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MINISTRY OF AGRICULTURE

DEPARTMENT OF RESEARCH AND TRAINING



FARMING SYSTEMS RESEARCH PROGRAMME, LAKE ZONE/CIAT REGIONAL BEANS
PROGRAMME AND NATIONAL BEANS RESEARCH PROGRAMME

~~THE~~ ADOPTION AND DIFFUSION OF LYAMUNGU-90 BEAN VARIETY IN
KAGERA REGION, TANZANIA

FIELD NOTE No.58

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THE ADOPTION AND DIFFUSION OF LYAMUNGU-90 BEAN VARIETY IN
KAGERA REGION, TANZANIA

FIELD NOTE No.58

BY

MAFURU JM¹, L. MUKANDALA², J MAIMU³ AND CH. BOSCH⁴

1. Agricultural Economist, ARI-Ukiriguru, P.O.Box 1433-Mwanza
2. Agronomist, ARI-Maruku, P.O.Box 127-Bukoba
3. Agronomist, CIAT Regional Beans Programme, Box 2704-Arusha
4. Technical Advisor (Agronomist), FSR Programme, Lake Zone,
Box 127-Bukoba

ACKNOWLEDGEMENTS

Many people have contributed to this study. Authors acknowledge the Farming Systems Research Project, Lake Zone and CIAT Regional Beans programme for the financial support which made this study possible. We thank the enumerators; Mr C Rugaiganisa, Mrs P Ngaiza and Ms B Mnyaga for conducting the interview. Special thanks go to the farmers, village extension workers and beans traders for their patient and understanding during the interview. Last, but not least we thank the review team; Dr Bart de Steenhuijsen Piters, Mr Leonis Ndege and Mrs Koos Kingma for their comments and encouragements they gave to us.

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SUMMARY

This survey was conducted during 1994/95 season in three districts in Kagera Region. The main objective was to assess the performance of Lyamungu-90 beans after three years since 1992 when it was first distributed to farmers. A total of 94 farmers was selected from a list of those who received seeds of Lyamungu-90. Eight villages were visited during the survey. Also, ten village extension officers and eighteen beans traders were interviewed using a questionnaire. Descriptive statistics and a multiple regression model were used to analyse the data.

Results show that 71% of the respondents are still growing Lyamungu-90, and most of them would like to grow more of it. The new variety has been grown during both short and long rains with more quantities being grown in the short rains. Of the three districts, Lyamungu-90 has been accepted more in Karagwe District followed by Bukoba Rural and lastly Muleba. The reasons being earlier acceptance of Lyamungu-85 in Karagwe which is similar to Lyamungu-90. Farmers appreciate Lyamungu-90 because of its palatability, high yield and early maturity. Other features are good market and tolerance to heavy rains. The only negative aspect mentioned by farmers is vulnerability to storage pests (bruchids). Similar response was obtained from extensionists and beans traders.

Seeds are mainly distributed through giving gifts to relatives and friends. The transfer model is said to be demand-driven since seeds are given only when asked for by others. The effectiveness of this model depends on seed availability and level of awareness in the village/area. Market potential is not yet an important aspect of Lyamungu-90 in Bukoba and Muleba Districts but it is important in Karagwe. The only socio-economic factor having significant positive effect on the diffusion of Lyamungu-90 was seed availability. This reflects the need to establish seed distribution programmes to ensure adequate supply. Also, to speed up the demand there is a need to embark on awareness raising strategies such as using already existing Lyamungu-90 extension leaflet developed jointly by FSR programme and beans section at Maruku research Institute to inform farmers on characteristics of the new variety. Furthermore, recommendations on beans storage methods should be demonstrated to farmers for adoption.

1.0 INTRODUCTION:

Beans are the second most important food crop in Kagera Region after banana. Many local varieties of beans are known among beans growers in the region. About 50 to 70 bean varieties are recorded to be grown in Bukoba District (Bosch et al, 1990; Nkuba et al., 1995). Traditionally, beans are a major component of the local dish (matoke) cooked in a mixture of bananas, fish or meat. Beans are the major source of protein to many households. They can be categorized/grouped as small, medium or large seeded varieties. Traditionally the small seeded varieties are mainly used for home consumption while the large seeded ones are marketed.

Lyamungu-90 is an improved large seeded bean variety released for medium altitude areas 1000-1500 masl (Kagera and Arusha) in 1990 after it proved to be high yielding (Mushi et al, 1990). The variety was tested against local varieties (Lushara and Kisapuli) first on station then on-farm in farmers fields in Bukoba, Muleba and Karagwe Districts during 1988-1990 seasons (Bosch et al., 1990). According to farmers Lyamungu-90 out-yielded the large seeded local varieties, and farmers showed interest of growing it.

