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Effectiveness of Individual and Group Agroforestry Extension Methods: A Case Study of Vi-Agroforestry Project in Uganda

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Abstract: Many agricultural service providers have used group and individual methods to disseminate agroforestry technologies to farmers with varying degree of success. A study was conducted to assess the effectiveness of group and individual extension methods in delivering agroforestry technologies at Vi-Agroforestry project, Masaka district. Questionnaires were administered to nine randomly selected farmers who had received extension services from the project. Participatory Rural Appraisals (PRAs) were used in four villages. In addition, 12 project extension workers were interviewed. Project manuals and reports were also studied. Data were analysed using SPSS computer package and descriptive analysis. A statistical t-test was carried out to assess the influence of group and individual extension methods on farmers' adoption of agroforestry technologies. Group and individual methods were found to have varying degree of success on farmers' implementation of agroforestry technologies ($t = 3.55$, $p<0.05$) from one household to another. In disseminating agroforestry technologies, group methods were found to be the most effective. Many farmers preferred group compared to individual method. Much as group methods were more effective, service providers should sustain both methods in order to address a variety of farmer characteristics.

Key words: Adoption, extension methods, farmers, NGO, technologies

INTRODUCTION

Agroforestry technology as an integrated management system in which woody and non-woody components are grown in specific arrangements and locations to perform specific functions through appropriate management inputs (Rocheleau *et al*., 1988; Mullar and Scherr, 1989). Agroforestry is based on the premise that biological, ecological and economical interaction of different components in a well composed and managed system will lead to sustainability and increased productivity (Nair, 1993). Since the evolution of scientific approach to agroforestry, literature on its benefit and the need to adopt its technologies in many parts of Africa has proliferated and is available (Per Rudebjer and Kasolo, 1993).

Agroforestry technologies become relevant when new research findings are communicated to farmers for adoption (Nair, 1993). Farmers learn in different ways, for instance by listening, observing, discussion and different extension methods have been employed by service providers when extending agroforestry technologies (Nair, 1993). However, different extension methods have been found to be more effective, in different situations and at different levels in adoption process (Sim and Hilmi, 1987). Through various extension methods and tools, different levels of achievement have been attained by farmers while others have failed to emphasise the relevancy of agroforestry (Lionberger and Groin, 1986; Del-Castillo *et al*., 2001). Effectiveness of a method depends upon selecting the right method, at the right time (Kerkhof, 1990). Greater implementation of agroforestry requires appropriate selection of extension methods that can address their needs (FAO, 1986).

Group and individual methods are some of the extension methods through which agroforestry messages can reach farmers. Group methods such as community meetings, method and result demonstrations and field tours have been employed (Sim and Hilmi, 1987). Sharing of knowledge and ideas between farmers and extension agents has been a key component that has enabled farmers and extensionists to cooperate as equals. Also in an attempt to meet the project's goal and objectives, extensionists have also frequently visited individual farmers with agroforestry technologies. Activities such as home visits, personal letters, telephone calls and informal

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contacts have been used (Sim and Hilmi, 1987). Semana (1983) and Kerkhof (1990) defined individual method as a way in which farmers are visited on their own farms.

The government recognizes the role NGO's and CBOs in information dissemination in project-specific areas since, its capacity to deliver agriculture extension services has reduced because it did not realise the anticipated benefits. In Uganda, many NGOs and government agencies have used group methods and individual methods to disseminate agroforestry technologies to farmers. However, FAO (1986) observed that these methods have varying degree of success. There is inadequate information to extension staff as to, which of these two methods is most effective in disseminating agroforestry technologies to farmers. If farmers are to adopt any new technology, a good mode of information delivery (Sim and Hilmi, 1987). It is in view of this, that this study was intended to investigate the effectiveness of group methods and individual methods in Kkingo sub-county in disseminating agroforestry technologies.

It is hoped that this study communicates the most effective method in disseminating agroforestry to improve timely delivery of agroforestry technologies. The aim of this study was to investigate the effectiveness of the group and individual methods in disseminating agroforestry technologies in Kkingo sub-county, Masaka District. The objectives of the study were to document group and individual methods, compare their effectiveness and assess factors that affect group and individual methods in disseminating agroforestry technologies.

