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The Influence of Smallholder Farming Characteristics on Household Food Security in West Pokot County, Kenya

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Abstract
Despite their importance in global and regional food production, smallholder farmers' especially in agro-pastoral regions have received minimal recognition in policy, strategic frameworks and interventions. In Kenya, there has been little focus by government and interventions on agriculture for smallholder farmers in agro-pastoral regions, thus, rendering them into numerous vulnerabilities and constraints that impede their agricultural activities. This study investigated smallholder farming characteristics on household food security in West Pokot County, Kenya. Multi stage and systematic random sampling techniques were used to determine a sample size of respondents in respective locations. This study adopted an explanatory research design and employed mixed methods approach. The researcher also drew philosophical inspiration from pragmatic worldview that is problem centred and more focused on real world issues. The target population comprised of 78,946 smallholder households in West Pokot County with a sample size of 297 respondents. Questionnaires, interview schedules and observations were used for collecting data. The collected data was analysed using both and inferential statistics. Qualitative content was achieved through content analysis. The study found out that more males (76.66%) were involved in both crop and livestock production as compared to females (58.04%). In addition, there is significant relationship between total size of household arable land and land size under food crop production (r=0.570, P=0.000). The study showed that farming characteristics which included farming practices and size of arable land under food production had a significant positive influence on the household food security. The results of this study will also be significant at household level as a community and will enhance household food security by understanding the challenges and opportunities in smallholder farmers.

Key Words: Influence, Smallholder, Farming, Characteristics, Food Security

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I. Introduction

Globally, one of the main challenges is how to ensure food and nutrition security for a growing population whilst adjusting to an overall net increase of disasters, including those caused by climate change, and increased economic volatility, and ensuring long-term sustainable development (FAO, 2009). For food security to exist at the national, regional, and local levels, food must be available, accessible, and properly utilized. Availability of food means that enough safe and nutritious food is either domestically produced or imported from the market. However, food availability does not ensure food accessibility. Government policies must also contribute to equal distribution of food within nations, regions, and communities. In addition, for food to be accessible, individuals and families must be able to afford the food prices on the market. Food must be properly utilized which depends on proper food storage to guard against spoilage, appropriate handling to avoid disease transmission, and proper preparation to ensure nutritiously balanced meals (FAO, 2009).

Food Security and development are now familiar concepts to a majority of researchers throughout the world, particularly among the developing countries, such as Kenya. Within the developing world, Africa, particularly Sub-Saharan Africa, is classified as one of the poorest regions associated with escalating food security problems. As long as a society is deficient in all its food needs, poverty is inevitable, since food insecurity is viewed as both a cause and a consequence of poverty (Sanchez, *et al.,* 2005). In order to adequately address development, it would be simpler to deal with food insecurity, as food is just one of the basic needs required by an individual for a minimum healthy life.

The primary causes of food insecurity are poverty, high illiteracy levels, poor health status, and certain disabilities that increase the risk of food insecurity for individuals and households for instance in the United States. In developing countries, the root causes of food insecurity include: poverty, war and civil conflict, corruption, national policies that do not promote equal access to food for all, environmental degradation, barriers to trade, insufficient agricultural development, population growth, high illiteracy levels, social and gender inequality, poor health status, cultural insensitivity, and natural disasters (FAO, 2002). All these factors

contribute to either insufficient national food availability or insufficient access to food by households and individuals (IFPRI, 2002; FAO, 2011, 2012).

In Kenya, food insecurity is a monumental crisis affecting many, particularly in the rural areas and ASAL areas. According to the Global Hunger Index Report 2015 (GHI, 2015), Kenya was rated among 30 countries with the least food security index in the world. According to statistics from the Republic of Kenya (2016), only about a third of the Kenyan population can be said to be chronically food insecure. Official estimates indicate over 10 million people are food insecure with majority of them living on relief food. Over the last 3 decades, per capita food availability has declined by more than 10%. The International Food Policy Research Institute (I.F.P.R.I) classified the status of hunger in Kenya as alarming. It was indicated that negligible progress was made between 2000 and 2015 in terms of the global hunger index. Households are also incurring huge food bills due to the high food prices.

