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## FARMERS' PERCEPTIONS ON ADOPTION OF BAMBARA NUT PRODUCTION AS A FOOD SECURITY CROP IN KAKAMEGA COUNTY, KENYA

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### Abstract.

*This study was conducted between April and December 2011 to examine perception of smallholder farmers in four districts of Kakamega County, Kenya in adoption of Bambara nut production as food security crop. The study was conducted to determine relationship between the perception of the farmers and some socio-economic factors. Bambara nut, a crop a species only identified and classified as "underutilized" crop. The crop has several production advantages compared to other legumes. Bambara nut, a crop a species only identified and classified as "underutilized" crop and has several production advantages compared to other legumes. Three hundred and eighty four respondents used for the study were selected by random sampling while focus group discussions and interview schedule were employed to gather additional data through survey and correlational research study designs. Descriptive and inferential statistical tests were used to analyze collected data. The findings showed that farmer perceived adoption of bambara nut production was high, but however, despite its vast potential production at household level was low and hence, its the utilization at household level was quite low too. And that; age, labour availability, credit availability, farmers' income, membership to social organizations significantly influenced farmer's perceived decisions to adoption of bambara growing as a food security crop. However, farmers level of education, land size, marketing and provision of extension service did not significantly influence farmers' perception in their decision to adoption of bambara nut production as food security crop. Overall, it was found that farmers had positive perception towards adoption of bambara nut production as food*

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*security crop. However they had a number of challenges e.g lack of certified seeds for planting, lack of extension service information on the crop and labour shortages particularly during peak periods. To ensure sustainable increase in production and utilization, there is need for deliberate efforts to be stepped up by Ministry of Agriculture, Livestock and Fisheries and other stakeholders to provide agronomic information for formulating and implementing research programmes towards commercialisation of this crop. This would lead to increased production and assist to fight against hunger and food insecurity.*

**Key words: Perception , Food Security, Bambara nuts, “underutilized” Adoption**

## INTRODUCTION

Bambara nut *Vigna subterranea* (L.) is neglected and underutilized crop in the region (Berchie, 2009). The crop is a low input leguminous crop that is rich in nutrients, drought tolerant, short production period and high yielding even

in less fertile soils besides being a nitrogen fixer. When cooked, the crop is a complete food, as contains sufficient quantities of protein, carbohydrate and fat (Poulter *et al.* 1980; Baudoin *et al.* 2001). However, despite being a popular traditional food crop among the Luhya communities in Western, Nyanza and Coast regions of Kenya, crop adoption levels remain very low (Onyango, 2010; Andika *et al.* 2010). The leading producers of Bambara nut are: Nigeria, Niger, Ghana, Zimbabwe, Botswana, South Africa, Swaziland and Cote d’voire (Goli *et al.* 1991). Production of Bambara nut in Kenya has been on the decrease for the past few decades. Knowledge on factors that are perceived to influence farmer decisions in adoption Bambara nut production, will play a greater role in ensuring nutritional and food security in the region (KARI, 2009; Korir, *et al.* 2011; Onyango, 2010)

Adoption of agricultural practices is influenced by a number of components including social, economic and institutional factors. Adoption or non-adoption decisions is often based on these factors. According to Rogers (1995), adoption of innovations is a function of several factors and involves a sequential process of decision making in five stages: awareness, interest, evaluation, trial and adoption. He goes to say that the characteristics features of an innovation namely: perceived usefulness and ease of use, compatibility, observability and trialability, have been found as the key influential factors affecting users’ attitude towards adopting the proposed new technological innovations. Thus attitude can be a very powerful enabler or a barrier towards the adoption of the new technology. Ajzen (1988) defines the term attitude’ as a complex conundrum of feelings, desires and fears that create a state of readiness to act within a person. Similarly, Fazio (1990) defines an attitude as a learned association in memory between an object

and a positive or negative evaluation of that object, and attitude strength refers to the power of the bond in this respect.