MATERIALS AND METHODS

Study area: The study was conducted in Kkingo sub-county found in Masaka district, situated in the southern part of Uganda. Kkingo is one of the sub-counties where Vi-Agroforestry project works. It consists of four areas of Concentration (AoCs), namely; Kiteredde, Kasana, Nkoni and Kaganda. It lies between longitudes 31°30^{1}E and 32°00^{1}E and latitudes 0°00^{1} and 0°30^{1}S. The area is generally flat but interrupted by undulating plains. The soil ranges from black loam in the low-lying marshland to less fertile reddish brown lateritic type of soil especially on hilltops. Sandy soils, grey clay and greyish black soils dominates parts of swamps. The soils are fertile and well drained, although some decline in fertility have been noticed (Vi-Agroforestry project Annual Report, 1999). The rainfall pattern is bimodal having two crop seasons. The major activities are subsistence farming, trading, brick making and livestock keeping. The main crops grown are coffee, banana, maize, cassava, sweet potatoes, groundnuts and beans.

Design of study and sample frame: Reconnaissance survey was carried out to determine households and villages practicing and receiving agroforestry services from the Vi-Agroforestry project. According to the project, the study area is made up of four parishes termed Area of Concentration (AoC). Each AoC comprised of three villages. A pre-test was made to verify the validity of the questionnaires before administering it to the intended farmers. The validity of the study was controlled by interviewing only those who were practicing agroforestry. Systematic random sampling was adopted for selecting the households using a record book of Extensionist. A list of farmers was assigned numbers and every 10th household was picked for interviews. The first household was picked randomly and a total of 90 households were interviewed. Questions were related to a variety of agroforestry practices, with an emphasis on extension method used and its effectiveness. Every interview ended with an opportunity for the farmer to comment on the interview and give questions about the study.

Participatory Rural Appraisal (PRA) tools such as key informant interviews, participant observation through farm walk and focus group discussions were also used to get more data. Key informant interviews with the Vi-Agroforestry project extensionists were conducted to find out what farmers considered most appropriate or difficult for them and how their work was affected by both group and individual extension methods. Vi-Agroforestry project manuals and reports were to get Project's views. Data were edited, coded and entered into SPSS computer package for analysis. Descriptive analysis was used to analyze qualitative data. The two extension methods were statistically tested using a t-test to ascertain if there were statistical differences.

RESULTS

Documentation of group and individual agroforestry extension methods: Vi-Agroforestry Project introduced group approach in Uganda in 1997 with a focus to extend extension service. Vi-Agroforestry Project has adopted a program where farmers are taken to tour the Agroforestry Demonstration Center (ADC). Farmers are allowed to choose members to go and learn and then bring back the knowledge to others. This enables the farmers to improve their own farms after seeing the benefits of agroforestry at ADC. At ADC, farmers are shown various agroforestry technologies and what can be expected after a particular agroforestry practice has been adopted. At Vi agroforestry, group extension methods involves training

seminars in which demonstrations were used to promote and facilitate the implementation of agroforestry technologies. They are intended to equip the farmers with the necessary knowledge and skills for improving their livelihood.

Sensitisation seminars were arranged to create awareness among farmers, change farmer's attitudes and cultivate interest in project programs. Questions such as what and why are answered during sensitisation. Questions asked often include: what is Vi-Agroforestry project?; Why should one plant trees? Vi-Agroforestry organizes field tours for group farmers to learn what has been implemented. A manageable number of farmers within the same AoC were taken by responsible extensionist to visit fellow farmers in another AoC who have practiced agroforestry for some time. Field days have been arranged where two groups of farmers (2-15 members) were mobilised and taken by their extension worker to visit a model farmer within the same AoC. During the visit the model farmers explain and demonstrate agroforestry activities.

