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RESEARCH ARTICLE

ASSESSMENT OF SOCIO-ECONOMIC FACTORS DETERMINING ADOPTION OF SMALL-SCALE IRRIGATION FARMING ON HOUSEHOLD FOOD SECURITY IN BONDO DISTRICT-KENYA

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ABSTRACT

Bondo in Siaya County, Kenya experiences food insecurity due to irregular rainfall patterns and persistent drought. Irrigation farming is a means of solving this problem, but it has low adoption rates. This study examined the socio economic factors responsible for low adoption of irrigation farming among the predominant Christian community in the sub-county. The study used descriptive research design. A random sample of 75 farmers practicing rain fed farming and 75 farmers using irrigation were interviewed. Data were analyzed using descriptive statistics, gross margins and Chi-Square with emphasis on two major crops grown in the area. Results showed that irrigation had a positive effect on food production with a larger proportion of household members in the irrigated farming receiving higher incomes. Male headed households were better adopters in both irrigated (32%) and rain fed (35%) compared to the female headed household at 4% and 10% in irrigated and rain fed respectively. The age brackets 40-50 years old were better adopters at 68% for males and 41% for females. Married people were better adopters at (41%) in both irrigated and rain fed farming, implying that they are more concerned about food security compared to the other categories studied with only 8% of the younger generation involved in farming activities. Educated people were better adopters of irrigation. Gender and age of the household head also influence adoption of irrigation. These factors are key to adoption of irrigation technologies.

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INTRODUCTION

In many parts of Kenya, hunger continues to be widespread and the right of everyone to adequate food supply is extensively violated (MOA, 2012). In order to adequately address the widespread food insecurity and poverty agenda in Kenya, the Millennium Development Goals (MDGs) were launched in 2002 with its first goal aiming at halving extreme poverty and hunger by 2015 (Migotto et al., 2005). According to Oniang'o (2011), 89% of Kenyans, majority of those who live in rural areas, are food insecure and live below \$ 1. Majority of them are women engaged in subsistence farming. Further studies have showed that Social and economic challenges including education, gender disparities, land sizes, and income levels hamper efforts by household to attain food security. Moreover, Socio-economic determinants and resources for individual households have been identified as basic factors influencing the food security status of households (Sanusi et al., 2006). Food security revolve around four pillars

namely, food availability, accessibility, nutritional factors and stability of supply (Gloss et al., 1999). This implies that in order to achieve food security, it requires that the aggregate availability of physical supplies of food is sufficient, that households have access to those food supplies through their own production systems, through the markets or other sources. Irrigation is one sure way of ensuring adequate food supplies when it is properly practised and the knowledge and skills are available with the farmers. Bondo sub-county in Siaya County, experiences severe food shortages throughout the year as a result of wide spread poverty and declining food production (MOA, 2011). According to the Sub-county poverty and food security assessment report 2010, over 47.2% of the population is poor while 41.1% of the household are food insecure. This translates into over half of the population being either hungry or are on the threshold of hunger (MOA, 2012). It is on this basis that the Sub-county was chosen for the study. The aim of this study was: (i) To assess socio-economic factors determining adoption of small-scale irrigation farming and its effects on household food security in Bondo, Siaya County-

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Kenya (ii) Establish the key players in promoting adoption of agricultural technologies in the region.

RESEARCH METHODOLOGY

Study area

The study was done in Bondo-Sub-county- Kenya between January-August, 2013. The Sub-county has a total area of 1328 km² of which 577.2 km² is land surface, while 751 km² is covered with water of Lake Victoria. Bondo Sub-county lies between 0°26' and 0°90' South of the Equator and from longitude 33°58'E and 34°35'W. The administrative divisions are, Usigu, Maranda and Nyang'oma. It has one constituency known as Bondo.

Adopted methodology

Two objective methods for food security assessment were used in this study (Maxwell and Frankenberger, 1992). In the first case, the household food security was assessed from the number of meals eaten. In the second case, food consumption record was undertaken for individual members of a household each food mentioned was analyzed for calorie content, (Migotto *et al.*, 2005). Duration of food stock from own food production was also used as an indicator of the status of household food security.

