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Assessment of Production and Marketing of Climbing Beans by Smallholder Farmers in Nyanza Region, Kenya

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Abstract: Bean (*Phaseolus vulgaris* L.) is a major cheap source of protein in Kenya. The crop is a good source of energy, folic acid, dietary fibre and complex carbohydrates. The Nyanza region of Kenya where this survey was carried out experiences low bean yield due to numerous factors, including non-use of high yielding varieties. This has had negative impact on food security and income in rural households. The need to increase productivity led to the introduction of climbing bean varieties in western Kenya through the East African Bean Research Network. The objective of the survey was to determine the status of adoption, production and marketing of climbing beans in the counties of Nyamira, Kisii and Kuria in the Nyanza region. Both primary and secondary data were collected using two questionnaires designed to capture information on factors affecting bean production and grain market supply. The questionnaires also focused on identification of major marketing channels, costs and margins, production and constraints. Results obtained showed that about 70% of the households had difficulties in accessing clean seed of improved climbing bean varieties. Eighty five percent of farmers planted farm saved seeds obtained from the previous season or from neighbours and relatives. Ten percent obtained seed from local traders while only two percent purchased certified seed from the research institution. Availability of staking materials is a major problem and hence most farmers prefer relaying climbing beans into maize that is almost ready for harvest so that the maize stalks serve as stakes. There exist confusion in the naming and description of climbing bean varieties, hence there is need for researchers to identify and document existing varieties.

Key words: Climbing bean · Varieties · Production · Marketing

INTRODUCTION

Bean (*Phaseolus vulgaris* L.) is a major cheap source of protein in Kenya. The crop contains high protein content; is a good source of energy and provides folic acid, dietary fibre and complex carbohydrates. It is high in lysine, which is relatively deficient in maize, cassava and rice, making it a good complement to these staples in the diet [1, 2, 3]. Common bean is produced by smallholder farmers for home consumption and sale [2]. In Nyanza region of Kenya, where this survey was conducted, bean yield is constrained by numerous factors: low soil fertility, losses due to field and storage pests and diseases, restricted access to fertilizers due to high cost, limited use of high yielding varieties and in particular climbing beans, undeveloped markets and weak extension services[1, 2, 3]. Consequently, rural households suffer from food insecurity and nutritional deficiencies. The decline of bean production has a negative impact on peoples' livelihoods due to low income and inadequate supply. Thus, there is need to increase bean productivity. Such an effort can only be realistic if the farming systems integrate the improved bean varieties, appropriate husbandry, best pest and disease management practices, improved market infrastructure and value addition such as canning or production of animal and fish feeds [2, 3].

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Improved bean production will go a long way in solving the problems of solving food security, poverty, malnutrition as well as increase revenue generation and employment. Improved accessibility of markets is critical for increased rural incomes in smallholder farming. Despite this, participation of smallholder farmers in domestic and regional markets remains low due to a range of constraints for example poor market access [4, 5, 6]. There are no studies that have empirically investigated the factors influencing production and marketing of climbing bean varieties in the counties of Nyanza region, Kenya.

Climbing beans were introduced in Kenya by Grain Legume Project for research purposes in mid-1970s [5, 7]. The first germplasm came in as breeding material and an attempt to disseminate them in the project sites was slow because the Government extension workers were more familiar with bush type beans. The bush type bean is preferred to the climbing type due to its low cost of production. Later, in 1990s more climbing bean varieties were introduced first in western Kenya and then to the Eastern and Central highlands of the country by the East African Bean Research Network through researchers participatory on-farm trials. The crop was highly accepted by farmers who participated in the trials [1, 2, 7]. Hence, a need was felt to bulk and disseminate the crop to more farmers in regions suitable for its production.

Climbing beans are considered to have the following advantages: high grain yields of up to 5 t ha^{-1}, diverse utilization as human and animal feed, biological nitrogen fixation and large biomass production which is a basis for improvement of soil fertility. Further, the climbing beans play a major role in crop rotation and intercropping systems [3, 7].

There are a number of high yielding climbing bean varieties developed in East Africa which would be promoted to increase yields. In other parts of the world, climbers dominate highland areas where population density is high and land is limiting [1, 2, 3]. It would therefore be appropriate to test the production potential of climbing bean varieties in the farming systems of the densely populated highland areas of southwest Kenya.