The contribution of smallholder farmers to global food production is significant: they supply up to 50% of the worlds' cereal, 60% of the world's meat and 75% of the world's dairy production (Kremen *et al.,* 2012). Indeed, both urban and rural food consumers in developing countries count heavily on the efficiency of their local smallholder farmers to satisfy their food needs. Within this figure, smallholder farmers produce most of the food that is consumed locally (Campbell, Thornton, Zougmoré, Van Asten, & Lipper, 2014). Smallholders, as gross domestic food and nutrient providers have therefore a special role to play in the global efforts to improve food and nutrition security (Beddington, Asaduzzaman, Fernandez & Scholes, 2012). Unfortunately, until recently small-scale farmers have not been the primary focus of agricultural development, and their actual and potential contribution to food and nutrition security is not valorised as it deserves (Grando, Pietromarchi, Desideri & Colombo, 2016).

A majority of sub-Saharan Africa's population live in rural areas where poverty and deprivation are the most severe. Since almost all rural households depend directly or indirectly on agriculture, and given the sector's large contribution to the overall economy, it might seem obvious that agriculture should be a key sector in development. However, while agriculture-led growth has played an important role in reducing poverty and transforming the economies of many Asian countries, the strategy has not yet worked in Africa. Most African countries have failed to meet the requirements for a successful agricultural revolution, and productivity in African agriculture lags far behind the rest of the world. This has recently led to renewed debate within the international development community concerning the role of agriculture, particularly small farms, in African development.

West Pokot County is one of the food deficient and food insecure Counties in Kenya (GOK, 2015). In agro-pastoral regions like West Pokot County in Kenya, smallholder farmers have negatively been affected by climate change and variability through its adverse impacts. Smallholder farmers in agro-pastoral rural areas have been experiencing low agricultural productivity, crop failure, human disease outbreak, pest and diseases, lack of water, shortages of agricultural-based food items at a household level and food insecurities (Mutekwa, 2007). These impacts have posed a huge threat to food security and livelihoods of most smallholder farmers compromising their well-being, as most of them depend on natural climatic sensitive resources such as agriculture for their livelihoods (Debela *et al.*, 2015). It is evident; farming characteristics such as farming practices and type of food increases the availability and accessibility of food. The current study investigated the influence of Smallholder farming characteristics on household food security in West Pokot County, Kenya.

II. Literature Review

The size of the family land determines the amount of food produced. Households with less land are unable to produce more and therefore become food insecure. Orodho, (1998) in a study conducted in Vihiga district, of Western Kenya, also found that families that had more land were more food secure than those with less land. In Kitui County, food production is carried out on farms that are generally small averaging 0.2-3 ha and without irrigation. This already scarce resource must be subdivided among more people, resulting in over-exploitation and low productivity (KNBS & ICF Macro, 2010). In addition, household farm size in Kitui County determines household food security although the biophysical agricultural potential is mainly a function of soil characteristics and moisture availability, both being largely controlled by elevation and topography.

The majority of smallholder farmers are the poor. Matshe, (2009) indicates that 50% of the worlds' hungry are smallholder farmers, with the landless rural population making up 20% of these. There is increased attention over the past few decades on studies that attempt to link household characteristics to household food security. This attention arose upon the realization that components of economic and social status that distinguish and characterize people are significant indicators of food security (Dauda, 2010). The size of a household farm is an important characteristic in understanding household food security (Orodho, 1998). It is the total area of land cultivated to food and cash crop by households, measured in hectares. Deininger (2003) and Jayne & Muyanga (2012) demonstrates that there is a positive relationship between farm size and improvement in households' income and food security.

In Kenya, the mean land owned per household has declined over the past decade, from 6.1 to 5.8 acres. This is attributed to increasing rural population pressures and land fragmentation (Kibaara *et al.*, 2008). He further states that household farm size in Kenya has a significant relationship on household food security. Where households with smaller lands tend to intensify labor input because smaller field size tends to be correlated with increased labor/land ratios hence increase food production. Smaller farms have higher adult equivalent per acre for example compared with bigger size farms explaining the high labor input. In addition, smaller fields tend to be more mixed cropped than larger fields and these mixed crops tend to include horticultural crops and other relatively high value crops.

According to Tankou *et al.*, (2017) in Cameroon and Herbert, (1996) in Burundi, there is a tendency towards income diversification through extra-agricultural activities which complement farming and increase food security of the household. Some farmers in Burundi have even adopted the growth of passion fruit following its high market demand to broaden their sources of income and this enhances their food security (Bashangwa Mpozi *et al.*, 2015).

