Effect of Socio-Economic Characteristics of Resource-Poor Farmers on Food Security in Semi-Arid Agro-Ecological Zones of Nyakach, Kenya

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Abstract- Resource-poor farmers make up over 95% of the farmers in the study area. They cannot afford artificial inputs into their farms, rather they rely on the intrinsic value of the soil, which once depleted then they are not able to produce food from their farms. This area being semi-arid implies that rainfall is low, unpredictable and variable. Soil fertility is low and supports only a few indigenous crops. The social and economic characteristics of these farmers determine their agricultural practices hence food availability, access and stability. Agriculture is the major source of food for these farmers' households so their food security is determined by agricultural yields.

Index Terms- Resource-poor farmers, Household Food security, Semi-arid, Agro-ecological zone, Nyakach

I. INTRODUCTION

Social and economic variables influence resource-poor farmers' agricultural land-use practices hence their shifting towards or against adoption of sustainable agricultural land-use practices that increase or negate food security respectively. These factors are farmers' characteristics such as age of the farmer, source of family labour, gender of the farmer, the farming household size; farmer's access to credit, farm size; extension services including trainings attended by the farmer, visits by extension officers and farmer belonging to farmers' groups.

II. STUDY AREA

The Semi-arid agro-ecological zone of Nyakach District is in Kisumu County, Kenya. It is located in western Kenya region along the shores of Lake Victoria, the second largest fresh-water lake in the world. It lies between latitude $0^0$00' (the equator) and $0^0$25' south, and between longitude $34^0$45' east and $35^0$2l' east. The study area has a small shoreline to the southwest where it touches Lake Victoria. It covers 182.6km^2. It is located on the Kano Plain, which is a flat flood plain within the Lake Victoria lowlands. The lowest altitude is same as the surface level of Lake Victoria, which is 1,134m above the sea level. It is a low zone, which is dry and receives very unreliable rainfall that varies from as low as 150mm during the short rains to 700 during the long rains. It receives mean annual rainfall of 600mm and sometimes lower.

Ecologically, it spreads across two main AEZS: LM3 and LM4. The altitude range is ll00m to l300m. LM3 is the Lower Midland Cotton Zone. It is warm and semi-arid. The annual average precipitation is 50-65 percent of potential evapotranspiration. Its climatic conditions are good to fair for cotton crop and fair for maize crop. At present the crop widely grown here is maize, but with high risk. Cotton is not grown in this area. The best preferred cereal is the early maturing dwarf sorghum like Serena and Seredo varieties. LM4 is the Marginal Cotton Zone/ Middle Sisal Zone. The climatic conditions are fair to poor for cotton and maize crops, fair for pigeon pea and good for sisal. The annual average precipitation is 40-50 percent of potential evapotranspiration.

The study area lies on the lowland flat area called the Kano Plain, with a flat topography. Fifty one percent (51%) of the study area comprise of predominantly Black Cotton Clay soils (vertisols) with moderate fertility and poor drainage, which is prone to flooding. The rest of the study area has sandy clay loam soils derived from igneous rocks, which are suitable for sugar cane growing. Sugarcane, therefore, forms the main cash crop in the area of study. The swamps along rivers Nyando, Sondu-Miriu and Awach are best suited for rice growing under irrigation The vertisols do not allow quick infiltration of surface water into the ground and this compounds with the problem of drainage since surface drainage is already impeded by the gradient. Most of the study area is waterlogged due to formation of hard pans at about 15 to 30 centimeters down from the ground surface. This has consequently resulted in shallow soils, with low and variable fertility, which cannot sustain high yields from crop production. Approximately 10 percent of the soils of the study area can be categorized as of moderate to high fertility. This means that the remaining 90 percent is deficit of the necessary soil characteristics that would support high yields. The mean temperature is 20°C while the mean maximum temperature is above 350c. The humidity is relatively high with mean evaporation rate being l800mm and 2000mm per annum.

III. METHODOLOGY

Research Design

Survey Research was conducted. This study adopted Cross-Sectional survey research design. The Unit of analysis was Household. Both qualitative and quantitative research methods were employed. Structured questionnaires were administered to the farmers. This concerned the resource-poor farmers/Household Heads, who gave information on their household food security status, the types of agricultural land-use

practices that they carried out, the family size, the source and amount of labour input on the farm, the amount of yields that they got and how long the food harvests lasted their families, Their awareness and adoption of policies on sustainable agricultural land-use practices and how this has influenced their household food availability, stability and accessibility.

Study Population and Sampling

The average number of individuals per household is 5.4. The study population was 4,198 farm households. This is 30 per cent of 13,995 which is the total number of farm households in the study area. The Sample Size was hence 352 farm households at 95 per cent confidence, being the minimum sample size, as illustrated by the Fisher's et al (1983) formula.

Simple Random Sampling was used to identify the farm households that were interviewed. Purposive sampling procedure then followed in identifying the respondents, who were the heads of the households, and had lived in the area for at least five years, so as to give consistent and reliable information on agricultural productivity, food production and consumption by their households.

Data collection methods

Primary and Secondary sources constituted data for this study. Various statistical and descriptive methods of data collection and analysis were utilized so as to come up with relevant results from this study.