Statement of Problem: Adoption of agricultural innovation is of considerable importance because it can provide the basis for increasing production and income. Smallholder farmers' decision to adopt or reject agricultural technology depends on objectives and constraints as well as cost and benefit accruing from it [2, 8, 9]. Hence, farmers will adopt only technologies that suit their needs. Several factors influence adoption of agricultural technologies. Studies so far conducted on cereal crops have reported various factors influencing adoption [2, 8, 9]. However, information with regard to production and marketing of climbing bean varieties in the Nyanza region is limited. Moreover, previous studies on adoption of beans have focused mainly on factors affecting adoption of improved varieties. Therefore, this study was conducted to analyze the current status, determinants of adoption, production and marketing of climbing bean varieties to bridge an existing knowledge gap and guide further research on the improvement of their production.

Maximizing climbing bean yield potential requires the beans to be supported by stakes or grown in association with other crops on which they climb. The scarcity of suitable materials for staking is a major impediment to adoption of climbing beans [7, 10]. However, farmers in the Kisii highlands of Nyanza region have evolved relay cropping system of beans with maize whereby stover left standing in the field after maize is harvested, acts as stakes for the climbing beans. This and the use of fast growing agro-forestry species common in the farming systems such as *Sesbania sesban* and *Grevillea robusta* needs to be investigated as sources of stakes and the system improved to enhance climbing beans production [2, 7, 10].

MATERIALS AND METHODS

Study Area: This study was conducted in the highland areas of southwest Kenya covering Nyamira, Borabu Kisii and the Kuria districts. These areas have a bimodal distribution of rainfall above 1500 mm, sufficient for production of two bean crops per year. The major farm types are tea/dairy, coffee/banana and intensive grazing land use systems [11]. Farmers in the highlands have developed interventions for improving food security for example cultivation of climbing bean varieties. They produce beans thrice a year: during long rains season (February-March), short rain season (September-December), with an off-season crop in between. Traditionally farmers have been cultivating the bush type bean varieties despite the advantage associated with the climbing beans.

Sampling Technique: A clear and precise identification and definition of the population of the study is an important prerequisite for research sample design [16]. This study defines the survey population at two levels, namely at the rural farm household level and the urban

markets. Once the target population was defined, the next task was the question of taking representative samples from the populations. Districts were selected purposively as representative of the agriculturally potential areas and these were where improved climbing bean varieties had been introduced and areas that had potential for growing climbing bean varieties.

An important decision taken while adopting a sampling technique is the size. A two stage sampling procedure was used in selecting rural markets and households. In the first stage, four rural markets were selected purposively-based on distance from main production areas and relatively better climbing bean production potential of rural households. Before selecting household heads for sampling, climbing bean grower household heads were identified in collaboration with extension officers, key informants and development agents of the respective administrative divisions. In the second stage, 20 farm household heads from each district were selected from identified climbing bean growers using systematic random sampling technique taking into account probability proportional to size of climbing bean growers in each of the four selected districts. As a result, the survey was administered and data were collected and analyzed on 80 respondents.

Source and Data Requirements: Primary data were collected using two types of questionnaires - one for climbing bean producers, focusing on the identification of factors affecting climbing bean market supply and household participation; the other for bean traders, focusing on the identification of major marketing channels, cost and margins, production and marketing constraints. Data collected from the households include output, access to market, extension service, credit and market information, annual income from other sources and the demographic characteristics of households. Further, primary data collected from bean grain traders included demographic characteristics of traders, trading activities and marketing costs, purchase and sale prices, marketing channel arrangements, volume and direction of trade, buying and selling strategies, role of marketing actors, marketing facilities and services. Pre-tested questionnaires and checklists were also used to guide informal discussion designed to probe inquiry and help to make the interviews more consistent.

A three stage stratified random sampling procedure was used to select 180 specific farm households. During the first stage, study sites were purposively selected based on climbing bean production potential. Prior to climbing bean farm household sampling, an initial complete listing of all the climbing bean farms in the study areas was obtained. The farmers were categorized into small, medium and large farm based on the farm size.

RESULTS AND DISCUSSION

This section presents results on the status of adoption, production and marketing of climbing beans, production packages and the influence of different personal, demographic, social, economic, institutional and psychological factors.

Adoption of Improved Climbing Bean Varieties: Improvement in production and productivity of a given crop depends, among other things, on presence and use of better and improved varieties. In line with this, efforts have been made by the researchers to generate improved varieties of climbing beans. As a result, many varieties have been released with some introduced into the study area by Kenya Agricultural Research Institute (KARI) and the Ministry of Agriculture. Despite this, adoption of improved climbing bean varieties in the highland areas of southwest Kenya is still very low.