The Asia and Pacific region can increase food production through crop diversification, making the best use of alternatives to rice and wheat. For example, potato has emerged as one of the important food crops in the region. Since it gives an exceptionally high yield and produces more edible energy and protein per unit area and time than many other crops, it fits well into multiple-cropping systems prevalent in the region. Since many potato varieties are bred for conditions in Europe and the United States (US), researchers are testing promising varieties under local growing conditions. The PRC and India are leading the way, accounting for about 79% of the land area allotted and production of potato in the region. There is scope for more research on improved varieties, appropriate production technologies, and value addition (Papademetriou, 2008; Thiele *et al.*, 2008).

Smallholder farmers have been found to tend crops that have been neglected but they are essential in achieving food security and nutrition. There is also a real opportunity to increase productivity in many secondary crops that have been neglected and bypassed by mainstream agricultural research. These "orphan" crops, such as millet, sorghum, cassava, and other root crops, provide the main sustenance for millions of poor households (Naylor *et al.*, 2004). The International Center for Agricultural Research in the Dry Areas (ICARDA) has been working for decades on the development of disease-resistant, yield-increasing cultivars of millet, and recently, there has been a strong interest from the research community and policymakers to revitalize millet production as a means of addressing food security challenges. Leading universities and nongovernment organizations in South Asia, in collaboration with Canadian researchers, are finding ways to bring the underutilized small grains back into the South Asian diets through multidisciplinary research and policy advocacy

Yahya and Xiaohui (2014) indicated smallholder farmers efforts are constrained by their inability to access agricultural inputs like seed, fertilizer and pesticides when needed. This was consistent with the study from Kenya, which revealed that female headed households have much lower adoption rates for improved seeds and fertilizers. Credit constraints also limit the access of female-headed households to fertilizers in Benin and Malawi (Minot, Kherallah, & Berry, 2000). Ndiyo and Urassa (2001) also finds out that smallholder farmers' access to agricultural inputs and technologies is constrained by their lack of access to credit and membership in rural organizations, gender-blind development programs and lack of attention to the needs of farmers in research.

Yahya and Xiaohui (2014) revealed a percentage increase in access to modern technology and agricultural extension education/ training to small holder farmers (ceteris paribus) increases the probability of being food secure and hence reduce constrain toward their effort in ensuring food security at households. Mechanized farming not only enables efficient utilization of various inputs such as fertilizers, pesticides, seeds, and use of water for irrigation, but also helps in improving yields and hence poverty alleviation. The majority of smallholder farmers are still practicing rudimentary farming, farming activities are done manually, which is time-consuming, since they can't afford to hire tractors/new technologies for food production (as to out 173 beneficiaries, only 62 are women while 111 are men). Furthermore, smallholder farmers are not only a key producer of food, but they also perform household chores, most of the time they do not have enough time to attend extension education/ training programs for existing/new technologies. A study by Tegegne (2012) in Ethiopia revealed that 29.4%, of women had training on agricultural technologies, 50.3% had no training in agricultural technologies and 20.3% partially participate in training on agricultural technologies. This tends to constrain farmers' ability to improve yield, earnings and efficiency in agriculture.

Poor food storage facilities increase the probability of being food insecure and vice versa. Poor food storage facilities and use of poor processing methods constrain WSFs efforts in ensuring food security at households, this is due to the fact that it leads to high post-harvest losses of food and hence food insecurity. In line with this study Imonikebe (2010) pointed out that the provision of processing and storage facilities by the government could minimize post-harvest losses and promote food security. Smallholder farmers play a greater role in every stage of food production, so in order to reduce food waste women should be empowered so that they can access modernized food storage facilities and food processing methods.

The issue of food losses is of high importance in the efforts to combat hunger, raise income and improve food security in the world's poorest countries. Food losses occur as a result of inefficiencies in food production and processing operations that diminish supplies (Rooney, 2011). Given that many small farmers in developing countries live on the margins of food insecurity, a reduction in food losses could have an immediate and significant impact on their livelihood. Food losses are among factors affecting food availability due to high pre and post-harvest losses due to pest, diseases and adverse climatic conditions. Pre harvest losses account for over 30% of all crop losses in the country. It is estimated that post-harvest losses range from 30-40% for cereal grain and legumes, up to 45% for roots and tubers and 40-80% for fresh vegetables and fruits. Moreover inappropriate food management at house hold level diminishes food stock available for consumption (IFAD, 2010).