The tools of collecting primary data were a Structured questionnaire given to the household head, which included variables such as the bio-data of the respondents' household characteristics, farm and farming systems, household food demand, income and expenditures on food, farm production, livestock production and food security related questions. Observation forms were filled by the researcher based on direct personal observation, unstructured oral interviews were administered during the Focus Group discussions.

The section related to food security was based on the conventional questionnaire format for the Household Food Insecurity Access Scale (HFIAS). The HFIAS is a tool to assess whether households had experienced problems in food access in the preceding 30 days (Coates, Swindale & Bilinsky, 2006 and D'Haese et al, 2010). HFIAS is composed of nine questions that ask about modifications made by households in their diet due to limited resources to acquire food. It measures the severity of food insecurity in the past thirty (30) days, as reported by the households themselves (Coates, et al, 2006). Reactions and responses caused by household's experience of food insecurity were captured, quantified and summarized in a scale.

Collection of secondary data involved a literature search on the concept of social and economuic characteristics and their effect on food security globally, regionally, nationally and in semi-arid Nyakach specifically. These were obtained from referred academic journals, reports, text books, periodicals, and government reports from libraries.

Data Analysis and Results Presentation

Data analysis employed both descriptive and inferential statistics. Regression analysis involved computation of percentages, frequency measures, and other measures of central tendency. These were used in analyzing spatial and temporal agricultural factors that influenced food security, such as education level of the farmers, gender of the household Head, source of labour on the farm, size of household, size of farm, source and type of seed, household dependency ratio, level of education of respondents, gender of the farmers, total acreage owned by each farmer, and yields per unit of land obtained by each farmer.

FINDINGS AND DISCUSSIONS

Seventy four (74) percent, confirmed that they have been worried about not having enough food in their households over the past 30 days. This is a sign of food insecurity in the sample population and households. Further, the results indicated that 86 percent of the respondents ate few kinds of food and was not able to eat the kinds of food they would have preferred over the past 30 days because of lack of resources to get the preferred food. Moreover, 78 percent and 75 percent, revealed respectively eating smaller meals than needed and fewer meals in a day by some household members because there was not enough food. 59 percent and 29 percent of the respondents stated respectively that at least a household member went a whole day without eating anything and went to sleep hungry because there was not enough food. Further 43 percent of the respondents stated not having food at all (rarely, sometimes, or often) in the household because there were no resources to get more food. Only 5.8 percent of the households in the study area were food secure, 9.2 percent were mildly food insecure while 21.7 percent of the households were moderately food insecure. 63.3 percent, were classified among the severely food insecure group indicating how severe the food insecurity situation was in the study area.

Age of the farmer

This variable is significant at 5% probability level in explaining food insecurity. The sign of the coefficient of change in age of the household head showed a negative relationship with food insecurity. As the age of the household head increases, the likelihood of being food insecure decreases by 0.858. This indicates that livestock and asset ownership decreases with generation. The finding is consistent with a priori expectations.

Gender of the Farmer

Women play a critical role in food production. This happens in areas of cultivation, seed selection, storage of yield; in the study area. They also provide the main labour on the agricultural sector. Women's contribution to food production here is 76 per cent. Despite their important role in ecological and agricultural rehabilitation and sustainable food security, they do not have direct rights to land and their access to it is being curtailed by titles being provided to men. Women form a tiny component of those small-scale farmers who receive training in modern methods; their traditional knowledge, especially regarding seed, is rarely sought and built upon.

Farmer's Family size

The coefficient for family size has a positive sign and statistically different from zero at 1% level of probability, indicating that this variable was the cause of food insecurity. Other things remaining equal, the odds ratio in favor of food

insecurity increases by a factor of 6.041 as household size increases by one. This case shows that as the number of family size increases, family food demand also increases.

The number of livestock owned by a household

Livestock holding is negatively and significantly related to the probability of being food insecure. The negative relationship is explained by the fact that households with large herd size have better chance to earn more income from livestock production. This in turn enables them to purchase food when they are in short of their stock, and invest in purchase of farm inputs that increase food production, and thus ensuring food security at household level. The implication is that the probability of being food insecure decreases by a factor of 0.400 for households owning livestock. Evidence has shown that, livestock numbers are severely limited by a lack of grazing facilities, as land is ever more intensively used for arable production, which provides the staple foods necessary for family subsistence.

Use of farm inputs

Input use (seed, manure and fertilizer) has a significant and negative influence on the probability of being food insecure. The possible explanation is that those farmers who use input are more likely to be food secure than those who have no access to it. If other factors are kept constant, the odds ratio in favor of being food secure increases by a factor of 10.101 as a farmer use more units of inputs. However, poor farmers can only afford a small amount of fertilizer and seed.

Farmer's access to credit facilities

Participating in credit use in this area contributes in diminishing the probability of being food insecure by a factor of 0.181 other things kept constant. This implies that credit utilization will enhance the capacity of rural households to access labor and input for productivity improvement or food when the need arises. Moreover, credit is important source of investment on off-farm and non-farm activities that generate income for farm households.