The level of adoption of a variety influences the amount of yield obtained. In the study area, the intensity of climbing bean adoption measured as area covered by climbing beans varied among sampled households. Farmers have their own variety preference criteria, which in most cases are not considered by research and extension personnel. During focused group discussions, majority of the climbing bean grower respondents preferred the following: local varieties for their consumption, high market demand for the variety and compatibility to agro-climatic condition of the area, time of maturity in reference to season of food deficit, better market price and disease resistance.

Understanding farmers' technology preference criteria is an important issue in technology generation and dissemination process. In most cases, technologies fail to be adopted by users due to mismatch in preference criteria between technology promoters and end users (farmers). In general, sample respondents have selected most preferred attributes, which can be used for selecting among varieties of climbing beans. This suggests the need to give emphasis to participatory research which considers farmers' technology preference criteria, needs and priorities. This demand driven approach will make effort of all actors involved in the system beneficial and fruitful.

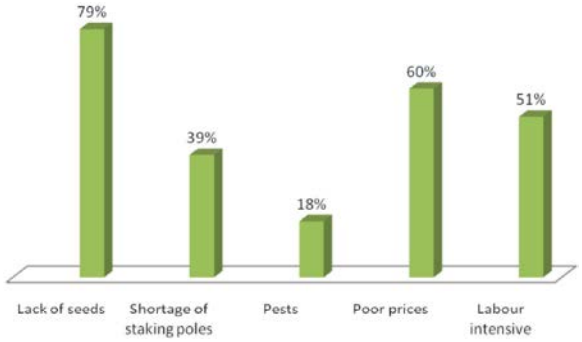

Fig. 1: Some of the constraints to adoption of the production of climbing beans

Challenges of Climbing Bean Production: The selected districts face high population density and over-exploitation of land. Scarcity of cultivable land therefore, is one of the challenges to the production of climbing beans; hence the populations are experiencing acute food deficits and low incomes.

Despite the better yields of climbing bean varieties, farmers continue to grow poorly performing mixed bush type bean varieties due to lack of seeds and staking materials for climbing beans. Besides, most farmers lack sufficient knowledge on the best staking methods. This implies that although staking has been noted to lead to better yields, lack of appropriate staking materials is a key challenge to the adoption of the technology. The woody sticks, which are the strongest stakes, are susceptible to damage by termites. They are also preferred by farmers for other alternative uses such as firewood. These competing needs therefore, could lead to deforestation and subsequent environmental degradation. In addition to the challenge of staking materials, incorrect market information (poor prices) and lack of seeds have encouraged the wrong perception that climbing beans are a subsistence crop not worth investing in.

Household Personal and Demographic Variables

Age of the Household Head: Age is one of the demographic factors that is useful to describe households and provide indication about the age structure of the sample and the population. In traditional societies, age serves as an important indicator of the individual's position in the society. Older farmers will be in a position to experience much with their traditional farming practices. With age a farmer can become more risk averse to new technologies and is expected to be less responsive to newly introduced agricultural technologies. Therefore, it is hypothesized that the farmer's age and adoption of the given climbing bean technology are inversely correlated.

As indicated in Table 1, the mean age of sample households was 39.11±11.72 (SD) years. The maximum age for the sample farmers was 72 years while the minimum was 15 years. Result of mean test using one-way ANOVA indicated that there was no significant mean difference (F=1.309, p=0.273) within the studied districts, implying the absence of significant relationship of age with intensity of adoption of climbing bean production. This is evident from the non-significant mean difference in average age among the respondents within the selected districts. The mean ages in Kisii, Borabu, Nyamira North and Kuria districts were found to be 40.10, 31.91, 39.05 and 39.10 years, respectively. Although it is weak, the correlation coefficient shows the existence of negative association between age and adoption and intensity of use of improved climbing bean production. Studies of Ndiema *et al.* [14] and Abrhaley Gebrelibanos [15] on assessment of farmers' evaluation criteria and adoption of wheat varieties in Nakuru and farmers' perception and adoption of integrated striga management technology in woreda, respectively also reported absence of statistically significant mean age difference in adoption of the technologies.

Experience of the Household Head: Farmers with higher experience in climbing bean production appear to have often full information and better knowledge and supposed to evaluate the advantage of the technology.