Several adoption studies have been conducted in Kenya to explain on farmer attitude and perception determinants and constraints of new innovations. These studies are important and can be utilised to assess impacts of agricultural research and provide information for policy reform (Olwade, *et al* 200). However, actors affecting adoption differ across countries and are specific to a given region (Jayne *et al.*, 2006; Reed, 20 07). This underscores the need to determine factors affecting decisions in uptake of bambara nut production. Indeed despite the wealth of information available on farmer perception in adoption studies worldwide, there is a paucity of information that is attributed to farmer perception on use of neglected food crops including Bambara nut in disaster risk reduction in food security. Most adoption studies in Kenya have centered mostly on the utilization of fertilizer and hybrid seed in the production systems of major food crops.

Purpose of this study was understanding farmers' perception of Bambara nut production and utilization as food security crop. The specific objectives of the study were: describe individual characteristics of the smallholder bambara nut farmers and evaluate the farmers' attitude and perceptions towards adoption of bambara nut production as food security crop that reduce risk of hunger and alleviate poverty.

### **Research Methodology**

The selection of study site was purposive sampling based on the fact that Bambara production in Kenya has been limited to Western Province and to a lesser extent, Coastal and Nyanza provinces. (Onyango, 2010). Of the 47 Counties in Kenya, Kakamega County is one of the most densely populated Counties after Nairobi. Kakamega County is located in the Western Province of Kenya its geographical coordinates are longitudes  $34^{\circ} 45' 0''$ . East and latitudes  $0^{\circ} 17' 0''$  N of the equator. The County lies within altitude 1,250m-2,000m above sea level, with an average annual rainfall ranging from 1250-1750mm per annum. The average temperature in the County ranges from a minimum of  $11^{\circ}$  C to  $30^{\circ}$  C a maximum with an average of  $21^{\circ}$  C. (Tittone, 2008). The target population in this

study comprised of small-scale farmers who live in Kakamega County. Survey research designs were used in this study to generate both qualitative and quantitative data. Purposive sampling technique was used to select four districts which produce more Bambara nuts in the County. For purposes of accomplishing the objectives of the study and testing the hypotheses stated earlier. Both primary and secondary sources data were used. Primary data used were collected through

structured questionnaire, interview schedule backed with focused group discussion in some cases. Three hundred and eight four respondents used for the study were selected by random sampling on the four districts of Kakamega County

Thus Lists of accessible farmers both adopters and non adopters were generated by researcher, with assistance from the agriculture extension officers at each of the four Districts. The population of the farmers was as follows; Kakamega North 1640 farmers, 1590 farmers from Butere District, 1177 from Matungu and 401 farmers from Mumias making a total of 4808 farmers.. These lists formed the sampling frames for each district. Then proportionate sampling technique was used to spread the 384 farmers within the survey districts. This spread as a ratio of: 131, respondents were used Kakamega North district, 127 respondents were interviewed Butere district. And in Matungu and Mumias districts, 94 and 32 respondents were interviewed respectively. However to take of missing respondent farmers, over 600 questionnaires were send out follows: Kakamega North District 205, Butere District 198 , Mumias District 50 questionnaires and Matungu 146 were selected. Secondary data from the Ministry of Agriculture Provincial level was used to arrive at the following Districts: Kakamega North, Mumias Matungu and Butere. For each farmer to have equal chance of being included in the survey systematic random sampling technique by used of random numbers was used to select farmers (respondents) from the sampling frame in each of four Districts. Focus group discussion and interview schedule were employed to gather additional data.

Based on available literature eleven independent variables perceived to influence farmers' decision on adoption of bamabara nut production included; district, age, gender, farm size, level of education, group membership, on-farm income, labour, access to credit, market and extension service, as relates to (dependent variable) adoption of Bambara nut production as a food security crop. Some of the data collected included personal and socioeconomic parameters of the respondents, past and present experience of cassava propagation, perception about the benefit and constraints. Data was collected from the farmers based on their knowledge, perception, attitude and practices regarding Bambara nut production as food security crop. Secondary data was collected from sources of literature journals. Periodicals district annual reports from the respective districts and conference papers, Universities, Internet and research institutions. Both descriptive and inferential statistical tests were used in analysis of data by use of SPSS (Statistical Package for Social Science, version 16 spreadsheet). During data analysis, the following statistical measures were employed; frequencies, percentages, chi-square test-cross-tabs Likert scale and regression analysis.