Sampling procedure

Multi-stage simple random sampling was used to select locations, sub locations and households. Sample of 210 households was randomly selected for the study. A sample of 70 households was obtained from each division for the study. A total of six locations and twelve villages were randomly sampled. A random sample of 3 households per village was done to select study population.

Data collection procedures and tools

A pre-tested semi structured questionnaire was administered to generate both qualitative and quantitative social information, including sex, age, education, occupation, income, marital status and households' sizes. These variables were categorized and coded for subsequent quantitative data analysis. The questionnaire was administered by the researcher assisted by two enumerators. The dependent and the explanatory variables used in the study included: Farm size, own food production, household size, age of household head, educational level occupation and gender, food stock duration and number of meals taken.

Data Analysis

Quantitative data was organized and analyzed statistically using frequency tables, mean and percentages. The Statically Package for Social Sciences (SPSS) computer software version 11.0 was used to generate the descriptive data such as percentages, means and frequencies. Simple regression analysis and analysis of variance (ANOVA) were used to determine the association and influence of household socio economic variables on household food security. Significance was accepted at 5% probability level ($p < 0.05$).

RESULTS AND DISCUSSION

Socio Economic Profile of Household

The Socio-economic variables for the study population in Bondo are as presented in Table 1.

Table 1. Socio-economic profile of households in Bondo

Variables	Number	% age	Male (%)	Female (%)
<i>Age of household heads</i>				
0-55	175	83.0	57.1	25.9
>55	36	17.0	10.0	7.0
<i>Education of household heads</i>				
Nil	48	22.8	13.3	9.5
Primary	63	29.9	19.5	10.4
Secondary	51	39.9	30.0	9.0
Tertiary	8	8.5	4.3	4.2
<i>Occupation of household head</i>				
Farmer	147	70.0	47.8	22.2
Civil servant	50	23.8	15.8	8.0
Businessperson	13	6.2	3.4	2.8
<i>Gender of household</i>				
Male	141	67.1	-	-
Female	70	32.4	-	-
<i>Household size</i>				
1-6	63	39.6	-	-
>7	45	21.0	19.5	1.9
<i>Land sizes (acres)</i>				
<1	139	33.0	45.7	20.9
1-5	27	12.9	8.1	4.7
>5	20	9.4	6.2	3.2
<i>Duration of food stocks (months)</i>				
0-3	101	47.8	32.0	15.8
4-6	58	32.2	21.6	10.6
7-9	11	5.2	3.5	1.7
10-12	3	1.4	1.0	0.4
<i>Number of meals eaten/day</i>				
1	62	29.4	19.2	9.7
2	129	61.1	40.9	20.2
3	17	8.0	5.7	2.3
>3				

The study revealed that 19% of the household heads were aged 0-18 years while 40.2% of the household heads were 19-35 years. Household heads aged 36-55 were 23.8% and 17.0% were over 55 years. Further analyses of the information showed that majority of the household heads were aged 19-35 years. Household heads with over 55 years had the lowest age range. A large proportion of household heads, 64%, were aged 19-55 years. Household heads with no education were 23.8% while those with primary level of education were 29.9%; this group exhausted their food stocks in 3.2 months. Household heads with secondary level of education were 39%. Those with tertiary level of education were only 8.5%. Majority of the household's heads had attained primary level of education. Household heads with primary level of education exhausted their food stocks in 3.2 months. Those with secondary level of education exhausted food reserves in 3.6 months. Household heads with post secondary and tertiary levels of education exhausted food stocks in 3.7 and 4.9 months respectively. Majority of the households had primary level of education. Further analysis of the findings observed that household with tertiary level of education took the longest time to exhaust their

food stocks, the shortest duration to exhaust harvested food were household heads with pre-primary education. The information collected showed that households with less than one-acre farm were 20.9%. Households with 1-3 acres 46.7% while those with 4-5 acres were 19.5%. The household with over 5 acres was 12.9%. Majority of the households had 1-3 acres while those with more than 3 acres were proportionately smaller. Households with less than one acre of land size exhausted their food stocks, on average, in 1.8 months. On average, households with 1-3 acre land sizes exhausted their food stocks in 3.2 months while those with 4-5 acres of land exhausted food in 4.9 months. Households with over 5 acres exhausted food stocks in 4.8 months. On household sizes, 11.5% of households had 1-3 members while 29.2% had 7-9 members. Households with 10-12 members were only 0.5%. Majority 58.9% of the households had 4-6 members. The human resources available to the farm household determine farm productivity and household income (Ankinsami and Doppler, 2005). Education level among the farming community is low hence a barrier to better off-farm activities, low education also impedes transfer and adoption of agricultural innovations.