Hence it was hypothesized to affect production positively. The survey result of farmers experience on climbing bean cultivation is presented in Table 2.

With respect to the respondents' farming experience, the most experienced farmer had 50 years of experience whereas the least experienced farmer had one year. On average, the sampled respondents had 8.73 years of experience in climbing bean cultivation. The average years of climbing bean cultivation experience of household heads for Kisii, Borabu, Nyamira North and Kuria were 8.24, 8.78, 8.92 and 9.90, respectively. One way analysis of variance ANOVA (F=0.280, p=0.840) for comparison of the average climbing bean farming experience of all the districts shows that there is no statistically significant mean difference between the districts.

Educational Status of Household Heads: Level of education was assumed to increase farmers' ability to obtain, process and use information relevant to the production of climbing beans. Education is therefore expected to increase the probability of adoption of production of climbing beans. It is measured as a binary

Table 2: Distribution of respondent households and their mean experience in climbing bean farming in years

Districts	Mean	SD	Min	Max	F	P	r
Kisii	8.24	9.18	2	50			
Kuria	8.78	5.56	3	20			
Nyamira	8.92	7.18	2	33			
Borabu	9.90	8.75	1	40			
Total	8.73	8.47	1	50	0.280NS	0.840	0.065

ns = not significant

Table 3: Educational status of sample household heads in the districts surveyed

	Kisii	Kuria	Nyamira North	Borabu	Total
Educational status of HHHs	%	%	%	%	%
Illiterate	52.3	44.4	38.9	27.6	44.4
Literate	47.7	55.6	61.1	72.4	55.6
Total	100.0	100.0	100.0	100.0	100.0

HHHs = household heads, $\chi 2 = 5.953$, Cramer's V= .193, df = 3, P= 0.114

Table 4: Relationship between total score achieved in social participation, adoption and production of climbing beans

District	Mean	SD	Min	Max	F	p	r
Kisii	5.07	3.78	0.013	17.34			
Kuria	6.15	3.20	2.70	14.02			
Nyamira North	6.73	4.25	0.44	16.62			
Borabu	7.31	6.80	1.33	38.21			
Total	2.64	1.98	0	11	7.799***	0.000	0.313***

*** represents 1 % significance level

variable: 1, if the farmer is literate and 0, otherwise. The result on educational status of household heads (HHHs) is provided in Table 3.

The distribution of total sample respondents in terms of literacy level has shown that 44.4% were illiterate and 55.6 % were literate. The literacy level was argued to have positive impact on the adoption and production of climbing beans. The result of this study shows that the proportion of literate farmers in the Kisii district was 47.7% and that of Kuria, Nyamira North and Borabu districts were 55.6%, 61.1% and 72.4%, respectively (Table 3). The Chi-square statistic ($\chi 2$= 5.953ns) of household heads indicates statistically insignificant difference in the educational status among climbing bean farmers in selected districts. Our findings are inconsistent with many of the previously conducted studies, for example, Asfaw Negassa *et al.* [17] and Mwanga *et al.* [18] have reported positive and significant relationship of education with adoption and production of technologies.

Institutional Factors: Institutional factors in the context of this study include support provided by various institutions and organizations to enhance the use of improved climbing bean technologies such as social organization, extension and credit services.

Social Participation: Participation in social organization is expected to have an indirect influence on the adoption behaviour of farmers. It links the individual to the larger society and exposes him to a variety of ideas. This exposure makes him positively predisposed towards innovative ideas and practices. The social participation scores of the farmers were calculated on the basis of scores given for their membership status, score of zero was given for non participant and score of 1 was given for those who are members only. The mean score for various districts are presented in Table 4.

The above table indicates that the average score for sample households was 2.64. The mean score of social participation for Kisii, Kuria, Nyamira North and Borabu districts was 2.20, 2.11, 2.67 and 4.10, respectively. One way ANOVA (F=7.799 and p=0.000) reveals statistically significant mean difference between the districts in relation to social participation score at 1% probability level.

Contact with Extension Information Sources

Contact with Development Agent: The extension service is supposed to have a direct influence on the adoption behaviour of farmers. When there is contact with extension agent, there is a greater possibility of farmers

Table 5: Relationship between contact with extension agent and climbing bean production.

