EFFECT OF NATURAL CAPITAL ON FOOD SECURITY AMONG SMALLHOLDER TEA FARMERS IN BOMET COUNTY, KENYA

ABSTRACT

Health and well-being of the general population, children's growth, development, and cognitive ability as well as the productivity of the workforce are all negatively impacted by food insecurity. In tea growing regions, there are records of high malnutrition, high morbidity rates, and low farm productivity and low incomes. The study aimed to describe the effect of natural capital on food security among smallholder tea farmers in Bomet County, Kenya. The study was guided by Entitlement Theory. The study adopted mixed approach design entailing exploratory design and explanatory research design. All the registered 16572 tea farmers in selected tea growing regions were the target population for this study. Multi-stage purposive and random sampling techniques were used to select a sample size of 391 smallholder tea farmers in Bomet County. Instruments of data collection included questionnaires, key informants, interviews, focus group discussions and direct observations. The Cronbach Alpha value was used to test the instrument's reliability. The Statistical Package for Social Sciences (SPSS) Version 26 was used to analyze the data in both descriptive and inferential ways. Thematic analysis and tables were used to present the findings from the study's qualitative data. The study findings revealed that there was effect of natural capital on food security. The study recommends that the government should subsidize tea farm inputs such as fertilizers and seeds. Organize farmers into SACCOs to enable them access farm inputs, credit facilities and market for their produce. Both national and county governments should improve road networks so as to help access food markets and also sale of farm produce.

Keywords: Food Security, Natural Capital, fertilizers, instrument's reliability

Introduction

Food security is a state in which every person has constant and unhindered physical and financial access to food that meets their nutritional requirements and food preferences for a healthy and active lifestyle (Capone, Bilali, Debs, Cardone & Driouech, 2014). Food insecurity, on the other hand, refers to a lack of adequate physical, social, or economic access to adequate, safe, and nutritious food that meets a person's dietary needs and food preferences for an active and healthy life. Globalization is frequently linked to poverty. Even in developed countries, the problem of food security deficiency can be seen at the household level (Berry, Dernini, Burlingame, Meybeck & Conforti, 2015). Small-scale subsistence farmers must have access to nutritious and culturally preferred food, as well as an abundance of it, in order to be considered food secure, and the ability to use the food they produce in a way that satisfies both of these requirements is an important aspect of food security.

Subsistence farming can help alleviate hunger in rural food-insecure households by encouraging rural households to participate in small-scale agricultural activities (Endale, Mengesha, Atinafu & Adane, 2014). Given that 75% of the poor in African countries live in rural areas and rely on agriculture and other agriculture-related activities for their livelihood, this benefit from the agricultural sector should come as no surprise. Scale and size of farm system, proportion of crops sold, household expenditure and use of family labor, mechanization, capital intensity, financial ability, and level of linkages with larger economic systems distinguish small-scale/smallholder farmers from commercial farmers (Amwata, Nyariki & Musimba, 2016).

According to the United Nations' Food and Agriculture Organization (FAO), global food production must rise by at least 60% by the year 2050. Smallholder farmers could be the key to global food security and eradicating hunger if they improve their productivity and increase crop production (FAO 2019). Poverty, a lack of education, ill health, and certain disabilities are the primary causes of food insecurity in developed countries like the United States, where it affects both individuals and households (Loopstra, 2018). Poverty and civil strife are the root causes of food insecurity in developed countries, while environmental degradation and trade barriers, as well as gender and social inequalities and poverty-related cultural beliefs are the root causes in developing countries. National policies that fail to promote equal access to food are also major contributors in developing countries (Borch & Kjaernes, 2016).

Several African countries have seen the devastation caused by widespread food insecurity in the homes of their citizens. A few examples of this are Cameroon in West Africa, Egypt in Northern Africa, Ethiopia to the East and South Africa to the South. Food security in Cameroon, according to the World Food Programme (WFP), is worse now than it was in the early 1980s, as evidenced by a drop in household food consumption (FAO & UNICEF, 2019). Children's mortality rates have risen rather than decreased as a result of this (Lotter, 2015).