Farmer's involvement in Off-farm employment

Off farm employment creates an opportunity to raise household's income. People living in households mainly engaged in off farm activities like petty trade, are more likely to be food secure since off farm employment negatively correlate with the probability of being food insecure. Off- farm employment in the study area is mainly petty trade and Wage, which aid people to escape poverty. Due to the decline in soil fertility and consequent reduction in farm productivity and income, farming families are more reliant on off- farm activities to provide food and income.

Household's own food production

The value of foods from own production (own consumption) has a negative relation with the probability of being food insecure at less than 1% probability level. This implies that keeping other factors constant, a unit changes in the value of own consumption will reduce the probability of food insecurity by a factor of 0.996. This implies that farmer's own produce has a significant contribution to achieve food security at household level.

Dependency Ratio

The result for dependency ratio showed that in a household where adults or productive age groups are higher than the non-productive age groups, the probability of the household to be food insecure would be less, provided that the area provides good working atmosphere and production potential. The study established that the higher the number of the dependants in a household (individuals whose ages are less than I5 years and greater than 65 years), the higher the probability of the household to be food insecure. A unit change in dependency ratio will increase the chance of households to be food insecure by a factor of 0.029, keeping other factors constant. This supports the argument that population pressure elsewhere is a threat to food security.

Farm size and land use

Land is the most important resource for agricultural production .As the study area is one of the most densely populated areas in Kenya; there is a limited access to land and overuse of the little fertile soil that exists. The overuse of land resources may generate food insecurity induced by poor yield as a result of land related resource depletion. The quantity of farmland available for a household was on average 0.99 ha of which 75.94 percent was for food crops while 11.87 percent was for cash crops. This indicates the priority given to food production at the expense of cash crops which could lead us to assume the importance of food production in the area. The number of plots on the plain and hills per household is on average 5.64 while the number of plots in swamps is on average 1.41. This indicates how farm land in the study area is highly fragmented. Because the area is densely populated, almost all available farmland was in use where on average only 7.12 percent of farmland was under fallow. This limited fallowing reflects the consequence of overuse of land resources as a result of demographic explosion yet fallowing would help increase soil fertility. However, fallowing should not be confused with uncultivated spaces because of laziness or other impeding factors.

Households' source of income

Households in semi-arid Nyakach have different sources of income. Agriculture is the main source of income for the respondents. Food crops and cash crops sale are the most important sources of income followed by livestock and salary. Commerce, artisans and forestry were also a source of income for some of the respondents. It is important to note that income diversification is also one of the practiced strategies by households in the study area as a way of risks management. These are calculated based on the share of the total of all households in the sample.

Level of Formal Education

Coping with food insecurity rests with farm and fish families who are the main food producers in the study area. Education opportunities should, therefore, be opened up to them. This is especially true with women who make up 71 per cent of the illiterate farmers in the area of study. The highest level that many small-scale resource-poor farmers receive is primary education. But even this should expose them to modem technology and the behavior of markets beyond their geographical horizons. With this kind of background, a Working relationship, with mutual respect, can be developed between producers, natural scientists and economists and in situ extension programs can become more easily adopted. Extension workers, "change agents" and other related experts must be able to visit the villages and provide in situ training, thus developing with the farmers themselves technologies suitable to the users and the

ecosystems. In addition, farmers are exposed to the successful experiences of others. The concept of field days can be extended to cover visits to other parts of the country and possibly to neighboring countries.

Household's Source of labour

One of the problems facing the resource-poor farmers in the study area is lack of enough labour to work on the farm. Despite increasing populations, many of these rural households suffer from inadequate labour supplies as lack of rural development has forced many young people to migrate to the urban areas. Constant labour is critical to food security. Historically, we know that apart from Japan, most industrialized countries raised labour productivity through technology. For many African countries, increased food production cannot be achieved in this way. Our economies simply cannot allow it. There are signs that instead of getting better, the economic situation in Kenya in general, and the study area in particular, will actually worsen over the next few decades. Therefore labour must be retained in rural areas if agricultural productivity is to increase. Currently, because of labour shortage, many of these rural old people, particularly women, have no option but to over-crop. This study therefore supports "Back-to-Land" initiative, which would encourage the unemployed youths in the urban areas to go back to the villages, where they can then produce from the land. Labour availability would help curtail over-cropping and consequent degradation of soils. This means, then, that agricultural development generally and food security in particular are intimately linked to the question of rural development. With the possibility of securing a livelihood in rural areas, labour would remain there and augment the very low technology that marry households apply.

Households' yearly expenditures on food and agricultural inputs

71 percent of expenditure is allocated to food purchase and 29 percent to agricultural inputs. Among agricultural inputs labor occupies 17 percent while 9 percent goes to improved seed and a remaining 2 percent and 1 percent go respectively to land rental and fertilizer inputs. The share of expenditure on pesticides is very small. The high proportion of households' expenditure on food purchase shows that farmers are not able to satisfy their food needs through their own production. They still need to purchase food. Even though we recognize that farmers cannot only eat the food produced on their farms, 71 percent of the total household expenditure is high and reveals limited food production for intra-household consumption.

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