Focus group discussion where farmers provide the theme for discussions about to agroforestry system. Such circumstances present the ideal setting for learning and information exchange to occur. Community Empowerment was used as a project entry point to make community members identify and analyse their own problems. This enabled group farmers to develop their own Community Action Plans (CAPs) to monitor implementation of agroforestry technologies assisted by Vi Community Empowerment Unit staffs and the Zone Managers. Different individual methods were used by Vi-project in disseminating agroforestry technologies namely, Home visit, Radio programmes, farmer to-farmers contacts and informal contacts.

Characteristics of the respondents: Most of the respondents (75%) were females. According to the Buganda culture, women entirely do most farming activities while men engage in commercial activities. The majority of the farmers (33%) were of age ranging from 45-54 years The average family size was 5 individuals per household, the range was 1-13 persons. Most of the farmers (90%) had formal education. Of these, 53% had primary education and others post primary education. Overall, the average land holding was 2.3 ha per household range was 0.5-7.5 ha.

Respondents reported several means of agroforestry technology awareness (Table 1 and 2). Among group methods, focus group discussion was the main source of information discussion for farmers (91%). It should be noted that some respondents used both extension methods.

Table 1: Group methods used by the farmers, n=90

Group methods	Frequency	(%)
Village meetings	37	41
Focus group discussions	82	91
Field tours	71	79
Field days	35	39
Farmers visiting demo. center	66	73
Training seminars	5	6

Table 2: Individual methods used by farmers, n=90

Individual methods	Frequency	(%)
Home visit	85	94
Farmer to farmer visit	69	77
Informal visit	22	24
Radio program	20	22

However, with in individual method, the extensionists (Home visit) had visited nearly all the respondents (94%). Out of 90 respondents, 20 had received agroforestry information through radio program (Table 2).

There were significant difference ($t = 17.68$, $p < 0.05$) of the farmers preference between group and individual extension methods. About 78% of respondents were very enthusiastic about group methods as the most significant approach in disseminating agroforestry technologies.

The significance difference was attributed to more benefits through group extension methods. Many respondents (61%) stressed that since farmers perceive information differently, group methods increased opportunities for sharing of knowledge and experiences by discussing agroforestry technologies and practices. Coupled to that, the extension workers said that group extension methods were more economical in disseminating agroforestry knowledge. It was easy for farmers groups (11%) to get support opportunities from different NGOs and the government. Through group methods, farmers (62%) could remind, encourage, assist and gain morale of implementing the technologies. About 17% of respondents were selling their farm produce through groups. However, group learning methods (13%) was hampered by low turn up for meetings especially during rainy seasons. Some respondents (11%) criticised group approaches for the time wasted in discussing contentious issues. They reported that, farmers raise arguments and fight for their recognition thereby wasting productive time. Gossiping among respondent (2%) also discouraged farmers.

The strength with individual methods was that extension agents could demonstrate agroforestry technologies on farmers farm. Thus it was easy for an extensionist to explain as well as advise a farmer at farm. However, it was constrained by slow adoption rates.

Consequently, there were low levels of implementation of agroforestry technologies. This is because individual farmers lack stimulation from fellow farmers, self-evaluation was difficult since there is no benchmark upon which the success could be measured.

Farmers adopted varied agroforestry technologies practiced by farmers. All farmers interviewed had scattered trees on their cropland, although their number varied from household to household. Limited to tree component, there were several multipurpose trees like hedgerows, fodder and so on. Agroforestry technologies practiced by respondents Scattered trees on cropland (100%), boundary planting (97%), mixed intercropping (63%), contour hedge (40%), improved fallow (29%), fodder banks (7%) and on-farm woodlots (18%).

During farm-walk it was observed that implementation of agroforestry technologies was difference between group and individual adoption methods. The respondents who were receiving individual agroforestry services had small land sizes that hindered prevented them from integrating many trees on the farm. Many farmers (N=70) that were receiving group agroforestry services had integrated different agroforestry trees on farms. They built soil and water conservation structures such as *Fanya juu*, *Fanya chini* and contours compared with 45% of farmers using individual methods. Further more, 74% of farmers in group approaches had practiced intercropping. They also mentioned that shade from intercropped trees had improved the microclimate in their gardens. Tree management practices such as pruning, thinning and pollarding were better implemented in group methods.

