Fodder legumes technology and farmer-to-farmer extension.

(A case of Desmodium and Calliandra in central Kenya)

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Paper contributed to the NARO Conference on "Integrated Agricultural Research for Development-Achievements, Lessons Learnt and Best Practice" to be held in September 1 – 4, 2004, Kampala, Uganda.(Paper 98-2)

**** =significant at 1%, **= significant at 5%, * =significant at 10%*

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ABSTRACT

Adoption studies on fodders legume technologies have shown that spread of the technology is significantly enhanced by informal methods of dissemination especially farmer-to-farmer extension. It is not known which type of farmers are involved in this dissemination. The objective of this study was to identify farm and farmer characteristics that influence farmer-to farmer extension hence identify the type of farmers that can disseminate fodder legume technologies. A random sample of 130 farmers who had been given calliandra in central Kenya responded to a structured questionnaire. Information collected included farm and farmer characteristics and the number of farmers the original farmer had given Calliandra outside the original group. A tobit model was used to analyze the data to get the magnitude of the effects of factors affecting the probability and the intensity of giving out the fodder. Results showed that farmers with positions in farmer groups** , community responsibility**, larger amounts of desmodium on the their farms** , more years of the fodder on their farms***; low access to markets* and off farm income* , were positively involved in spread of the fodder legume. It was recommended that this type of farmers be targeted with support to increase spread of the technology.

Key words: Information flow, tobit estimates, desmodium and calliandra, Kenya highlands

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Introduction

Since the late 1970s, the primary policy tool for sharing information about new agricultural technologies in developing countries has been the training and visit (T&V) system of extension (Birkhaeuser et al, 1991). This system was built around scheduled meetings between extension agent and 'contact' farmers, on the assumption that these farmers will then share the information about new technologies with other farmers in the villages. Since farmers have traditionally organized themselves into local organizations, T&V programs in most of Africa are now organized around local organizations in order to diffuse information more rapidly.

However, the extension systems in developing countries have gone through a decade or more of financial constraints that have stretched staff and services very thinly, and even immobilized them in some case hence transfer of knowledge from researchers to farmers has been low. There is need for significant changes in the institutional systems and relationships that are expected to produce innovation in agriculture and other aspects of rural life.

In the recent years, more attention is being given to participatory approaches to technology development and to farmer-to-farmer extension as a more viable method of technology dissemination or scaling out. It is characteristic of the farmer –to-farmer extension approach that farmers learn from other farmers about new agricultural technology and practices. The dissemination of innovations develops spontaneously when one farmer has successfully tested a new practice or technology, attracting the interest of other farmers. If the innovator is willing to share his/her knowledge, a farmer network may develop. The largest of this sort is the *ovimiento de campesino-a-campesino* in Central America (GTZ, Services for rural development). Farmer-to-farmer extension can also be in planned development projects. This approach is based on the conviction that farmers can disseminate innovations better than official extension agents because they have an in-depth knowledge of local crops, practices, culture and individuals, they communicate effectively with farmers, and are almost permanently available in the community. Innovations are provided by agricultural research, tested and adapted by selected farmers (called promoters or trainers), and, if considered valuable, passed on by hands-on experiences to fellow farmers. One of the criteria that must be met before farmer movement or network can develop is that the innovators must be willing to become farmer promoters (extensionists, trainers) who share their knowledge with other farmers (GTZ, Services for rural development). It is therefore important to identify this type of farmer to work with extensionists to increase technology diffusion among farmers.

This study analyzes farm and farmer characteristics that influence farmers' probability and extent of giving out desmodium and calliandra planting material and information. Calliandra and desmodium are fodder legumes that were introduced in highlands of central Kenya to reduce production costs of milk by reducing expenditure on concentrates among other benefits. Several attempts over the past decade to introduce these fodder legumes have been unsuccessful (Franzel and Arimi 1999). An adoption study in the area by Wanyoike (2004), showed that dissemination of the technology is more effective by use of informal methods especially farmer to farmer-to-extension.

The objective of this study was to identify farm and farmer characteristics that influence farmer-to farmer extension hence identify the type of farmers that can disseminate fodder legume technologies. These are the kind of farmers that technology promoters should work with if spontaneous spread of the technology is to be realized.

Methodology

The study area

The study was done in the highlands of central Kenya. Central Kenya is characterized by high human population, and although it is only 18% of the land area in the country, it has about 64% of the population. Population density ranges from about 100 persons per Km^2 in the dry lowlands to 1,000 persons per Km^2 in areas with high agricultural potential (CBS, 1994). Agriculture is the main activity in the area with coffee (medium to low) and tea (high altitude) as the main cash crops. Dairying production is an important farm enterprise and is second only to the cash crops in economic importance (Staal et al., 1997). In terms of cash flow, dairying takes on greater significance since regular payments are made compared to payments for cash crops which tend to be lumpy.