## Results and Discussions

### Farmers' Personal Characteristics

A total of 384 respondents from four districts from Kakamega County were involved in the study. Majority (211) 54.9 % of the respondents were females while (173) 45.1 % of males. Over (248) 64.6 % of the respondents fell in the age bracket of (31-50) years. Overall, (365) 95 % of the respondents from all the four districts had received basic formal education. Only (19) 5.0 % of the respondents had not received any formal basic education. Majority (349) 90.9 % of respondents had their land sizes measuring less than 5.0 acres. However, 9.1 % of the respondents had their land sizes above 5.1 acres. A total (203) 52.9 % of the respondents were low-income earners whose average family sizes ranged between (5-8) persons. Majority (303) 79.0 % had labour problems and depended majorly on family labour.

### Farmers perceived attitudes on adoption of Bambara nut production as a food security crop in Kakamega County, Kenya

Statements of farmers' perceived attitudes were measured by using rank order of the statement along with mean and standard deviation. As indicated in Table .1 the mean rating of the 11 attitudinal statements ranged from 3.27 and 1.63, with an overall domain mean of 2.17 indicating that farmers in the Kakamega County had an above average level of perception towards the adoption of Bambara nut production as a food security crop.

During data analysis when the means of the 11 attitudinal statements were ranked, it was found that the statement, Bambara nut production entirely a female activity and men should forget about it was ranked first with a mean score of 3.27. From these ranking results, it was quite clear that the low uptake of Bambara nut could be as a result of inadequate knowledge and awareness among the respondents about the role of gender in Bambara nut production as a food security and hunger reduction crop, given the perception held by most respondents Bambara nut production was only a female activity. Indeed gender was significant and could contribute to 13.4 % adoption of Bambara nut production as a food security crop respectively.

**Table 1: Mean, Ranking and Standard Deviations for Statements Perceived by Farmers Decisions on Adoption of Bambara nut Production as a food Security in Kakamega County. Kenya**

Rank	Statements used to determine respondents' perception	Mean	SD
1	Bambara nut production entirely a female activity and men should forget about growing it.	3.27	0.971
2	Bambara nut production is not profitable, if neighbor seeks my opinion on Increasing production I will definitely not advice him to cultivate the crop.	3.26	0.976
3	Soil fertility is not a problem in this area for Bambara nut Production	2.31	1.054
4	Bambara nut growing as a food security crop manageable in this area.	2.22	0.913
5	Bambara nut requires less rainfall and is resistant to Pests and diseases.	2.16	0.909
6	Bambara nut production lacks institutional support (Research, Extension Credit and Market).	2.05	0.956
7	Bambara nut production can conserve biodiversity.	1.93	0.847
8	Most farmers in this area should join their colleagues in revitalizing Agriculture to ensure food security.	1.73	.753
9	Production of Bambara nut is one of the ways of improving household nutritional status.	1.71	0.677
10	If Bambara nut improved varieties are made available on market we can adopt.	1.65	0.859
11	The planting of Bambara nut can increase incomes at household levels.	1.63	0.665
	<b>Overall Means</b>	<b>2.17</b>	

\*Scale: A four point Likert- type scale was anchored as follows: 1=Strongly Agree (SA), 2=Agree (A), 3=Disagree (DA), 4=Strongly Disagree (SDA) for positive statements and a reverse system for scoring for negative statements. To be able to discuss the data, the mean of 2.0 and above was used to signify agreement while a mean below 2.0 was used to stand for disagreement.

When the means of the 11 attitudinal statements were ranked during data analysis, it was found that the statement, Bambara production entirely a female activity and men should forget about it

was ranked first with a mean score of 3.27. From these ranking results, it was quite clear that the low uptake of Bambara nut could be as a result of inadequate knowledge and awareness among the respondents about the role of gender Bambara nut as food security and hunger disaster risk reduction crop, given the perception held by most respondents Bambara nut production was only a female activity.