Farmers were also planting both soil-improving tree species like sesbania and calliandra as well as fruit trees for domestic use and trade of farm products. About 65% of the farmers in individual methods did not have sesbania and calliandra. They contested their role to improve soils productivity. Greater levels of adoption and implementation of agroforestry technologies were observed among farmers who were using both group and individual extension methods. There were between 6-12 trees of different species on the farm among farmers receiving group methods compared to 4-6 trees. Farmers with individual methods also lacked species quantity.

Fuelwood welfare at household varied significantly ($t = 3.55$, $p < 0.05$) for the two extension methods. Farmers who preferred individual methods (72%) face firewood scarcity compared to 28% using group extension methods. They claimed that the problem of firewood scarcity had resulted in increased distances walked and time taken to look for firewood. Firewood impacted by the fact that most of calliandra and sesbania were grown for fodder.

Food availability at a household level was also assessed and it was reported that the number of households that were facing problems in getting enough food also varied significantly ($t = 5.39$, $p < 0.05$) between group and individual methods. Individual method farmers (41%) also reported increasing food insecurity due to declining soil productivity, while 21 said so in group extension methods.

DISCUSSION

Farmer's characteristics: The proportion of the female respondents (76%) tripled that of men (24%) even though 57% of the respondents were married. This scenario is not too different from the study done by IFAD (2000), where 72% of all employed women and 90% of all rural women work in agriculture as opposed to only 53% of rural men. The high number of female respondents is because certain activities in agriculture have traditionally been taken as the main occupation of women including site preparation, sowing, tending, weeding, harvesting, headloading of produce, crop-drying, winnowing, seed selection, pig and poultry-rearing (Bigglaar, 1995). Men tend to be responsible for the cash crops. Most of the respondents had formal primary education. In Uganda, agriculture is mainly done by resource poor and poorly educated people who hardly get employment in other sectors of the economy.

Sim and Hilmi (1987) reported that the most effective way of bringing change is through individual contact in the home or the work place of people. The discrepancy between Sim and Hilmi (1987) and observations during this study may be explained by several reasons. Firstly, because farmers in group often mobilise themselves and meet with or without extensionist might be a reason why the adoption and implementation of agroforestry was high. Group approach enabled farmers to help one another, motivated, effective, visit other places, work together and take joint action as well as monitoring the work, also made group method more motivated, effective and hence implementation of the agroforestry technologies. Such visits have proven significant in changing reluctant farmers. This is in agreement with what Gass *et al.* (1997) (cited in Ramirez, 1998) stated that participatory learning can yield powerful results when stakeholders work together. The fact that many farmers started practicing agroforestry after visiting their fellows is supported by Kerkhof' (1990). According to Kerkhof (1990), Koro Project in Mali organised an excursion (trip) to the Majjia valley project in Niger and the hundreds of Kilometers of Neem windbreaks made such an impression on the participants that once back in Mali, windbreaks

were seen as the only solution. For several years after, the project struggled without success to replicate the Majjia windbreaks. While the project manager had doubts about the model, he was apparently overruled by the determination of other excursion participants. This example shows the influence of excursion and group learning in changing farmers' attitudes. All these experiences given by farmers of Kkingo approves Kerkhof's prediction (1990), which says that group extension services can obtain considerable economies of scale if extensionists are able to focus their efforts on groups of people rather than dealing them one by one.

The idea that the implementation was higher among households (farmers) that were learning agroforestry services through group methods can also be supported by the out comes of other projects. For instance, there is a project in Sierra Leone called People's Participation Programme, which aims at improving the lives of the poorest through the formation of small farmers' groups which serve as a vehicle for self development, empowerment and cooperation while ensuring project sustainability. The groups that were formed proved to be successful and attracted development assistance (Thomas, 1994).