Districts	Kisii		Kuria		Nyamira North		Borabu		Total	
Information source/ Development agent	n	%	n	%	n	%	n	%	n	%
Yes	17	40.7	3	55.6	15	80.6	12	82.8	46	58.1
No	26	59.3	2	44.4	3	19.4	3	17.2	34	41.9
Total	43	100.0	5	100.0	18	100.0	15	100.0	80	100.0

$\chi 2$=25.4278***, df=3, Cramer's v=0.399, p=0.000

Table 6: Adoption categories and score for frequency of contact with extension agents

Districts	N	Mean	SD	Min	Max	F	P	r
Kisii	43	0.98	1.43	0				
Kuria	5	1.67	1.73	0				
Nyamira North	18	1.61	1.61	0				
Borabu	14	2.14	2.14	0				
Total	80	1.37	1.49	0	4	5.444***	0.001	0.300***

*** = significant at 1 %

Table 7: Farmers' participation in different extension events

Farmers attendance in different extension events		Percent
Attendance of household head in field visit	Yes	3.8
	No	96.3
	Total	100.0
Attendance in training	Yes	13.1
	No	86.9
	Total	100.0
Attending demonstration	Yes	0.0
	No	100.0
	Total	100.0

being influenced to adopt agricultural innovations. The result on sampled farmers contact with extension agent is given in Table 5.

Of the total 80 sample respondents 46 (58.1%) farmers reported having contact with development agents and 34 (41.9%) farmers reported having no contact with development agents, Table 5. Data in table also indicated that 40.7, 55.6, 80.6 and 82.8 percentages in Kisii, Kuria, Nyamira North and Borabu districts had contact with extension agent, respectively whereas, 59.3, 44.4, 19.4 and 17.2 percentages in Kisii, Kuria, Nyamira North and Borabu districts had no contact. The chi-square test ($\chi 2$=25.427 and p=0.000) shows statistically significant difference between respondents from the different districts with respect to farmers contact with extension agents thereby agreeing with prior expectation.

Frequency of Contact with Extension Agent: This refers to the number of contacts per year that the respondent made with extension agents. The effort to disseminate new agricultural technologies is within the field of communication between the change agents (extension agent) and the farmers at the grass root level. Here, the frequency of contact between the extension agent and the farmers is hypothesized to be the potential force which accelerates the effective dissemination of adequate agricultural information to the farmers, thereby enhancing farmers' decision to adopt new crop technologies.

Attending Extension Events, Field Visit, Training and Demonstration: The result on farmers' attendance in different extension events in relation to climbing bean production is given Table 7.

Table 7 indicates that only 3.8 percent of sampled farmers have attended field visits on improved climbing bean production technology and majority of the farmers (96.3%) did not attend any field visit. Training is an important aspect to improve farmers' performance. It equips farmers with new knowledge and skill, which help them to perform new practice properly. If a farmer has no skill and know-how about certain technology, he/she may have less probability of adoption. The skill acquired through training helps to carry out a new technology effectively and efficiently. If farmers are well trained in

new practice, they may not need outside support later. They can properly implement the recommendation. Concerning farmers' presence at training programs, out of total 80 farmers interviewed only 13.1 % of them were found to have attended and the rest 86.9 % did not attend any program.

Undertaking field trial on ones farm is very important because it helps other farmers to observe the productivity and yield of new technology practically. This situation may facilitate the adoption process. In other words attending demonstrations is an important means, which create concrete awareness among the target group on the practice. It is also a means of passing information to initiate farmers to try and then adopt the better practice into their farm. The study revealed that no farmer was found to have attended demonstration of improved climbing bean production technology.

Access to Credit: Access to credit is one way of improving farmers' access to new production technology. Farmers' ability to purchase inputs such as improved seed and fertilizers is particularly important. Farmers who have access to credit can minimize their financial constraints and buy inputs more readily [12, 13]. Thus, it is expected that access to credit can increase the probability of adopting improved climbing bean technologies. The result on credit accessibility of the respondents is presented in Figure 2.

Regarding credit access of respondent farmers in the study area, 31.3 percent reported having access to credit, while the remaining 68.8 percent reported lack of access to credit for the purchase of improved climbing bean technologies.

About 70% of the households interviewed indicated that they had difficulties in accessing seed of improved climbing bean varieties, because of limited sources and lack of knowledge of these varieties. It was noted that there is no commercial seed company in Nyanza region that produces bean seed to sell to the farmers. Therefore, bean seed can only be found in local markets or smallholder seed producing farmers and the type of seed found is not certified seed. It was however learned that all the farmers interviewed had some experience in bean production, although majority of the farmers were not exposed to climbing bean varieties.