Seeds of Lyamungu-90 bean variety were distributed to farmers in Bukoba, Muleba and Karagwe Districts in Kagera Region in September 1992. A total of 240 farmers in fifteen villages (7 Bukoba, and 4 in each of Muleba and Karagwe). Each farmer received half a kilogramme of seed. Farmers were asked to grow the variety under their own management practices (i.e decide on the design, planting dates and uses of the harvested beans).

It was hypothesized that farmers would retain the new variety if it's performance was comparable or superior to the existing large seeded varieties. The major factors influencing the adoption and/or diffusion rates are (1) socioeconomic environment of the location, (2) taste and (3) preferences of the individual farmer. Therefore, the degree of adoption would vary between and/or within locations and farmers.

This study was conducted in order to assess the performance of Lyamungu-90 over a 3 year period since September 1992 when it was distributed.

Specific objectives were:

- To assess the acceptability to farmers of Lyamungu-90 improved bean variety.
- To investigate whether farmers exchange seeds and information on this bean variety with the aim to get insights in local bean distribution mechanisms.
- To identify constraints to adoption of Lyamungu-90 bean variety.

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This paper describes the results of the survey conducted in the area. The paper is divided into six sections. Section two describes the study area. Method used and results of the survey are presented in sections three and four respectively. The discussions are in section five, while conclusions and recommendations are summarized in the last section. It is expected that findings and recommendations from this study will be used to improve the adoption of the variety under study.

2.0 THE STUDY AREA

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The study was done in Kagera Region which is situated in the North-west part of Tanzania. The area is bordered in the North by Uganda, Lake Victoria on the East, Rwanda and Burundi on the West while further to the South it is bordered by Mwanza and Kigoma Regions. The region is administratively divided into five districts: Bukoba, Muleba, Karagwe, Biharamulo and Ngara. Among these, the first three are the major bean producers.

2.1 Muleba District

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The study in Muleba District was carried out in Nshamba and Bulamula villages. The district has a bi-modal type of rainfall: Long rains (Masika) in March to May and short rains (vuli) from September to January. The average annual rainfall for Nshamba and Bulamula villages are 1100mm and 1400mm respectively. Both villages are located on Bukoban sandstone. Bulamula is on the Kamachumu plateau (1600 masl) and Nshamba is in the south of the plateau (1250 masl). Nshamba is near the bean markets (Nshamba and Muleba), connected by a malum road from Nshamba to Muleba town where it joins the main road from Bukoba to Mwanza. This village had also good results were obtained in previous on-farm trials. Bulamula is far from bean markets (Bukoba and Muleba) towns. It is 6 Km Northeast of Kamachumu centre with two local roads one connecting to the main road Bukoba-Mwanza via Muhutwe and another passes via Nshamba to Muleba town. Nevertheless, most of the beans produced in Muleba District are locally consumed.

2.2 Karagwe District

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Due to the mountainous relief, the climate of Karagwe is characterised by variable annual rainfall, ranging from 800mm in the Northeastern lowlands to 1300mm in Northwestern highlands. The main rainy seasons are March to May (Masika) and September to January (vuli), the later being the main bean growing season. The average annual rainfall in the two villages selected (Katembe and Bwema) does not differ very much (900-1100mm). The soils in both villages are derived from Karagwe Ankolean parent materials (Bosch, 1990).

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Katembe is near Kayanga Market. It is connected by a good malum road to Kayanga town where it joins the main road to Bukoba town. Bwema is situated far from the bean market but with relatively good local road which connects it to Kayanga town. In general

Karagwe District is the largest bean producer and exporter in Kagera region. Farmers in Karagwe rank beans second to coffee as source of cash income (Ndege et al., 1995).

2.3 Bukoba District

Unlike Karagwe and Muleba Districts, the climate of Bukoba is very much influenced by Lake Victoria and its topography basically characterised by low plains to highlands (1300m asl). There are two main rainy seasons. The long rains (Masika), starts from March to June; and short rains (vuli), from September to January. However the latter is the main season for bean production. There is a steep gradient in mean annual rainfall: from 2000mm along the coast where the soils are acidic and poor in nutrient status, to 800mm in the far west of the district where the soils are relatively better than that in the coast areas.

Most of the soils in Eastern part are derived from Bukoban sandstone while soils in the Western part are derived from Karagwe-Ankolean parent materials (Touber and Kanani, 1994). The study included Buhekera village in the eastern and Kyaitoke village in the Western with average annual rainfall of 1500mm and 900mm respectively. Kagondo (1000mm) represented the central zone. Generally soil fertility is a major limitation to bean yields in Bukoba. Nevertheless the western part of the district has a high potential for bean production. This is the area which produces surplus beans for sell. With the only exception of Kanyigo village which is far and with poor local road to Bukoba town the rest are connected to Bukoba market by reasonable good malum roads.