Determinants of food security status of households in Bondo

Table 2. Summary on the effects of socio economic determinants on food security

Source of variation	Do	Mean square	F-value	Significance
Age x food stock duration	3	1.682	3.241	0.032*
Education x food stock duration	3	4.427	10.259	0.000*
HH size x food stock duration	3	0.096	0.178	0.276
Land size x food stock duration	3	9.252	23.27	0.040*
Gender x food stock duration	1	0.296	1.902	0.170
Age x No. of meals	3	0.962	1.902	0.072
Education x No. of meals	3	1.701	3.167	0.002*
HH size x No. of meals	3	0.102	1.150	0.250
Land size x No. of meals	3	3.107	7.261	0.007
Gender x No. of meals	3	2.016	1.218	0.165
Age x Acreage indigenous crops	3	0.137	0.867	0.021*

Note:*indicates significant at 5% level

Results from Table 2 revealed that four of the seven variables included in the regression model were significant in explaining the variation in the food security status of household in the study area. These are age, educational level, land size, quantity of food and its duration.

Age

There were significant differences between age of household heads and food availability. Age is very important in any production activity since there is inequality in the production capacity of young and old people, it affect the efficiency of carrying out farming activities. Age is also associated with farmer's experience in farming practices as he or she gains experience overtime. Age of household head significantly influenced the adoption of new technology as younger and educated people are more inclined to adopt new farm practices. This study found that the most active group in food production were adults aged 40-50 years. This group also found it necessary to involve in a more advanced commercialized

agricultural practices as an intervention to the persistence of household food insecurity in the area.

Educational level

In this study, the association between education and duration of food stock was significant at 5% level. Education is significant in facilitating awareness and adoption of new technologies. Education increases managerial competence, enhances ability to diagnose, assess, comprehend and respond to financial and production problems of the household. Higher level of education enhances the understanding of instructions given and also improves the farmer's level of participation in agricultural activities and perception on modern technologies.

Land size

The association between land size and duration of food stocks was highly significant. Land being one of the major factors of production, its size and productive capacity is directly related to the farming system and practices household adopt. The economic implication on the prevalence of small land holding among the majority of the farmers is that, household farm incomes cannot be increased through expansion of cultivated area but only through improved land productivity and value adding technologies.

Quantity of food and duration

The study revealed that there is positive relationship between the level of education and the duration food stock last. Further analysis of the findings observed that household with tertiary level of education took the longest time to exhaust their food stocks where as house hold heads with pre-primary education taking the shortest duration. There was no significant relationship between household member sizes and food stock. There was relationship between gender of household heads and duration of food stocks but was not statistically significant. The association between land size and duration of food stocks was highly significant. On educational level of household heads and number of meals consumed by day the relationship was significant. No statistical significance between household's member's sizes and number of meals eaten. Therefore household socio-economic determinants discussed, had significant influence on food stocks hence on household's food security. The level of significance used was 5% probability.

Gender roles in food provisioning

The study established that the role of women in food provisioning. Figure 1, was 59.5% while that for men was 27.5%. The combined efforts of men and women accounted for 10% while workers contributed only 3%. Therefore these findings revealed that though men were the majority household heads, women's contribution to household food provisioning was higher. Fig 1: Proportion of men and women in food provisioning Based on the recommended number of meals consumed by day about 61% of the households in the area were food insecure and 39% were regarded as food secure. The area could also be regarded as food insecure given that majority of the households, 94.8%, exhausted their food reserves from their own production in less than six months. The area has the

highest poverty levels and the ability of the resident to purchase food from the market is limited. Despite limited control over resources, 59.5% of women were responsible for food provision compared to men (27.5%) or combined effort by both gender (10%). Only 1.2% of land was registered under women in contrast to 81.3% by men.