It was evident from the survey that climbing beans are mostly intercropped with maize. First farmers plant maize and after harvesting they plant the beans in between the maize planting hills: the bean crop in this cropping system is not staked instead it is allowed to climb on the mature maize crop. The other varieties were perceived to be climbers but were dwarfs with climbing behaviour for example the Wairimu variety.

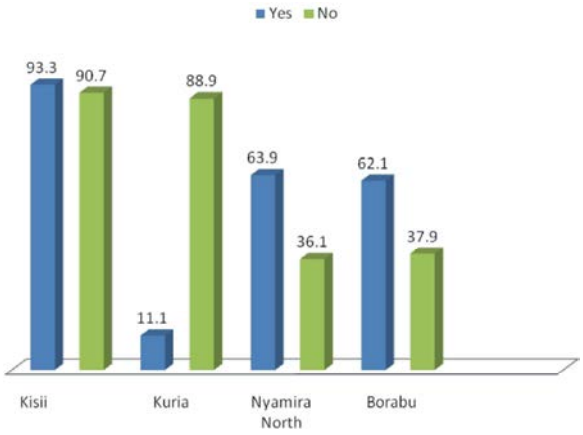

Fig. 2: Access to credit across selected study districts

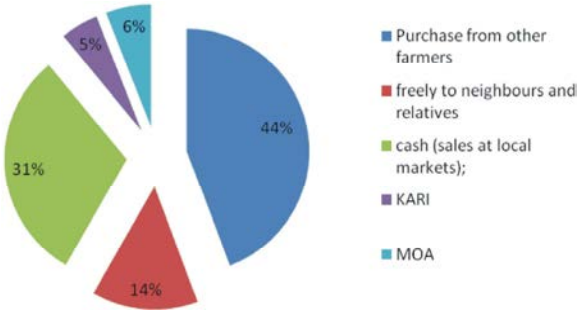

Fig. 3: Seed diffusion methods

Table 8: Seed availability and access

Farmers' Sources of seeds	% of respondent
From previous harvest (recycled seeds)	70%
Fellow farmers	15%
Local traders	10%
Non-governmental Organizations	2%
National Agricultural Research station (e.g KARI)	2%
Government extension Services	1%

The majority of farmers, 70%, recycle seed from previous harvest. The other sources included researchers (small quantities through on-farm trials); other farmers and local traders. The other sources were non-governmental organizations; researchers (KARI) and other farmers. There is lack of exposure and limited sources; farmers do not know where they can get the seed and prices of new bean seeds are unaffordable.

Diffusion Channels of Climbing Beans Varieties: Although the extension service has been the main channel through which seed and technology is