Temperatures in Karagwe, Muleba and Bukoba Districts vary greatly from 15 to 28 C degrees with the mean of 20 degrees.

2.4 Land Use Systems:

The majority of the bean crop in the three districts is produced in complex associations with other crops, mainly bananas. Small scale farmers are the principal producers of beans in all districts.

The land use systems in all the study area (Karagwe, Muleba and Bukoba) are more or less similar. The system is basically dominated by permanent banana gardens (Kibanja) concentrated in clusters, surrounded by extensive grassland under periodical fallow (Kikamba or Rweya).

Kibanja is the most important production unit in the farming system where the house is situated. Crops grown in the Kibanja are Banana/coffee/beans. The beans are interplanted in the Kibanja during the rainy season; September-January (Vuli) and March-June (Masika) in Karagwe and the western part of Bukoba District.

Semi-permanent cultivation of annual crops is practised in Kikamba landuse type. These are plots in the immediate surrounding of Kibanja. They are devoted to annual crops like cassava, sweet potatoes, maize, sorghum, groundnuts and beans. Bean production on this landuse type is very important in Karagwe District and Western part of Bukoba District which have a good bean production potential. Bean yield depends mainly on land use system and variety used. In Karagwe the average yield obtained by farmers on Kibanja and Kikamba landuse types are 500 Kg/ha and 1000 Kg/ha respectively (Ndege al el., 1995).

Rweya is a grassland unsuitable for crop cultivation. It is used mostly as grazing area. Cattle has an important role in the system by producing manure.

Generally the intensive use of land varies from one district to another depending on the population pressure and market integration. It is very high in the Bukoba coast, medium in Muleba and relatively low in Karagwe.

It is estimated that about 90% of all the Kibanja landuse type in the area is planted with beans during the main bean growing season (September-January). Despite its rapid increase in importance as a cash crop, women are still playing a dominant role in bean production.

There is no well established formal market for beans. Local private traders buy beans from farmers and sell to consumers or other traders. Some of the beans produced in Karagwe, Bukoba and Muleba Districts are sold outside the region. Despite the great potential for increased production and apparent stability of the traditional production system, bean productivity in the area is low. The major constraints to bean production include soil fertility, periodical moisture stress (Karagwe and Bukoba west), low yielding potential of local varieties, insect pests and poor marketing of beans.

3.0 METHODOLOGY.

The survey was conducted in three districts in Kagera Region in November and December 1994. The sample villages were selected from those where Lyamungu-90 seeds were distributed in September 1992. Eight villages were visited during the survey. The distribution of the villages were Bukoba rural(4), Muleba(2) and Karagwe(2).

In Bukoba rural District the villages visited were purposely selected based on the agroecological zones, distance from market and whether the beans on-farm variety trials have been conducted in the village. Distance from the nearby market was used in order to assess the influence of market on the diffusion and adoption of Lyamungu-90 bean variety. Three agro-ecological zones exist in the district (FSRP, 1989). One village from each zone was selected (i.e Buhekera, Kagondo and Kyaitoke to represent

study farmers who are still having the seeds for the last four seasons are considered to have adopted the new variety. Therefore, the variety appears to be most acceptable in Karagwe followed by Bukoba District and lastly Muleba (Table 1).

Table 1. Number of farmers adopted Lyamungu-90 bean variety in Bukoba, Muleba and Karagwe Districts, 1994.

	Bukoba	Muleba	Karagwe
Currently grow	32	13	22
Used to grow	16	10	1
Total	48	23	23

Source: Survey, 1994

Farmers who are no longer growing the new variety mentioned lack of seeds after a total loss was the main reason. Others are storage pests and crop failure. Only three farmers did not appreciate the variety.

4.2 Production of Lyamungu-90

There are two growing seasons in the study area, short and long rains. Normally beans are grown during both seasons with large quantities in the short rains. Results show that Lyamungu-90 has been grown by farmers during short and long rains (Table 2). However, in Muleba and Bukoba Rural Districts farmers like to grow more during short rains than long rains, but the difference is not big in Karagwe District.

Table 2. Number of farmers growing Lyamungu-90 by seasons

District/Season	SR 92	LR 93	SR 93	LR 94	SR 94
Bukoba Rural	45	7	33	7	32
Muleba	23	3	17	2	13
Karagwe	15	16	18	13	22
Total	83	26	68	22	67

Source: Survey, 1994

SR=Short Rains; LR=Long Rains

About 95% of farmers planted Lyamungu-90 bean variety during the first season in Bukoba and Muleba District while in Karagwe only 53% grew the new variety. In the subsequent seasons the number of farmers who grew Lyamungu-90 increased in Karagwe, but decreased in Bukoba rural and Muleba Districts. The reason is that in Karagwe, Lyamungu-85 (ruzikoko) which is similar to Lyamungu-90 is widely grown. Therefore, adoption of Lyamungu-90 has been fast after farmers have tested and compared the two varieties. Farmers said that they prefer Lyamungu-90 over Lyamungu-85 (ruzikoko) because of high yield, marketability and palatability.