Group members reported that their income and food security. In people's participation programme villages, there was a stronger feeling of cooperation and unity. This is in line with what was found out with Vi-projects extensionists, that more farmers were interested in group methods as the benefits of working and learning agroforestry technologies together with fellow farmers (as a unit) became obvious. Another effect of apparent benefits of the group methods is that farmers who were using individual approaches commented on group methods favourably and referred to them as the best mode of delivery through which farmers can benefit. It is also interesting to note that among the reasons why group membership was declining in some villages where the people's participation programme worked is that the members felt that was little profit and that they would be better off working on their own and that no extension agents visited villages.

These reasons are the same ones as mentioned by farmers who did not want to learn with their fellow farmers in Kkingo sub-county. In his report, Thomas (1994) observed that all the villages in the people's participation programme where the group had declined were in the primary stages when the project closed. This shows the risks of project having to phase out according to their strict agendas and not according to the actual progress and needs of the communities.

Norman and Douglas (1994) noted that if there is a conflict between strategies required for sustainable resource management and those ensuring food security in the short run, problems will rise. There was a possible conflict between short and long term goals for many farmers who were interested in individual methods. Constructing soil and water conservation structure and at the same time grow crops for household use was labour consuming. Perhaps this explains why very few farmers had afforded to put either *fanya juu* or *fanya chini* or contours on their gardens. And implications of soil degradation were starting to show up in forms of loss of fertility and soil erosion. Also tending banana plantations and planting sesbania and calliandra along boundary or contours might mean much labour for nothing to begin with. The same goes for the home nurseries, which need a lot of attention and care when the seedlings are young. All these turn out to be impossible for an independent individual who may not be so committed.

Agroforestry technologies: According to Mullar and Scherr (1989) the most popular practices and technologies of agroforestry are scattered trees on cropland, boundary planting, contour hedgerow, improved fallow, mixed intercropping, on-farm woodlots, trees management, soil and water conservation structures, mulching, tree home nurseries and among others. Results of the farmers' interview mirrored this observation and the most popular technologies in the study area included scattered trees on cropland, boundary planting, contour hedgerow, improved fallow, mixed intercropping and woodlots. The greater number of respondents that had planted trees along boundary could be because farmers thought that planting trees on boundary would avoid direct competition with crops and at the same time take advantage of unutilised space, an idea shared by Mullar and Scherr (1989).

The fact that few farmers had adopted zero grazing as a viable enterprise could be used to support for low adoption of fodder banks. Production of supplementary fodder through establishment of fodder bank became limited (Oluka-Akileng *et al*., 2000). During the survey, *Sesbania sesban* and *Calliandra calothyrsus* were found to be the most common species for fuelwood and fodder production, respectively in the farmer's fields. Probably, this very big popularity of Sesbania may be because of its observed production of high woody biomass besides other properties that make it suitable for use as biomass (Von Carlowitz, 1991; Gutteridge, 2002). Therefore, adoption of Sesbania for fuelwood supply may have been encouraged by its possession of good qualities as well as its fast growth rate (Nair, 1993).

Further more, increased popularity of calliandra has been manifested through its vital role as a good quality fodder shrub (Lodoen *et al.,* 1998; Oluka-Akileng *et al.*, 2000). Nair (1993) reported that calliandra gives coppices well and good gives that are vital to animal diet. This importance might explain its adoption among farmers. It also appears that the wide spread planting of sesbania and calliandra is a result of the work of Vi-Agroforestry project. The project's aim is to increase firewood availability and food and nutritional security of households by 2010. The project supplies the seeds and technical support to the farmers to promote planting of sesbania and calliandra plus other multipurpose trees.

Dissemination of agroforestry technologies: Group and individual methods are some of the methods for extension work (Bo Tengnas, 1994) and suggested that non of these methods can be singled out as being the best one. However, Simute (1992) disagreed with Bo Tengnas (1994) by scoring individual method as the best approach through which farmers learn better. The selection and application of the method to agroforestry technology dissemination constitute the key to having an impact on farmer's field. Group and individual methods are some of the extension methods through which agroforestry information can reach farmers (Bo Tengnas, 1994).