Insufficient farming land is to blame for food insecurity among Kenya's middle class. Only 18% of Kenya's land can be used for agriculture. Poverty is also a factor. One-dollar a day food insecurity affects 24% of Kenyans, according to the 2007-08 Human Development Report from the United Nations (Mutie, Rono, Kathambi, Hu & Wang, 2020). Dry seasons in rural Kenya have resulted in lower crop and livestock production among middle-class households. Floods also displace people, putting them at risk of food insecurity in the home. An estimated 700,000 people were affected by the 2006 floods, and the majority of them were unable to receive food assistance because of the impassability of the country's roads (Kimani-Murage et al., 2014). The March/April agricultural production was disrupted by the 2007-2008 post-election violence. 50 percent of farmers were not adequately prepared for farming due to post-election turmoil, according to the World Food Programme (Emongor, 2014).

Just like in Kenya, agriculture sector is the backbone of Bomet County's Economy. It is the major source of food, income, employment and raw material for the industrial sector. Although the county used to be one of the food basket regions in Kenya during the 20th century, most of the farmers shifted to tea production in the 21st century. Majority of the farmers practice smallholder tea farming, food crops (maize, beans and potatoes) as well as dairy animals. Bomet County experiences food shortage every year. The current food policy in Kenya stipulates that an average person consumes 98 kilograms of maize per year; however, today one person consumes about 50 kilograms of maize which means small scale tea farmers are at risk of suffering food insecurity. Food security has become a problem in Bomet County because of lack of resources such as financial resources, lack of access to nutritious food at affordable prices, lack of knowledge about nutritious diet. Despite significant improvement in household income, commercialization of subsistence economies could dramatically challenge household food security through increased child labour, gender roles and land tenure [Langat, B. K., et al. 2011;

Shadreck et al. 2013]. Further, more increase in population and poverty has accelerated the problem of food insecurity. Therefore, the symptoms of food insecurity can easily be observed in Bomet County, such as poor health, morbidity, low income and low farm productivity. Most households (30.9%) earn a monthly income of between Ksh 10,001-20,000 in Bomet County (Kenya Red Cross Society, 2015). This low income is contributed by low agricultural productivity. Overcrowding in agriculture has resulted in the fragmentation of landholdings, which has a negative impact on agricultural productivity. As a result of the rural environment, farmers are reluctant to use modern methods of agriculture, and poor technique is a major cause of low agricultural productivity in developing countries. Despite the increased production of tea in the county of Bomet, the prevalence of food insecurity is still so high, estimated to be 57.24% (Bomet County Annual Report, 2018). Even though the farmers receive income from the sale of tea from the nearby tea industries, most of the households go hungry due to lack of food. The income from tea is not enough to cater for the household expense as well as food security. There are limited studies carried out to look at factors affecting food security in Bomet County. The study therefore sought to examine effect of natural capital on food security among smallholder tea farmers in Bomet County, Kenya.

Theoretical Framework

Entitlement Theory

This study is anchored by Entitlement Theory by Amartya Sen (1981). Amartya Sen's pioneering work on food "entitlements" is a major influence on this study's focus on "access." Because of prevalent denial of benefits, many people in the country are suffering from hunger. People's ability to obtain food through legal means is the focus of the "entitlement approach" to starvation and famine in a given society (Sen, 1983). As a result of production and trade, an individual's endowments, such as his or her resource bundle, become food or commodities that can be exchanged for food.

The Entitlement Theory conceptualizes how bundles of private property rights and powers shape access to resources and how this access is gained, maintained and controlled by the entitlement theory (Boyd & Helms, 2005). Farmer's title deed may show ownership of land, yet the farmer may have no way to profit from that land because they lack sufficient expertise, labor, or

networks to market their products. To achieve sustainable livelihood outcomes, people must be able to acquire, maintain, control, and enhance the resources on which their livelihoods depend.