In Bukoba and Muleba Districts the variety was new, hence farmers wanted to test and evaluate the variety under their own conditions. Therefore a decrease in the number of growers could mean that the variety has low acceptance in these districts.

Table 3 shows the average amount of Lyamungu-90 planted across the seasons. The amount of seed planted increased from the first season to the fifth season. All three districts show a similar trend. However, the increase in Karagwe was more pronounced than in other districts because of its market potential.

Table 3. Average seed quantities of Lyamungu-90 planted per season per farmer(kg)

	SR 92	LR 93	SR 93	LR 94	SR 94
Bukoba	0.5	2.2	3.5	3.1	4.7
Muleba	0.5	2.0	2.0	2.3	3.2
Karagwe	0.5	7.3	9.2	2.2	22.3
Total	1.5	11.6	14.7	7.6	30.2

Source: Survey, 1994

When farmers were asked to rank the first three varieties they have been growing during the last five seasons (short and long rains), Lyamungu-90 was among the many varieties grown, during the short rains in Bukoba rural. Others were Tikyakuponza, Lushara, Kisapuli and Mwanamwana. Lyamungu-90 ranked third in all villages in Bukoba District. However, during the long rains Lyamungu-90 was not grown except in Kagondo and Kyaitoke. During the long rains, the preferred varieties are Kisapuli, Lushara and Mwanamwana.

In Muleba District Lyamungu-90 was ranked third in the short rains, and second in the long rains. Other important varieties grown by farmers during short rains are Kisapuli, Kyakaragwe, Temekibira, and Lwondela. During the long rains, farmers grow Kisapuli, Lyamungu-90, Mwanamwana and Tibihabwa.

The preferred varieties in Karagwe are Lyamungu-90, Lushara, Kisapuli and Kyakaragwe during short rains, while in long rains farmers prefer to grow Lyamungu-90, Mwanamwana, Lushara, and Kyababikira. Therefore, in all districts, Lyamungu-90 bean variety is becoming popular among beans growers both in short and long rains seasons. Farmers' ranking is shown in Appendix 2.

Production levels of Lyamungu-90 per district increased over time. Harvesting fresh beans is a common practice in all districts. It was observed that each season large quantities of fresh beans were harvested and consumed fresh at home. Table 4 shows the trend of production levels for dry beans. It indicates that the production of Lyamungu-90 dry grains per season in Karagwe District is higher than that of Bukoba and Muleba Districts. One of the reason is that Karagwe District produces

more beans than any other district in Kagera Region, because of its suitable climate, soils and influence of markets (availability of suitable markets).

Table 4. Beans production in three districts in Kagera Region (Kg).

District/season	SR 92	LR 93	SR 93	LR 94
Bukoba	390	95	681	158
Muleba	90	104	210	133
Karagwe	217	858	1270	2267

Source: Survey, 1994

4.3 Farmers' Assessment.

Farmers were asked to rank the positive and negative aspects of Lyamungu-90 bean variety by comparing with the most preferred variety i.e. Kisapuli and Lushara, and Lyamungu-85 (for Karagwe District). The results are indicated in Table 5.

Table 5. Positive and negative aspects of Lyamungu-90

Positive Aspects	% of farmers	Negative Aspect	% of farmers
1. Palatability	90.0	1. Vulnerable to storage pest	51.0
2. High yielding	71.0		
3. Early maturity	54.0		
4. Tolerance to heavy rains	44.0		
5. Marketability	22.0		

Source: Survey, 1994

The variety has several positive aspects as indicated above hence accepted by farmers. The problem of beans storage in the study area has been documented in previous studies (Nkuba et al, 1995; Rwiza and Mafuru, 1991). The large seeded varieties are more vulnerable to storage pests (bruchids) than small seeded varieties. This poses a threat to the adoption and or diffusion of Lyamungu-90 although there are no indications that Lyamungu-90 is more susceptible to "bruchids" than other large seeded varieties like Kisapuli and Lushara.

The high ranking of palatability and low ranking of marketability might indicate that Lyamungu-90 bean variety in the mean time is mainly for home consumption. While selling Lyamungu-90 is yet an important aspect it is likely to change with time because most large seeded varieties fetch high prices in the market. Also, Lyamungu-85 has been accepted by farmers because of its high market value. The same may hold for Lyamungu-90. Already farmers who received seeds of Lyamungu-90 in Karagwe are replacing Lyamungu-85 by Lyamungu-90 because the latter is even better

preferred for marketing.