Table 9: Bean varieties grown in Nyanza region, Kenya

District	Variety	Reasons for growing the variety
Nyamira North	Red haricot	High yielding, good pod filling, good taste, good colour, high marketable Large seed size;
		good taste, high yielding, cooks fast, good market
	Punda	High yielding, cooks fast, good taste, very marketable
	Zaire	Very marketable, good taste
	Amin grade	Good taste, highly marketable,
	Wairimu (Onyoro).	Good colour, liked by bean seller, good market, good taste
	Onyoro grade Osama*	High yielding, long pod with good grain filling, good market, tolerant to diseases withstands high rainfall
		Good taste, good seed quality, thick soup, high marketable, cooks fast
	KATB1	Good colour, liked by bean seller, good market, good taste
	KATBI	Good colour, liked by bean seller, good market, good taste
	KATX56	High yielding tolerant to diseases, cooks fast, good taste
	KATX69	High yielding tolerant to diseases, cooks fast, good taste
Borabu	Red haricot	High yielding, long pod with good grain filling, good market, tolerant to diseases withstands high rainfall
		good taste, good seed quality, thick soup, high marketable, cooks fast
	Punda	Good colour, liked by bean seller, good market, good taste
	Zaire	Good colour, liked by bean seller, good market, good taste
	Amin grade	High yielding tolerant to diseases, cooks fast, good taste
	Wairimu (Onyoro)	High yielding tolerant to diseases, cooks fast, good taste
	Onyoro grade	High yielding, long pod with good grain filling, good market, tolerant to diseases withstands high rainfall
		Good taste, good seed quality, thick soup, high marketable, cooks fast
	Osama	Good colour, liked by bean seller, good market, good taste
	KATB1	Good colour, liked by bean seller, good market, good taste
	KATBI	High yielding tolerant to diseases, cooks fast, good taste
	KATX56	High yielding tolerant to diseases, cooks fast, good taste
	KATX69	High yielding, long pod with good grain filling, good market, tolerant to diseases withstands high rainfall
		good taste, good seed quality, thick soup, high marketable, cooks fast
Kuria	Red haricot	Good colour, liked by bean seller, good market, good taste
	Punda	Good colour, liked by bean seller, good market, good taste
	Zaire	High yielding tolerant to diseases, cooks fast, good taste
	Amin grade	High yielding tolerant to diseases, cooks fast, good taste
	Wairimu (Onyoro).	High yielding, long pod with good grain filling, good market, tolerant to diseases withstands high rainfall
		good taste, good seed quality, thick soup, high marketable, cooks fast
	Onyoro grade	Good colour, liked by bean seller, good market, good taste
	Osama	Good colour, liked by bean seller, good market, good taste
	KATB1	High yielding tolerant to diseases, cooks fast, good taste
	KATBI	High yielding tolerant to diseases, cooks fast, good taste
	KATX56	High yielding, long pod with good grain filling, good market, tolerant to diseases withstands high rainfall
		good taste, good seed quality, thick soup, high marketable, cooks fast
	KATX69	Good colour, liked by bean seller, good market, good taste
Kisii (Mosocho)	Red haricot	Good colour, liked by bean seller, good market, good taste
	Punda	High yielding tolerant to diseases, cooks fast, good taste
	Zaire	High yielding tolerant to diseases, cooks fast, good taste
	Red gold	High yielding, long pod with good grain filling, good market, tolerant to diseases withstands high rainfall
		good taste, good seed quality, thick soup, high marketable, cooks fast
	Amin grade	Good colour, liked by bean seller, good market, good taste
	Wairimu (Onyoro).	Good colour, liked by bean seller, good market, good taste
	Onyoro grade	High yielding tolerant to diseases, cooks fast, good taste
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	KATX56	Good colour, liked by bean seller, good market, good taste
	KATX69	High yielding tolerant to diseases, cooks fast, good taste

Table 10: Farmer seed sources, market outlets and marketing constraints

Market Outlets	% of respondent
Local traders	62.6%
Distance traders	10%
Neigbours	28%
Marketing Constraints	% of respondent
Low prices	82%
Lack of good market outlet	71%
Poor quality grains	33%

distributed to farmers, the climbing bean varieties spread mainly through farmer to farmer diffusion. Survey results show that most (43.8%) farmers received first seed from other farmers in the area; 14% freely to neighbours and relatives. The other means were 31% cash (bought from local markets); 5% from KARI; and 6% from Ministry of Agriculture.

The common existing bean varieties include; Red haricot bean, Punda, Zaire, Amin grade, Wairimu (Onyoro), Onyoro grade and Osama among others.

The majority of farmers (62.6%) sell their beans to local traders in the local markets though the prices offered were low; others included 10% distance traders. Low prices were the major marketing problem among the farmers. The other problems were lack of good markets and poor quality bean grain resulting in low prices.

CONCLUSIONS

- There exist climbing bean varieties that farmers are currently growing in Nyanza region.
- Farmers prefer intercropping climbing beans with maize because of scarcity of trees for staking. The beans are planted after maize has matured and is almost ready for harvested so that stover left acts as stakes.
- Farmers acquire seed of new climbing bean varieties either from fellow farmers, local traders or research centres.
- Farmers are poorly trained on climbing bean production and hence experience on it is poor.

Recommendations:

- There is need to explore alternative and cheap staking poles that can easily fit the existing cropping systems.
- Since maize and climbing beans are intercropped, bean varieties that are compatible with maize based cropping system need to be determined.
- There was confusion in the naming of climbing beans because some of the names given in some districts as climbers were bush type beans. Hence there is need for researchers to identify and document the existing varieties
- Lack of certified climbing bean seeds was cited as one of the constraint in the adoption of climbing beans. Hence there is need for models to be developed to avail the bred bean varieties to the farmers.
- Farmer trainings are necessary for the growers. The trainings should cover suitable agronomic practices from seed to seed including staking methods, pest and disease control, post-harvest handling and storage, marketing and value addition.
- The contribution of climbing beans to soil fertility improvement as extra gain from growing the varieties need to be determined.

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