Due to the high human population, farm sizes in central Kenya are small average holdings being 0.9 ha to 2 ha per household (Gitau et al., 1994; Mwangi, 1994; Staal et al., 1997) and are decreasing rapidly because of subdivision. Animals are therefore confined in stalls and high yielding fodder crops, mainly Napier grass (Pennisetum purpureum), grown and cut and carried to the animals in a production system referred to as zero grazing. Approximately 80% of the dairy animals in Kenya are kept in this system (ILCA, 1979). Although the animals kept are capable of producing more than 10 litres of milk per day (Innuendo and Potter, 1986 as quoted by Mwangi, 1999), the actual values reported from farms are lower. In Kiambu, Gitau et al. (1994) reported that more than half the farmers were producing below 5 kg milk per day. This poor performance has been attributed to inadequate year round supply of forage and poor quality of the forages, especially supply of nitrogen and minerals.

Research design and data sources

In the period from March 1999 to May 2000 148 kg of calliandra seed and 20,000 mulberry cuttings were distributed by Systemwide Livestock Program (SLP) among 150 farmer groups with a total of 26000 households in the above-mentioned areas. Farmers were expected to begin benefiting from the technology in 2001. In the short rains of 2000, desmodium cuttings were distributed to a small number of these groups.

In March 2003, a list of all farmers in the groups that were given both C*alliandra* and *Desmodium* fodder legumes was made with the help of extension officers in the areas. From this list, 60 % of the farmers who had desmodium on their farms not later than 2001 and 60% of those who did not have the fodder were randomly selected. This list was the first generation farmers, which had 130 farmers. Interviews were carried out between July to August 2003.

Data collected from first generation farmers included farm and farmer characteristics as well as details about the fodder holdings. Farm characteristics include distance of the farm from the nearest access road and outlet market (distance in km) , number of years he/she has had the fodder on the farm, the number of cattle and goats owned by the farmer (in tropical livestock units), and the total amount of desmodium in square metres or number of calliandra trees on the farm. Farmer characteristics include the age of the farmer in years, level of education of the farmer, position of the farmer in the farmer groups (1 for official, and 0 for non-official) community responsibility of the farmer (1 for one with responsibility and 0 without responsibility), whether the farmer has received any farm training (1 for received and 0 for not received), whether the farmer visits other farms (1for visits and 0 for no visit), the number of farmers outside the group that the farmer had given calliandra or desmodium planting materials or information about the technologies. The distance of the second farmer from the first farmer was also recorded in km.

This data was analysed using a tobit model. The dependent variable was the number of other farmers outside the group that the farmer has given calliandra or desmodium planting material and information.

Results and discussions

The tobit estimates of the effects of farm and farmer characteristics on sharing of calliandra and desmodium technologies are as shown in table 1. Individual status seems to affect likelihood of giving out the materials in a positive way. This can be because farmers who have a position in the groups or a community responsibility, are also more likely to be outgoing hence more likely to interact with others and share about the technology. It is also these farmers, because of their position in the group, that talk to many other farmers as part of their duties hence a higher opportunity of giving out the technology to them.

Livestock ownership influenced whether farmers gave away materials i.e. the more goats they have the more likely they are to give away Calliandra. This may be a reflection of wealth positively influencing giving out of the material. It may also be that farmers with more livestock are in more cohesive groups and are used to sharing information. In contrast, the more cattle they have the less likely they are to give away desmodium. This is perhaps because they need the desmodium for their own animals and if they give out they decrease the holdings by pulling up material to be used as cuttings, which is not the case for Calliandra since they give out seeds. This reflects on characteristics of the material affecting diffusion of the technology.

Distance to road as a market access indicator seemed to influence likelihood of giving out calliandra. That is the further away the farm is from the road the more the more likelihood of giving out calliandra. Perhaps the further away the farmers are from the road and therefore the lower market access that they have means they and therefore their neighbours rely more heavily on non marketed inputs. This result contradicts studies on adoption other technologies. This is because fodder legume technology is to substitute for concentrates.

Other farm visit had no effect on giving out calliandra and desmodium suggesting that these kinds of visits do not involve discussion of new technologies. The same finding was observed by Palis et al, (2002) in the villages of Nueva Ecija in the phillipines where conversation in neighbours houses when they converge was generally wider in scope and more common topics discussed are family affairs, politics, “hot” events in the village, and gossips. In any case, when farming is discussed in these situations, the new technologies introduced will more likely not get enough attention. Such visits may suppress more beneficial farmer group meetings in which the farmer would have been taught more about the new technologies to share with other farmers.