4.4 Farmers future plans concerning Lyamungu-90

Farmers were asked to indicate their intentions regarding Lyamungu-90 bean variety. About 63% of those who responded would like to increase the area they plant with Lyamungu-90, 29% would not change the acreage they currently grow and, 8% will reduce their acreage under Lyamungu-90. The results confirm the acceptance of Lyamungu-90, by farmers in Bukoba, Muleba and Karagwe Districts. For those who are intending to increase the farm size under Lyamungu-90 they are intending to decrease Kisapuli, Mwanamwana and Lushara beans varieties. The reason mentioned was higher yields obtained with Lyamungu-90 and tolerance to heavy rain.

4.5 Diffusion of Lyamungu-90

Primary uses of beans produced by farmers who grow Lyamungu-90 are food, market sales, seeds for future use and transfer to other farmers (through gifts or selling). Sharing seeds as a gift is a common practice in the study area. About 5% of the beans harvested was given away. This was more in Bukoba rural and Muleba Districts but less in Karagwe (Appendix 3). When farmers were asked why they gave away seeds as gifts, they said it was their tradition to give friends and relatives gifts. Selling seeds to other farmers was practised in Karagwe District only but not in Bukoba/Muleba. Therefore implying that new seeds can spread rapidly through informal structure as gift.

Previous studies conducted in Bukoba rural District showed that buying from village markets is an important alternative source of seeds in addition to own source (Nkuba et al, 1994). Gift from friends and relatives were considered as minor source. Results from this study show that for a new variety where the availability of seeds is still limited, informal distribution mechanism becomes the major source of seeds. Table 6 shows the quantities and number of farmers who have received seeds of the new variety from the first recipients.

Table 6. Quantities of Lyamungu-90 given to others (kg).

	SR92	LR93	SR93	LR94
Bukoba Rural	50 (12)	11 (6)	48 (33)	2 (1)
Muleba	14 (5)	12 (3)	18 (2)	24 (5)
Karagwe	9 (3)	20 (4)	84 (17)	50 (12)
Total	73 (20)	43 (13)	150 (52)	76 (18)

Source: Survey, 1994

Numbers in the parentheses are farmers who received the seeds from the respondents.

The number of farmers who have given seeds as gift to friends, relatives and neighbours are; 23 in Bukoba, 5 in Muleba and 8 in Karagwe Districts. A total of 103 farmers have received seeds of 'Lyamungu-90' from 36 farmers out of 94 who were given by researchers in September 1992. More farmers have given away and received the new variety in Bukoba Rural District than in the other districts. This has to do with lack of other sources of the new seed in the district, also the fact that many farmers wanted to test the new variety may have influenced the informal distribution mechanism. On the other hand, large quantities of 'Lyamungu-90' were given away in Karagwe than in other districts.

The role farmers play in diffusing new technologies has been documented in several studies. Grisley (1992) described farmer-to-farmer technology transfer as a supply/demand driven model. The model is said to be supply driven when farmers transferring the new technology are active and those receiving the technology or information are passive. Where farmers receiving the technology are active and those supplying are passive, the model is called demand driven. Results from the survey indicate that seed transfer in the study area is demand driven. Farmers gave seeds because they were asked for. Also it was observed that farmers will transfer seed when they have enough for their own use. Majority of the farmers responded that they did not give or sell seeds because they had little for their own use (planting and home consumption). Since the major source of planting seeds is from their own stock; farmers would give away seeds when they have enough for their own needs. Hence, the performance of this model would depend on the initial amount acquired/produced by the first recipients.

Twenty farmers lost their seeds through storage pests and some ate all. Only 9% farmers interviewed bought seeds from other farmers. The reasons for buying seeds were for restocking after crop failure and to get more seeds. Farmers who did not buy new seeds mentioned unavailability of the seeds (26%) as the major reason and others (65%) had enough seeds from their own stock.

4.6 Knowledge of Village Extension Officers (VEOs) on Lyamungu-90

Village extension officers were asked whether they were aware of the existence of new varieties in their area of operations. All extension workers interviewed had seen farmers growing new varieties in their area. In Bukoba rural and Muleba Districts, the new varieties mentioned by extension workers were Lyamungu-90, and Kyakaragwe. While in Karagwe the varieties mentioned are Lyamungu-85 and Lyamungu-90 both are locally known as "ruzikoko". These varieties were first grown between 1989 and 1993 seasons mainly during the short rains and at a limited scale in the long rains. 66% of extension workers interviewed have seen farmers growing Lyamungu-90 bean variety in their area. According to the extension workers, farmers prefer Lyamungu-90 variety because it tolerates heavy rains and drought (38%), marketability (25%), palatability (25%) and high yields (25%). Only one extensionist

- x_1 = Sex of the respondent
- x_2 = Type of the household
- x_3 = Level of education of the respondent
- x_4 = Number of years the farm has been cultivated
- x_5 = Cattle ownership
- x_6 = Hire labour
- x_7 = Work for others as labourer
- x_8 = Shop ownership.
- e = Error term

These variables were assumed to affect farmers' decision on whether to give seed or not. Amount of seeds for planting during the season reflect the availability of seeds in the area, hence used as a proxy variable to various sources of seeds i.e market, friends and other seed suppliers.

