size, annual gross household income, private forest holdings, accessibility to the plantation sites, high number of economically active members in the family, and households without off-farm earning members. Furthermore, knowledge and understanding about the program were crucial; however, community involvement in the project's identification, inception, planning, and organizational stages was achieved, bringing about favorable results during the implementation phase. Attitude toward the program, perceived value of different forests, and a sense of belonging are highly significant on the protection levels. Moreover, dynamic project area leaders with less vested interest have attracted the Mayuge residents' cooperation to participate actively in community activities. However, the distribution of preferred seedlings, training of local people, timely follow-up, and effective monitoring and evaluation of ongoing activities are lacking, especially in Mutai. Hence, to bring effectiveness in program performance, the various aspects discussed have to be considered. Further studies should be carried out in other districts to confirm these findings and determine the specific factors that affect influence people participation in afforestation and reforestation programmes. Secondly, to increase the participation of low and medium-income households, additional incentives such as better prices for farm produce, off-farm earning opportunities, forestry-related training, and provision for the distribution of preferred species, should be incorporated in community forestry programs.

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