As opposed to food availability, Sen (1981) described food security as the ability to obtain food (the "demand side"). That food security for households and individuals cannot be achieved solely by increasing food availability at the national level, the author asserted. A fundamental indicator of food insecurity was brought to the fore in this way: the inability of households to obtain food an important determinant of food security is the household's ability to produce and buy food on the open market. Food availability concentrates on the supply side of food security which mainly depends on food production that increase the stock levels that families can depend on.

If the entitlement set does not include a resource bundle with an adequate amount of food, the person must go hungry. Using the example of a peasant, (Sen, 2000) argues that a person's endowment determines how much food he or she has access to; land, labor, capital, and other resources. These resources can be used to produce a large amount of food, or they can be used to grow cash crops, which can then be sold to buy food. Legal means of obtaining food, such as production, trade, inheritance, and other forms of acquisition, are accessed through an entitlement approach to hunger (Sen, 2000). In a market economy, food entitlement refers to the amount of food that a person can buy in the market or directly own by producing their own food on their own plot of land.

When it comes to private ownership market economies, Sens analyzes four primary types of entitlement relationships. The term "trade-based entitlement" refers to benefits obtained through the exchange of property with a cooperative third party. The right to own what one produces with one's own or hired resources is referred to as a "production-based" entitlement. The term "own-labor entitlement" refers to a person's right to benefit from the sale of their labor power, including any trade or production-based entitlements. Entitlement to be the owner of something that has been given to you voluntarily by someone else or that you have inherited from someone else after their death is referred to as an inheritance or transfer entitlement.

Methodology

A pragmatic paradigm approach was used in this study because it allowed for the use of both qualitative and quantitative strategies in various stages of the research procedure, (Molina-

Azorin, 2016). Pragmatist mainly emphasizes on the what and how of the study problem. In addition, pragmatism is perceived to be a model that gives the fundamental theoretical framework for mixed research methodologies, (Rezaee, 2017). It was determined that this paradigm was appropriate for this study because it included both qualitative and quantitative methods.

This study used a multi-method approach to research. Using a combination of quantitative and qualitative data collection, analysis, and integration is known as a mixed methods research approach (Taheri, Jami Pour & Asarian, 2019). Using this strategy, researchers can gain a deeper understanding of a problem than they could by looking at it from two different perspectives. Close-ended data, such as rating scales, behavior checklists, and performance instruments, are all examples of quantitative data. In order to answer research questions, this type of data is analyzed through the use of questionnaires (questionnaires) or checklists. Qualitative data is information that can be interpreted in any way the researcher chooses. The analysis of qualitative data (words, text, or behaviors) generally follows the path of collating it into categories of information and conveying the diversity of ideas collected during the data collection process.

The study used a mixed approach design that included both exploratory and explanatory research methods. Key informant interviews, focus group discussions, and direct observations were used to gather qualitative data in this exploratory study. Qualitative data was gathered by asking open-ended questions to the participants. Analysis of qualitative (words, texts or behaviors) data typically follows the path of aggregating information (themes) into categories and presenting data collection's richness in terms of ideas. The design enabled in-depth comprehension and substantiation while negating the potential weaknesses to using each strategy by itself.

The target population for this study were all households in Bomet County who are smallholder tea farmers. According to the Bomet County annual report (2021) there are approximately 16572 registered smallholders' tea farmers who take their tea to five tea factories; Kapkoros, Tirgaga, Rororok, Kapset and Mogogosiek. Therefore, the target population for this study were all registered 16572 smallholders' tea farmers.

From the target population of 16572, Yamane (1967) sample size formula was used to select a sample size from population.

Table 1 Sample Size

Name of Tea Factories	Sample Size
Kapkoros	109
Tirgaga	102
Rororok	82
Kapset	54
Mogogosiek	43
Total	**391**

The study examined primary and secondary sources of data. Primary data was collected by the researcher from sources such as questionnaires, observation, interviews and Focus Group Discussion (FGD); Sources of secondary data were government publications, books and journal articles. The study used questionnaires as the main method of data collection. This is because the questionnaires helped the researcher to describe the characteristics of a large population which can provide broad capability and ensure a more accurate sample for the gathering targeted findings which helped in making conclusion and recommendations (Bartram, 2019).