Results of the multiple regression analysis are presented in Table 7.

Table 7. Parameter estimates of the multiple regression model of socioeconomic factors influencing diffusion of the new variety

Variable	Bukoba	Muleba	Karagwe
a	2.029	-10.555	62.776
x_1	0.129(3.31)**	1.895(3.75)**	-0.060(-0.65)
x_2	0.485(0.76)	7.130(1.43)	-51.382(-5.05)**
x_3	-0.835(-0.22)	-7.636(-2.20)	12.715(1.99)
x_4	0.192(0.27)	0.976(0.25)	-12.446(-1.65)
x_5	-0.049(-2.05)	-0.026(0.24)	-0.766(-2.51)
x_6	0.399(0.49)	-8.382(-2.53)	2.677(0.28)
x_7	-0.230(-0.34)	2.986(0.69)	20.960(2.96)*
x_8	-1.450(-1.32)	4.060(0.82)	10.900(0.55)
x_9	-1.185(-1.14)	15.840(3.83)**	-11.198(-0.58)
R ²	45.5%	82.2%	73.3%

Numbers in the brackets are t-values

The results show that in Bukoba District the socio-economic variables influencing the decision of farmers to give seeds of the new variety to friends are seed availability, type of household, education level of the farmer, and cattle ownership. But only amount of seeds planted have significant effect on the diffusion of Lyamungu-90. Other variables do not favour the diffusion of the new variety. In Muleba District variables having positive effect are seed availability and level of education of the farmer. Others include the ability to use hired labour, and whether farmer works for other people. Also, shop owners are likely to spread the new varieties more fast. In Karagwe, type of household, cattle ownership and hiring labour have positive effect on the decision to give seeds to other farmers. However, farmers who use hired labour give more seeds to others than those who worked for other people.

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be fulfilled when extension departments are fully aware and informed on sources and the availability of seeds in addition to the performance of the new variety. Involvement of NGOs in distribution of large seed quantities in the initial stage would be one of the best ways of ensuring adequate and proper supply during early stages of introducing the new variety.

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Investigations on the effect of selected socio-economic factors on the amount of seed transferred as gift revealed that not all factors included have positive effect on farmers' decisions. Seed availability was important in two districts (Bukoba and Muleba) but it was not important in Karagwe District. This confirms earlier assumption that initial quantities of seed given to the first recipients should be enough to allow a big harvest to facilitate seed transfer. But other factors like soil fertility and viability of the seeds are also important in the diffusion of Lyamungu-90. It was observed that the amount of seeds given as gifts to friends during the first short rains were less than in the subsequent short rain seasons (Table 2). On average each recipient received 1.6 kg in the first season, the quantities increased to 3.31 and 4.17 kg per recipient in the second and third short rain seasons respectively. The amount of seeds planted was not important in Karagwe because of high production levels which make the seeds easily available.

Sex of the respondent does influence the decision to give seeds to friends and relatives. Female farmers have a tendency to give more seeds than male farmers in Muleba and Bukoba Districts unlike in Karagwe. Traditionally female are responsible for the production of beans, hence the tendency by female farmers in giving seed as gifts. However, it has been observed that a female crop once it attains market value it is taken over by men (Nkuba et al., 1995). In Bukoba and Muleba Districts substantial amount of beans are consumed at home, some given to friends, and others are stored as seed for planting in the next season. Selling was not yet a major use of the new variety, therefore, women play an important role in the decision for uses. In Karagwe it was observed that large quantities are sold to the market/traders hence bean production is an important economic activity, men here have an important role in the decision on what to do with the harvested beans.

Furthermore, it was observed that, in Muleba and Bukoba Districts farmers with formal education are likely to give out more seeds of the new variety than those without formal education. While on resource ownership, cattle owners will transfer more seeds than non-cattle owner in Bukoba and Karagwe Districts. Households who hire labour will give more seeds to others than those working for other people as labourers in Muleba and Karagwe. Shop ownership significantly influence farmers to transfer seeds.