The amount of *Desmodium* a farmer has on the farm had the greatest positive effect on both the extent and probability of giving out desmodium. This factor had no effect on giving out calliandra. This can because of kind of material the farmers were passing over to others. For desmodium, it was desmodium vines and for calliandra it was seeds or seedlings. A farmer with a bigger plot of desmodium has enough to easily give out some.

It was shown that the more years the farmer has had calliandra on his farm the more the farmer is likely to give out the *Calliandra* to other farmers. It is most likely that the farmers who have had the fodder for a longer time have had time to test the technology and seen its benefits hence can share this out. This can also be associated to the mode of propagation of *Calliandra*. In order for the farmer to be able to give out *Calliandra* to others, the fodder must first be left to produce seeds, which can be given to other farmers in form of seeds or seedlings. This takes time hence farmers who have had *Calliandra* on their farms for a longer time, can harvest seeds and share out to others.. The corresponding variable for desmodium was not significant. This is perhaps because desmodium is not propagated from seeds but from vines. Hence the issue of time in this case of desmodium is irrelevant.

Off farm income had a positive significant effect at 10% level for calliandra, which can be associated to the fact that farmers with off farm income are also likely to interact with others and share out the new technology. This is because they interact with other people away from the farm, which gives them a personality of confidence in sharing information with others. It has been found that farmers have fear to share out information about new technologies because they feel others might think they are boasting (Palis et al; 2002), a problem that could be considered more likely to occur with farmers who do not interact much with others outside the farm.

Age of household head being insignificant in its effect on both giving out desmodium and calliandra although positive can be associated with the interaction between the old farmer having experience in the fodder technologies given that they were introduced some years back by other projects and the fact that old farmers are not active in farmer group meetings to learn more about the technologies and are also inactive in interacting with others to share information. A similar interaction seems to exist in the effect of education level on giving out information, which is positive but insignificant for both calliandra and desmodium. Farmers with a higher level of education may be more conversant with the technology and its benefits which they can share out with other farmers but at the same time some may be well off that they may prefer concentrates and not be enthusiastic about sharing information about fodder legumes which they think is a hassle.

Conclusions

Although the likelihood of farmers giving out calliandra was affected by the type of person, characteristics of the farm and the technology seem more important in affecting diffusion. There were some indications that specific characteristics of the fodder related to mode of propagation (via seeds or vegetative propagation) were likely to affect diffusion. In considering scaling-up of fodder adoption the different factors hindering the diffusion of individual fodders must be taken into consideration.

It can also been concluded from the study that in some cases it is helpful to target more influential members of the community as well as the resource- endowed farmers with the technology since they seem to be the ones who are sharing out the technology to others than the others. It is also important to note that farmers who are away from the market are the ones who should be targeted with the fodder legume technology because they share it out more than others, although this may reflect the appropriateness of the fodders for different types of farmers.

Acknowledgement

Funding support by the Smallholder Dairy (R&D) Project (SDP) of the Kenya Ministry of Livestock and Fisheries, Kenya Agricultural Research Institute and International Livestock Research Institute, through the UK Department for International Development (DFID) is gratefully acknowledged. The views expressed are not necessarily those of the DFID.

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Table 1: Tobit estimates of farm and farmer factors that influence giving out of Calliandra and desmodium planting material.

	Desmodium			Calliandra		
Variable	Coefficient	Change in extent of giving out	Change in probability of adoption	Coefficient	Change in extent of giving out	Change in probability of adoption
Age of household head	0.03(0.04)	0.01	0.36	0.02(0.3)	0.01	0.23
Years of education of household head	0.06(0.14)	0.02	0.73	0.05(0.10)	0.02	0.61
Group official	1.96(0.97)**	0.51	22.86	1.29(0.72)*	0.43	16.98
Comm. responsibility	-0.2(0.86)	-0.05	-2.25	1.50(0.76)**	0.51	19.81
Off farm income	-0.14(1)	-0.03	-1.56	1.38(0.76)*	0.47	18.29
Other farm visit	-2.48(1.1)	-0.71	-30.78	-0.58(0.87)	-0.19	-7.67
Area of *Desmodium*	3.12(0.22)**	0.83	50.1	0.00(0.00)	0.00	0.01
Number of cattle	-0.72(0.43)*	-0.18	-8.33	0.47(0.15)***	0.15	6.24
Number of goats	-0.22(0.32)	-0.06	-2.55	0.23(0.31)	0.08	3.08
Years of *Desmodium*	-0.06(0.07)	-0.02	-0.71	0.49(0.28)*	0.16	6.47
Distance to road	-0.29(0.23)	-0.07	-3.41	0.26(0.14)*	0.08	3.39
Constant	-0.82(3.3.36)	-0.21	-9.55	-5.68(2.78)	-1.85	-75.12

***= Significance at 1%; **= significance at 5%; *= significance at 10%; Values in parentheses are standard errors.
Total number of observations (n) =131