Using interview schedule, key informants gave in depth information concerning tea growing and food security nexus among smallholder tea farmers in Bomet County, Kenya. In this study, open ended questions were developed through reading books and research materials relevant to the study. The aim of the interview questions was to verify the information obtained through questionnaires.

Focus Group Discussion (FGD) was used to gather qualitative information from the eight smallholders' tea farmers in every factory selected. FGD were carried out with help of area chiefs who called for meetings where researcher conducted the FGD. Area chiefs and assistance chief were briefed about the study early enough in order to call for the meetings per factory on different days.

The researcher also engaged in direct observation. The researcher maintained constant presence, carefully watching and recording of events, activities and other phenomena of interest for the purpose of the study. Observation was done during visits to factories and households in the study area. The data to be collected using observation were farming, physical environment, socio-economic activities and status of infrastructure in the area.

This study employed content validity technique to establish that the instrument is able to measure the intended variables accurately. The researcher sought advice from experts who went through the instruments; ensuring relevant information concerning food security is included. The data to be obtained were tested for reliability by obtaining the coefficient of reliability. The researcher considered an r=0.7 and above as appropriate. All of the test items measure the same construct, that is, the general factor saturation. The reliability of the instrument was tested through the use of Cronbach Alpha coefficients. That is, to establish the reliability of the questionnaire.

The collected data were analyzed using both quantitative and qualitative methods. Qualitative analysis involved the use of narrations and descriptions of data collected from the interview guide, key informant interviews and focus group discussions. This involved identifying major themes emerging from the data collected and relating them to the research objectives. After quantitative data collection, the data were organised and edited to remove any inconsistencies, repetitions or errors that might made analysis difficult. Descriptive and inferential statistics were used to analyse the data with the aid of the Statistical Package for Social Sciences (SPSS) version 26. Descriptive statistics included percentages, frequencies, mean and standard deviation.

Results and Discussion:

Response Rate

Data collected statistics revealed that out of the anticipated total sample population of 401(100%) respondents, 378(94.3%) responded and their responses analyzed. This response rate was considered appropriate for analysis as it surpassed 50%, as recommended by Mugenda (2010).

Natural Capital

The study first sought to determine the effects of natural capital on food security among smallholder tea farmers in Bomet County. Table 2 presents the study results.

Table 2 Natural Capital

Statements		SA	A	UD	D	SD
Agricultural land fragmentation is rampant in the area	**F**	68	141	14	85	60
	%	18.5	38.3	3.8	23.1	16.3
Most of the farms are irrigated	**F**	3	23	8	193	141
	%	0.8	6.3	2.2	52.4	38.3
Soil samples have been analyzed	**F**	5	48	8	180	127
	%	1.4	13	2.2	48.9	34.5
Safe drinking water is readily available	**F**	11	96	11	223	27
	%	3	26.1	3	60.6	7.3
There are enough water boreholes in the area	**F**	8	44	13	223	80
	%	2.2	12.0	3.5	60.6	21.7
There is adequate land for farming	**F**	10	124	11	143	80
	%	2.7	33.7	3.0	38.9	21.7
There is adequate rainfall	**F**	69	221	6	45	27
	%	18.8	60.1	1.6	12.2	7.3

Total number of respondents (n=368)

The study results in Table 2 showed that majority 209(56.8%) of the respondents agreed that agricultural land fragmentation is rampant in the area. On contrary, 145(39.4%) of the respondents disagreed that agricultural land fragmentation is rampant in the area.

Also, the study findings noted that 26(7.1%) of the respondents agreed and a vast majority 334(90.7%) disagreed that Most of the farms are irrigated. The study further revealed that, 53(14.4%) of the participants agreed that Soil samples have been analyzed. On contrary to that the majority 307(83.4%) of the respondents of the respondents disagreed that soil samples have been analyzed.