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APPENDICES

APPENDIX 1a

QUESTIONNAIRE FOR LYAMUNGU-90 DIFFUSION STUDY IN BUKOBA, MULEBA AND KARAGWE DISTRICTS-KAGERA REGION

IDENTIFICATION

Investigator: _____
Village: _____ Ward: _____
Farmer's name: _____

ACQUISITION OF LYAMUNGU-90

1. Do you grow Lyamungu-90?
Currently grows _____ 1
Used to grow _____ 2

2. How did you first obtain seed of Lyamungu-90
Trials _____ 1
From distribution programme _____ 2
From extension agent _____ 3
Others (specify) _____ 4

IF PARTICIPATED IN TRIALS:

3. Seasons when farmer participated in beans variety trials
Vuli 1989 _____
Masika 1990 _____
Vuli 1990 _____
Masika 1991 _____
Vuli 1994 _____

ASK ALL FARMERS:

4. During which seasons have you grown Lyamungu 90?

Vuli 1992 _____
Masika 1993 _____
Vuli 1993 _____
Masika 1994 _____
Vuli 1994 _____

5. How much seed of Lyamungu-90 were you given first time you received it? _____

6. How much seed of Lyamungu-90 did you first plant? _____

7. What do you like and dislike about Lyamungu-90?

POSITIVE ASPECTS

NEGATIVE ASPECTS

8. VARIETIES GROWN BY SEASON

Which bean varieties do you usually grow by season?. Rank up to the three most important varieties in terms of the amounts usually planted.

	VULI	RANK	MASIKA	RANK
1.	_____	_____	_____	_____
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____

9. Since 1992, during which seasons did you plant Lyamungu-90?. How much seed did you plant each season?. How much did you harvest after each season in fresh and in dry states?. How much did your household consume after each season in fresh and in dry states? How much Lyamungu-90 did you sell after each harvest?.

Season/ planted	Amount planted	Amount harvest- ed fresh	Amount harvest- ed dry	Amt.con -sumed fresh	Amt. cons dry	Amt. sold
Vuli 92						
Masika 93						
Vuli 93						
Masika 93						
Vuli 94						

IF FARMER STOPPED GROWING THE VARIETY:

10. Why did you stop planting Lyamungu-90?

IF NO LYAMUNGU-90 SOLD DURING ONE OR MORE SEASON:

11. Why didn't you sell any Lyamungu-90?

12. All the seasons you have planted Lyamungu-90, have given seed to anyone Y/N. If yes fill the following table.

Season/year	Name of farmer	Relation-ship	Village	Ward	Amount

Code for relationship: F= friend, R= relative, N=neighbour,

13. Why did you give the beans away as a gift?

IF NO LYAMUNGU-90 GIVEN AWAY:

14 Why didn't you give away any Lyamungu-90 to other farmers?

RESTOCKING

15. Since you have been growing Lyamungu-90, have you ever been without seed of that variety to plant? Y/N

If Yes; How did you loose your seed?

- Crop failure _____
- Eaten by storage pests _____
- Seed moulded/rotted _____
- Ate all seed _____
- Sold all seed _____
- Other (specify) _____

16. Besides the initial seed you were given, have you ever bought Lyamungu-90 seed or obtained it in any other way? Y/N

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did you
How much
d in dry
arvest?.

Amt.
sold

IF YES:

17. How many times did you buy or obtain Lyamungu-90 seed?

18. Why did you need this seed?
To restock seed supply after loss.... _____
To get more seed..... _____
For food..... _____
Other (specify)..... _____

19. Where did you get the seed from?
Market..... _____
Shop..... _____
Farmer..... _____
Distribution programme..... _____
Other (specify)..... _____

20. IF NO, Why?
Not available.....1
Too expensive.....2
Other (specify).....3

21. What plans do you have for Lyamungu-90? .
Decrease the amount you currently grow.....1
Plant same amount.....2
Increase the amount you currently grow.....3
Others (specify).....4

22. If decrease/increase which variety will you increase/decrease
the amount you currently grow?

Why? _____

SOCIO-ECONOMIC INFORMATION

23. Sex of respondent: Male.....1
Female.....2
Both.....3

24. Age of female respondent: <20.....1
20-30.....2
30-60.....3
61+.....4

25. Household type: Monogamous male headed.....1
Polygamous male headed.....2
Female headed, no husband.....3
Female headed no husband.....4

26. How far have you gone in school?
No formal education.....1

ed?

- Some primary.....2
- Completed primary school.....3
- Some secondary school.....4
- Completed secondary school.....5
- Post secondary school.....6
- Adult education.....7

How long have you been cultivating this farm?

28. Do you own cattle? Y/N

If Yes; Number of cattle owned?.....