Similarly, the statements that Bambara production is not profitable, if neighbor seeks my opinion on in increasing production I will definitely not advice him to cultivate the crop was ranked second with a mean 3.26 see Table .1 above . These results again point the fact that there was of inadequate knowledge and awareness among the respondents about Bambara nut cultivation production in study area since the perception held by most respondents was that Bambara nut production was not profitable enterprise. In fact, maize and beans were grown as first and second priority crops by 50.0 percent and 30.0 percent of the respondents respectively as cross the study districts. During focused group discussions with farmers, opinion leaders and agricultural officers showed that in most of the districts, did not Bambara nut as a priority crop as most farmers (70.5 percent) were growing crop for subsistence purposes mostly as fourth or fifth priority crop.

Soil fertility is not a problem in this area had a mean of 2.31 and was ranked third by the respondents. Given the fact that the farmers rated lowly the statement it was quite clear that the low uptake of Bambara nut could be as a result of inadequate knowledge and awareness among the respondents about the soil fertility status in the study area and hence low Bambara groundnut as food security and hunger disaster risk reduction crop.

The adoption of production Bambara nut as a food security crop needed for institutional support good practice' and 'most farmers in the area should adopt the hybrid variety of Bambara groundnut. All respondents pointed to the fact that the needed Bambara seed variety that possessed certain characteristics that would be much more superior to the land races of Bambara groundnut they were planting before the hybrid variety was introduced. Indeed most of the ratings of the remaining attitudinal statements were very low and completely indicated farmers' support for the adoption of Bambara groundnut of as a food security crop as disaster risk reduction strategy in food security and hunger in the Kakamega County.

Analyzed data from the study revealed that 92.3 percent of the respondents held a perception production of this crop ensure food security because its drought and pest resistant. Little production could be explained by the fact that there is over reliance on other crops like: maize, beans and sweet potatoes as staple foods. Bambara is basically grown for domestic consumption

with very little left for sale to make incomes to make profit thus analyzed data reveal that only 49.3 percent of the respondents agreed that it was profitable production Bambara while 87.00 percent agree to join their colleagues in revitalizing Bambara nut production as food security crop to fight hunger and poverty alleviation.

### **Factors Influencing Farmers' Perception on Decisions to Adoption of Bambara Nut as a Food Security Crop in Kakamega County, Kenya**

The use of the logit model for this analysis was consistent with the literature on adoption Rogers, (1983) and Alston *et al.* (1995) which describes the process of adoption as taking on a logistic nature. Thus this logit model was used to provide explanation of behaviour (empirical estimates) of how the socio-economic, institutional variables influence adoption of the Bambara groundnut production as a food security crop. This regression model was used because the dependent variable is dichotomous, focusing on the decision of farmers to adopt Bambara production and utilization technology or not. The estimates (Table 2) indicated that seven variables (63.6 %) were statistically significant ( $p < 0.05$ ). These were: district, gender, farm size, on-farm income, labour, member of social group, marketing problem, extension service and respondents' access to credit.



**Table 2: Farmers characteristics perceived to influencing decision in adoption of Bambara nut production as a food Security Crop in Kakamega County Kenya**

Independent Variable	Coefficients (beta)	S.E	t-value	P-value
Intercept	.766		4.336	.000
District of Residence	-0.138	0.018	-2.711**	.007
Gender of Farmer	0.134	0.045	2.578*	.010
<i>Education Level</i>	<i>0.072</i>	<i>0.022</i>	<i>1.463</i>	<i>.144</i>
Farmer's Age	-0.115	0.022	-2.191*	.029
Land Size	0.055	0.032	1.026	.306
On-Farm Income	-0.133	0.018	-2.409*	.016
Labour Availability	0.213	0.054	4.346**	.000
Social Group	0.096	0.016	1.830	.0068
Marketing Problems	-0.008	0.045	-.151	.880
Extension Service	0.027	0.046	.487	.626
Credit Facilities	0.106	0.056	1.990*	.047