Many different NGOs and extension workers facilitate extension activities as community meetings, method and result demonstration, field day and field tours, trainings, home visits, office calls and equiries, personal letters, telephone calls and informal contacts (Sim and Hilmi, 1987; Simute, 1992). It was found out that group methods were more preferred to individual methods. Similar studies from Western Kenya showed that CARE was working effectively by mainly using the group approaches to pass on technologies to the beneficiaries (Bo Tengnas, 1994). The large number of farmers encountered could be due to the more varied methods of extension used in group approach Sim and Hilmi (1987). Many farmers were able to get agroforestry information probably because of many different tools (activities) being used in group method as compared to individual method. The fact that in Kkingo sub-county groups were common could also explain why group approach was more feasible than individual approach. This is in line with the prediction made by Bo Tengnas (1994) that the more varied the methods of extension used in an area, the more people change their attitudes and practices.

The high number of respondents in focus group discussion could be because the majority of farmers were semi-literate and thought learning in a group would induce confidence and exchange of ideas (FAO, 1986). Another reason is that focus group discussions are less expensive in terms of staff, time and effort, to cover a given number of farmers. The few number of farmers that had learnt agroforestry information through training seminars could be because it is often difficult for farmers especially the women to absent from their homes for lengthy period (FAO, 1986; Sim and Hilmi, 1987).

The greater response in home visit could be because it is an obligation for every extensionist to visit all her/his farmers on their farms and whenever possible and carry out or teach agroforestry innovations from there. On the other hand, little number of farmers that had learnt agroforestry technologies by means of radio programmes might have been that very few farmers owned or had access to radios (Sim and Hilmi, 1987; Simute *et al.*, 1998).

The variance in preference could be explained by the assertion that the opportunities associated with group method outweighed their limitations. Therefore, this explains why there were significant variation ($p<0.05$) in preference between group and individual methods. The extension method that has more opportunities than limitations, will definitely prompt farmers to love that extension method (Sim and Hilmi, 1987). The variety of opportunities associated with group method such as:- farmers having chance to travel to new environment to see things; exposed to new ideas in practices through visits to research stations; exchange of ideas and experiences among group; many information being presented, or techniques demonstrated to several people at one time; discussion can take place, comments or suggestions can be offered by the group and questions from both sides can be asked and answered and direct contact between the group members themselves and the extensionist, contributes to high adoption of information and implementation (FAO, 1986; Sim and Hilmi,1987; Simute *et al.*, 1998). This might explains why farmers developed positive attitude towards group method and regarded it as a better provider of agroforestry information.

Going by accounts of the farmers, that group methods had many opportunities than individual methods, could be used as a guideline to explain why many farmers in Kkingo sub-county preferred group methods to individual methods. According to extensionists, how well the group will function, partly depends on the culture and wealth of the village. If the people are well-off, which in this case means to having enough food and safe drinking water, they are often more reluctant to learn with fellow farmers or groups. Often these farmers will meet and talk with the extensionist and then go home to implement learnt technologies. There was seldom real co-operation in such wealthy villages.

CONCLUSION

Our results show that group methods bring about many advantages and benefits for the farmers taking part in the project's activities. It was found out that group methods make development process in the villages more sustainable. Significance of the statistical differences between two farmers categories was sufficient to rejects the null hypothesis, that group methods and individual methods are equally effective in disseminating agroforestry technologies. Group methods farmers were work guided by the project staff in various discussion issues concerning the whole livelihood situation, problems and possibilities of community development through adoption of agroforestry technologies.

The creation of relatively better functioning working groups in the AoCs makes the extension service more efficient. Farmers who were learning agroforestry through group methods had better knowledge of various farming practices and ways to improve soil fertility. Another factor that makes group methods more effective is monitoring and evaluating that farmers perform. Since the members of the group monitor their progress, they can facilitate the work on achieving the goals agreed upon in the community action plan. This makes the village and farmers in particular less dependent on the presence of the project and increases the probability that the work will continue when the project phases out. It can be concluded that development and change brought about as a result of Vi-Agroforestry project may not be sustainable or last without the use of group extension methods.

RECOMMENDATIONS

There is a need for future research focusing on the impact of the current extension methods. Though the group extension teaching methods were used most, the extension services should use of both extension methods to overcome limitations associated one method.

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