III. Methodology

The study was carried out in West Pokot County of Kenya using pluralistic approaches where pragmatism drawing from both qualitative and quantitative research approaches was used. The study embraced mixed methods because mixing qualitative and quantitative data during collection and analysis provided deeper insights and a more complete picture of the phenomenon and triangulated research yielded results that were more comprehensive and reliable than those generated through single methods (Creswell & Plano Clark, 2017). This approach also helped in triangulation of the research findings. This study adopted explanatory research design which aimed at establishing causal relationship between variables.

The target population in this study was 78,946 households in West Pokot County (KNBS, 2013). These households were clustered into sub counties which included West Pokot Sub County with 26,660 household, Pokot Cental with 14,840 households, North Pokot with 15,338 households and Pokot south with 22,108 households.

A sample size of 282 households was achieved using the following formula;

Sample size $n = [(z^2 * p * q) + ME^2] / [ME^2 + z^2 * p * q / N]$

n =sample size, z =critical standard score, p = population proportion, q = 1- p, *ME* = margin of error, N =size of the population

n = $[((1.96)^2 * 0.90 * 0.10) + (0.035)^2] / [(0.035)^2 + (1.96)^2 * 0.90 * 0.10 / 78,946]$ = 282.2309954 which is **282** households

Study sites were selected with regard to the land classification types largely based on food (crop) production potential. According to Obwocha (2015), the Pokot themselves utilize their land largely on the basis of altitude, rainfall and agricultural potential. First, West Pokot County was purposively sampled based on the geographical location, diversity in agro ecological zones and proneness to food insecurity. A list of administrative sub counties in the three land classification types were considered from which one sub county was selected randomly as a representative whereby West Pokot Sub County, South Pokot and North Pokot County was selected. From the randomly selected sub counties, the division within the sub county was listed and purposively categorised on the basis of the land classification in the area, climatic conditions experienced in the specific locations and accessibility/security whereby one division per Sub County was selected thus Kapenguria, Chepareria and Kacheliba were sampled. Further from each division, two locations were randomly sampled to bring the total number of locations to 6. From each location, two sub locations were randomly sampled bring the total number of sub location to be twelve. From each sub location, the study sampled two villages making the total number of villages in this study to be 24. From each village, the study selected between 11 and 12 households using systematic random sampling where each 2ndhousehold was sampled to achieve a sample size of 282.

The local administration leaders that included chiefs and village elders helped the researcher to identify farmers and make the necessary appointments. The study also used Key informants comprising of 6 chiefs and 6 agricultural extension officers for both livestock and crop production each from the 6 locations and 3 representatives of Non-Governmental Organizations working on Food security in the study area.

A Questionnaire and interview guides were used in data collection. Orodho (2005) observes that questionnaires have a major advantage of time efficiency and anonymity. Creswell and Plano Clark (2017) argues that the questionnaire is a suitable tool for collecting data given a large sample size. Based on these advantages, the current study preferred to use the questionnaire and interview guide for key informants over other tools of data collection. In this study, questionnaires were used to collect data from smallholder farmers. On the other hand, an interview guide was used to solicit for in-depth data from key informants and farmers' organizations in the county. These instruments were used to collect primary data.

The validity of the data collection instruments that were used to collect data were measured by deriving all the questions from the study's objectives, and checking each question to determine its contribution to the objectives (Check & Schutt, 2012). To test internal consistency of the items listed on the instrument used, the

Cronbach alpha coefficient was computed. The statistic coefficient value between 0 and 1 was used to rate the reliability of an instrument such as a questionnaire ranges.

The study used both quantitative and qualitative data analysis. The data that was obtained through questionnaires was edited and coded through a predetermined coding scheme. Editing of data is a process of examining the raw data (especially in surveys) to detect errors and omissions and to correct these errors where possible (Kothari, 2004). Quantitative data was analysed in SPSS and at descriptive level and more soundly statistics of empirical facts, the statistical summaries were derived and presented in the form of frequency tables, percentages, cross-tabulations, means and standard deviations. Inferential statistics were used to determine the relationships between smallholder farming, farmers associations and household food security as well as testing the hypotheses. Qualitative data was mostly applied in triangulation of the quantitative data as presented by the respondents in West Pokot County to improve validity and reliability of all variables associated with household food security in the study area.

The researcher followed all codes of ethical issues while conducting this study. Informed consent was sought from smallholder farmers and key informants before administering the questionnaires and conducting interviews respectively. Privacy and confidentiality was practiced during data collection and with data handling.