Intercept 0.766, Sample size 384

From Table 2 above, four factors: age, level of education marketing and credit were not significant ( $p > 0.05$ ) in influencing farmers' perception of adoption of bamabara nut as a food security crop in Kakamega County. The factors: level of education, land size, marketing and provision of credit These factors did not significantly sustain farmers' decision to adoption of Bambara groundnut production and utilization as a food security crop and hence need not be considered when designing agricultural intervention for increased adoption of production Bambara groundnut as a food security crop. For instance level of education, these results can explained by that fact there were no great variations in respondents' level of education and land sizes within and between the districts under study. The volume of bambara nut produced was to little to warrant proper marketing and provision of credit by loaning institutions

However, seven (7) other factors were found to significant. For instance district of respondents' residence had a coefficient of negative 0138. This implies that any change in county study district resulted in 13.8 % decreased level

farmers perception on adoption of Bambara groundnut production as a food security crop. On gender, the coefficient of gender was positive 0.134 meaning gender could contribute to 13.4 %

positive perception on adoption of Bambara groundnut production as a food security crop. While on age the coefficient of age was negative 0.115. These results showed that a unit increase in age resulted in 11.5% reduction in level of perception of production and utilization of Bambara groundnut as a food security crop. Thus as farmers become older, they are less likely able to perceive increase in adoption as they become less energetic and risk averse. Indeed study results showed that over 64.6 % of the respondents across the four districts were in the age set of 31-50 years. Since there no much difference in the age bracket among the respondent in the four districts, study results showed that there is no significant association between farmer's age and adoption of Bambara groundnut production practices.

Similarly on annual earnings from on-farm income the coefficient and t-value, of their annual farm income were negative 0.133 and 2.486 respectively. This inverse relationship implied that a unit increase in annual farm income resulted to 13.0 % decrease in level of perception in adoption decision to Bambara groundnut as a food security crop. Indeed over 83.3 % of the respondents in the study area were low income earners (less than Kshs100, 000 annually). However, these results disagree with the findings of Akinola *et al.* (2012) who found income to have a positive significant influence on adoption of mulching technology in Yam in Osun State, Nigeria.

Labour availability and membership in social organization the coefficients of labour were positive 0.213 and 0.96 respectively. This implies that unit increase labour availability and respondents' membership in social organization could have a 21.3% and 9.65% increased probability of adoption of Bambara as a food security crop. These results are similar to those recorded by Wasula (2011) Bamire *et al.* (2002) who found out that labour availability and membership in social groups provided the much social needs of the farmers can adoption agroforestry technologies and improve diffusion and facilitated collective approach solutions to problems respectively. Similarly Accessibility Credit the coefficient of education was 0.106 while the t-value was .990. The positively significant relationship at ( $p < 0.05$ ) implies that credit availability increases the probability of adoption of Bambara groundnut as a food security crop by only 10 %.. Similar results were recorded by Teklewold *et al.* (2012) who found availability of credit to have positively influenced adoption of poultry technology by relaxing the binding capital constraints that farmers face during initial investments or helps to finance the variable costs associated with production of improved poultry breeds.

## Conclusions

The study found out that farmers' area of residence-(district), on-farm income and age were perceived to negatively significantly influence farmers decisions to adopt Bambara groundnut production as a food security crop. However, labour, membership to social group, gender, farm size and respondents' access to credit were perceived to positively significantly influence farmer decision on adoption of Bambara groundnut production as a food security crop. However, four factors namely: land size, level of education, marketing and provision of extension service were perceived not have any significant influence farmers' decision to adoption Bambara groundnut growing as a food security crop in Kakamega County.

## Recommendations

Bamabara nut is food crop with potential to improve nutrition, boost food security and foster rural development and based on the above conclusions, there was need to initiate development of programs and deliberate policies that can enhance farmers perception on adoption of production of neglected crop speciese ge Bamabara nut. Increase in their productions will address the food and nutritional security needs of the rural poor and promote rural development

and thus support sustainable land management.

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