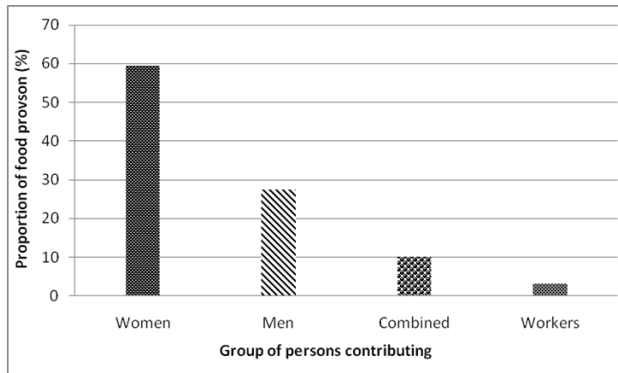


Fig. 1. Proportion of men and women in food provisioning

Sources of technical information to the farmer

Majority of the farmers rely on agricultural extension workers for information, a number depend on the knowledge obtained from fellow farmers with few in irrigated category consulting private extension providers (Figure 2) The results indicate that majority of the respondents practising irrigation farming, obtained technical information from the agricultural extension workers and fellow farmers. Information is critically considered as means of improving farm productivity. Source and the kind of information a farmer collects determine the level of production. Farmers in the irrigated farms were more informed hence higher adaption rate of new technologies.

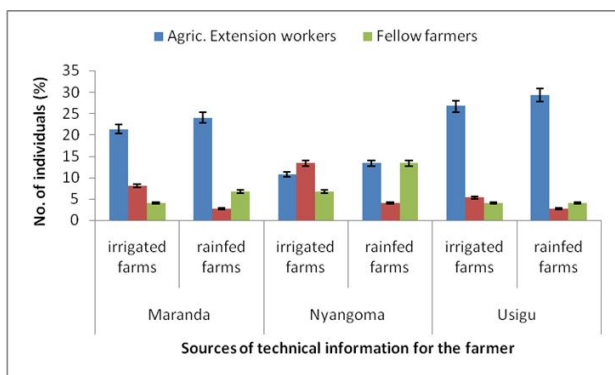


Figure 2. Sources of technical information to the farmers

Kinds of information gathered

Farmers obtain information on different aspects of farming (Figure 3). Majority of farmers in the irrigated category were more interested on the information related to modern irrigation techniques, as those in rain fed category gathered information on good agricultural practices and seed selection.

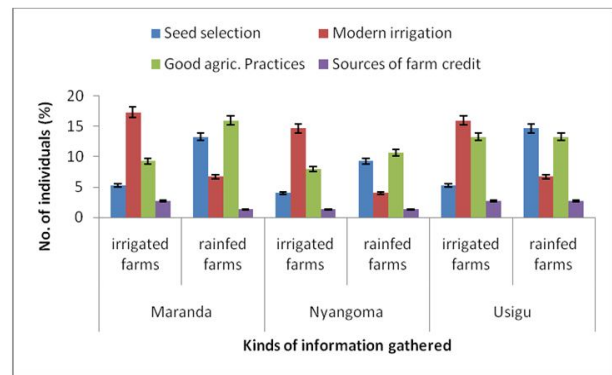


Figure 3. Kinds of information gathered

Conclusion

This study has shown that the socio-economic variables of farming households have implications on their food security status. A large proportion of agricultural and food provisioning tasks were undertaken by women, who could be highly constrained in access to assets for food production such as land. Majority of the residents had primary level of education. This low level of education impacted negatively on household food and nutritional status. The church played important role in the provision of social infrastructures including building of schools, hospitals, electricity, irrigation equipments and farm credits for agricultural activities. The study established that a number of innovative approaches are being developed and adopted by farmers to enhance food security in the area. These approaches are inexpensive and manageable in spite of some negative past experiences, some technologies are showing promising results and increasing adoption rates by farmers. These include low-head drip irrigation technologies, bucket and drum-drip irrigation system, among others. The study concluded that, there is a possibility of adapting other high-level technologies, such as greenhouse farming in the area.

Recommendations

The households should adopt latest technologies including water harvesting, irrigation and greenhouse production of various short seasoned crops.

- The households should diversify food production to include growing of traditional food crops such as cassava, sweet potatoes and others that perform much better in the region.
- Women should be empowered to fully participate in agricultural activities by involving them in the decision making and the ownership of the factors of production since they spend most of their time in the farm.
- The church should continue providing support to community based development projects in the area focusing on irrigation and water management.

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