IV. Results and Discussions

The aim of this study was to evaluate smallholder farming characteristics on household food security in West Pokot County. The characteristics were informed by farm size, farming practices such as application of fertilizers and manure, use of improved seeds, type of food crops, number of cultivation per season and mixed farming practices. The findings revealed that 79.7% of the sampled households have their household land size less than 3.0 hectare although 7.9% had between 4 and 5 hectares. On the other hand, it was noted that 70.2% of the respondents cultivated less than 2 hectares with 32.4% cultivating less than 1.0 hectares. It can be deduced that most of the sampled households, did not utilized the available land for food production. A correlation was established between total arable land available and arable land under food production as indicated by R=0.570.

The results also indicated that most of the sampled household grew more than one food crop as indicated by 73.0% of the respondents. Maize was grown by all respondents and it was followed closely by bean at 58.0% of the respondents. Other crops were vegetable, potatoes, banana, carrot, cassava, millet and sorghum. The most dominant mixed cropping were maize and beans, maize and millet as well as maize potatoes and maize vegetables. The results also revealed that 3.3% of the farmers were able to grow a combination of five food crops.

The land under cultivation was established to less than 1000 hectares as it was 847.74. Maize was grown 613.9 hectares which is 72.4% of the total land. The land ranged from 0.25 hectares to 5 hectares with mean acreage of 2.60 hectares. Beans was grown 178.86 hectares which was 21.1% of the total arable land. Other food crops were cultivated in less than 15 hectares. The acreage ranged from 0.01 to 5.0 hectares with a mean of 1.21 hectares. The results also revealed that maize and cassava were grown for one season by all sampled respondents. However, carrots, peas and other legumes were grown thrice a season. Other crops such as beans, vegetable, millet, and banana were grown between one and three seasons while sorghum between one and two seasons.

The study also sought to establish farming practices from the perspective of improved seed, application of fertilizer and manure. The results indicated that 41.5% of the sampled respondents did not use improved seeds as compared to 5.4% who always used improved seeds. Those used improved seeds from moderate to more often were 29.8%. In regard to application of fertilizers, 26.6% did not used fertilizer at all as compared to 0.8% who always applied fertilizer. It was noted that 24.5% of the sampled respondents did not used manure as compared to 2.1% who used it always. Those used manure from moderate to more often were 31.1% of sampled farmers. It was noted that availability of improved seed, fertilizer and manure were some of the reason that sampled farmers did use them. Another significant reason was availability of cash to purchase them thereby denying them opportunity to utilize them in the farm. For manure, some of the respondents indicated that lack of skill, energy to carry to farms and some claimed the land was naturally fertile; therefore, there is no need to apply fertilizers and manure.

The study further sought to establish if respondents kept livestock besides crop farming. Majority of the respondents indicated they also kept livestock (72.2%). Majority of the respondents kept between 1 and 20 livestock which included cattle, goats, sheep and poultry. The total number of livestock was 3,942 with a mean of 16 although it ranged from 2 up to 120. Total income from livestock was Ksh. 2,009,800 while the mean was Ksh. 12,000 per annum. It ranged from Ksh 400 to 100,000 in some households. The respondents affirmed that income from livestock has been decreasing over the years.

Inferential statistics was applied to test the second null hypothesis that $\mathbf{H_{01}}$: There is no significant relationship between smallholder farmers' farming characteristics and household food security in West Pokot County. Using simple regression analysis, the results indicated that farming characteristics which included farming practices and size of arable land under food production had a significant positive influence on the

household food security in West Pokot Sub County as indicated by R square of 0.421. This implies that up to 42.1% of change in household food security in West Pokot Sub County is significantly influence by smallholder farming characteristics. The second model of the study, the unstandardized B-coefficient yielded a value B=.912 which was significant at p=.000 implying that a unit change in smallholder farming characteristics would result to significant change in household food security by 0.912 units. The findings were also supported by multiple linear regressions results which revealed unstandardized B coefficient of 0.401. This implies that when the variance explained by all other variables in the model is controlled. A unit change in smallholder farming characteristics would result to significant change in household food security in West Pokot County by 0.401 units in the same direction.

V. Conclusions and Recommendations

The study concluded that smallholder farming characteristics influences household food security in West Pokot County. Size of land under food production is associated with quantity of food production especially food crops whereby, household with significant arable land size are able to produce adequate food for household consumption as well as surplus to supplement other household needs. However, other factors were also found to be associated with food security under farming characteristics. The smallholders' farmers in West Pokot County overly rely on maize production which is staple food in most household in Kenya and therefore needs to do crop and animal production diversification so as to enhance food security in the region.

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