29. How often do you hire labour to work on your farm?

- Never.....1
- Rarely.....2
- Every season or once a year.....3

30. Do you work on other people's farm for pay?

- Never.....1
- Rarely.....2
- Every season or once a year.....3

31. Do you own a shop or business? Y/N

increase

APPENDIX 1c

QUESTIONNAIRE FOR BEANS TRADERS

1. List beans varieties you normally sell. Rank them in order of quantities you sell

Variety Rank

- 1. _____
2. _____
3. _____

2. Do you sell Lyamungu-90?

- Currently sell.....1
Used to sell.....2
Intending to sell.....3

IF STOPPED:

3. Why did you stop selling Lyamungu-90?

4. When did you first sell Lyamungu-90?

5. Where did you first buy Lyamungu-90?

- Market (name/village) _____
Farmer (") _____
Others (specify) _____

6. Which village/markets produce/sell Lyamungu-90? Rank them in terms of quantity they sell/produce

Village/Market Rank

- 1. _____
2. _____
3. _____
4. _____

7. Where do you sell Lyamungu-90?

- Traders _____ 1
Villagers _____ 2
Others (Specify) _____ 3

8. For villagers, do you know how they use Lyamungu-90? Y/N

- Food.....1
Seed.....2
Both.....3

9. For traders do you know where they sell Lyamungu-90?

10. Do you have any difficulties in selling Lyamungu-90? Y/N

If Yes mention them: _____

farmers in varieties in

new bean ? Y/N

have been

ungu-90?

indicate

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farmers experience.

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APPENDIX 2

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Table: Farmers' ranking of beans varieties they grow per village in Bukoba, Muleba and Karagwe Districts, Kagera Region.

Short Rains	Long Rains
Bukoba District	
Buhekera	
1 Kisapuli	Don't grow
2 Lushara	
3 Lyamungu-90	
Kigarama	
1. Tikyakuponza	"
2 Mwanamwana	
3 Kisapuli	
Kyaitoke	
1 Kisapuli	1-Lushara
2 Lushara	2-Kisapuli
3 Lyamungu-90	3-Mwanamwana
Kagondo	
1 Temekibira	1-Lyamungu-90
2 Kyakaragwe	
3. Lyamungu-90	
Muleba District	
Nshamba	
1-Kisapuli	1- Kisapuli
2-Kyakaragwe	2- Lyamungu-90
3-Lyamungu-90.	3- Lushara
Bulamula	
1-Temekibira	1-Mwanamwana
2-Lyamungu-90	2-Lyamungu-90
3-Lwondela	3-Tibihabwa
Karagwe District	
Bwema	
1-Lyamungu-90	1-Lyamungu-90
2-Lushara	2-Lushara
3-Kyakaragwe	3-Chababikira
Katembe	
1-Lushara	1-Lyamungu-90
2-Lyamungu-90	2-Mwanamwana
3-Kisapuli	3-Lushara

* Ranking is indicated by numbers; 1, 2 and 3

APPENDIX 3

Socio-economic characteristics of the respondents

	Adopted		Not Adopted	
A. Gender aspects				
District:	Male	Female	Male	Female
Bukoba	28	4	15	1
Muleba	12	1	9	1
Karagwe	21	1	1	0
B. Age of farmers (%)				
20-30	13		4	
31-40	25		48	
41-50	27		11	
51-60	16		19	
61+	18		19	
C. Household type (%)				
Monogamous male headed	64		59	
Polygamous " "	12		7	
Female headed (absentee husband)	3		4	
Female headed (no husband)	21		30	
D. Level of education (%)				
No formal education	21		19	
Some primary "	37		33	
Complete primary "	36		41	
Some secondary "	0		0	
Complete secondary "	2		8	
Post secondary "	2		0	
Adult education	3		0	
E. Farming Experiences (%)				
<20 years	61		48	
21-30	19		37	
31-40	12		11	
41+	8		4	
F. Cattle ownership (%)				
Own cattle	19		19	
No cattle	81		81	
G. Use of hired labour (%)				
Never use	42		59	
Rarely "	31		22	
Often (every season)	27		19	
H. Sell labour to others (%)				
Never	95		89	
Rarely	2		7	
Often (every season)	3		4	
I. Own shop (%)				
Yes	9		19	
No	91		81	

APPENDIX 4

Uses of Lyamungu-90 (kg)

	SR92	LR93	SR93	LR94
Bukoba District				
Consumed at home	156	17	280	74
Sold at market/traders	100	0	229	40
Given away as gift	50	11	48	2
Sold to farmers	3	0	12	0
Seeds	65	60	94	42
Destroyed by storage pests	16	7	17	0
Muleba District				
Consumed at home	62	53	140	47
Sold at market/traders	0	0	35	0
Given away as gift	14	12	18	24
Sold to farmers	0	0	0	0
Seeds	8	35	9	55
Destroyed by storage pests	6	4	8	7
Karagwe District				
Consumed at home	51	77	258	346
Sold at market/traders	40	537	541	1448
Given away as gift	9	20	84	50
Sold to farmers	0	25	50	20
Seeds	110	175	327	400
Destroyed by storage pests	7	25	10	3