The study nonetheless showed that 107(29.1%) of the participants agreed that Safe drinking water is readily available. On contrary to those findings most 250(67.9%) of the respondents disagreed that safe drinking water is readily available. On top of the above findings Another, 52(14.2%) agreed that there are enough water boreholes in the area. However, majority of the respondents 303(82.3%) of the respondents disagreed that there are enough water boreholes in the area.

Furthermore, it was noted from the study that 134(36.4%) of the participants agreed, however, a vast majority 223(57.4%) disagreed that there is adequate land for farming. Finally, majority of the respondents 290(78.9%) agreed that there is adequate rainfall. However, 72(19.5%) of the respondents disagreed that there is adequate rainfall.

It is therefore in agreement with Martínez-Gimeno et al. (2020) who stated that the main purpose of irrigation scheduling is to determine the amount of water required by a crop per cycle during peak demand periods, and how often it should be applied.

The study findings from interviews indicated that low production of food was attributed to changing climatic conditions and dwindling natural resources needed for the production of food. This finding concurs with Nganga and Robinson (2016) who recommend that strategies to reduce natural resource degradation in semi-arid areas include introducing zero grazing, fodder production, demarcation of designated grazing lands and pasture management and destocking.

Risks to food insecurity may be increased, because supply chains become more vulnerable and because of pollution. Loss of crop diversity, decline of pollinators and increased vulnerability of monocultures to diseases are additional stress factors. Agriculture reduces biodiversity and affects natural habitats through land conversion, eutrophication, pesticide inputs, irrigation and drainage. Unsustainable agricultural practices may also lead to direct environmental feed-backs such as soil erosion and loss of pollinators (because of excessive pesticide application).

The climatic hazards to food crops are a major shock to smallholder tea farmers. In the event of climatic hazards, only tea growers with relatively high incomes and other sources of income can endure famine without difficulty during such periods. While tea farmers with low income from

the tea plant have difficulties to cope with the period of climatic hazards, non-tea farmers are the most severely affected.

The study findings from interviews with the chief further revealed that environmental degradation is an important factor in maintaining food security. Two general mechanisms by which degraded natural capital may influence food security are by; directly influencing the productivity of farms in a region and limiting the ability of residents of a location to generate an adequate income (from agriculture activities or in other industries). This is because stock of natural ecosystems that provide a flow of ecosystem good and services defines natural capital.

Forest quality is considered an important measure of the available natural capital in an area. Along with elevation, soil quality, and other factors, forest degradation may also contribute to such things as soil erosion and flooding. These have more direct impacts on agriculture production. The use of holistic grazing management can result in the regeneration of grassland ecosystems, which can reduce the cost of natural capital impacts by 11 percent. Greenhouse gas emissions offer the most significant natural capital cost reductions through the use of holistic grazing management. This is due to the increased carbon sequestration of rehabilitated grassland ecosystem on which the cattle graze.

Study findings are in agreement with Seddon et al., (2020) who asserted that if properly designed and implemented, strategic investments in natural capital can be a means of tackling pressing environmental and social issues, such as climate change and energy, food, and water security. Chiofupa and Wale (2020) also agrees with the findings through formulation of policies to reduce poverty, improve health and education services, and raise the status of women are likely to be most effective if the income sources of the poor are protected

Study findings further concurs with Pablo-Romero and Sánchez-Braza (2015) in the concept that human capital is strongly related to the level of wealth – heads of poorer households are generally less educated than those of richer households.

Conclusion

The study concluded that there was food insecurity since the households were not able to have enough food also households were not able to eat the kinds of food they preferred because of

lack of resources, they had a limited variety of foods due to lack of resources and the households went to sleep at night hungry because there was not enough food.

Recommendation

The study recommended that the government should subsidize tea farm inputs such as fertilizers and seeds. Organize farmers into SACCOs to enable them access farm inputs, credit facilities and market for their produce. Both national and county governments should improve road networks so as to help access food markets and also sale of farm produce.

Suggestion for further studies

The researcher suggests that, there is need to study how governance affect social and economic aspects and overall effect on food security at household level

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