Journal of Arts & Humanities

Banana Production and Its Implications on Food Security in Imenti South Sub-County, Kenya

Kevin A. Nyamamba[1,*], Hellen Kamiri[2], Tom O. Ouna[1]

ABSTRACT

Agricultural systems provide food to the population and ensure food security among many Kenyan communities. Food security is a contemporary discourse globally which seeks to strategise on availability and sufficient food supplies for the ever-growing population. Agricultural land use practices such as cultivation of cash and food crops influences food security at household level. Land acreage under other crops such as maize has reduced as farmers have turned to banana farming in Imenti South. For example, most high agricultural potential regions in Kenya such as Imenti South in Meru are experiencing high population density which is associated with sharp decline in farm productivity due to land fragmentation and degradation. This study evaluated the effects of banana production on food security in Imenti south Sub-county. Mixed research design of qualitative and quantitative approaches were used in order to achieve this objective. Multi-stage sampling of respondents was used to identify respondents while the main research instruments were questionnaires for households and key informants. The results from the study showed that there was an increase in household banana farming activities for food crop and commercial purposes. Food sufficiency in the region was influenced by level of banana production, markets and land use. This study concluded that banana farming has led to food availability and food security in the region. In recommendation, the government and other stakeholders should make small holder banana farmers adapt good banana farming practices to ensure continued availability and accessibility of food.

Keywords: Household, Agricultural land use, Land use, banana, small holder, food security.
This is an open access article under Creative Commons Attribution 4.0 License.

1. Introduction

In many Sub-Saharan Africa (SSA) countries, agriculture is a major occupational sector and supports livelihood for millions of rural communities (UNEP, 2011). Kenya's economy is dominated by agriculture regardless of the fact that out of her 582,636 Km2 of available land, only 17% has adequate fertile soils and supports rain-fed agriculture. About 7.5% of the land is classified as first-class land and

---

* Corresponding Author's Email: kevinayiera89@gmail.com
1 Department of Humanities and Languages, Karatina University, P. O Box 1957-1010, Karatina-Kenya.
2 Department of Agricultural Sciences, Karatina University, P. O Box 1957-1010, Karatina-Kenya.

delivers economic challenge with their first choice dedicated to cash crops rather than food crops. Approximately 2.2 % of 17% of land is under forests reserve while 80% is classified as arid and semi-arid. Agricultural sector directly contributes to 33% of total Gross Domestic Product (GDP) and 27% of GDP indirectly by agricultural sector via linkages to other sectors like manufacturing, distribution and other service sectors and approximately over 65% of total export earnings for the country (Boulanger et al., 2018). Additionally, it has created employment for more than 40% Kenyans and about 70% of rural dwellers (MoA, 2019).

Food Agricultural Organization (FAO), (2017) reported that approximately 5.6 million hectares of land were under banana farming in the world according to the available data. Growth trends in banana production are evident in Africa as the exports grew by 2.4% in 2012 as exports reached 649 000 tonnes (FAO, 2018). In Kenya, banana is a popular food crop, with production of about 2 million tons annually from approximately 80,000 ha (MoA, 2013). They are mainly grown in Central, Eastern, Western and Nyanza regions where they contribute economically and to food security. Bananas offers ready income and it is a food item among the rural small holder's population of Kenya (GOK, 2011). In 2012, banana production constituted 38% of the total value of fruits produced in Kenya (GOK, 2012). GOK (2008) noted that horticulture farming where banana production falls is among the fastest growing industry within agriculture sector of Kenya, recording an average growth of between 15% and 20% per annum. This can be partly attributed to banana being a perennial crop which provides steady source of income and food to the family all year round and it is almost grown exclusively by smallholder farmer for home consumption (Kabuga et al., 2011). Majority of farmers embrace banana crop as an alternative to better income and food for the households (Bhattacharyya, 2008).

Banana production became a popular enterprise since the enactment of the Kenya Coffee Act (GOK, 2015). The Act gave farmers an opportunity of replacing coffee plants with banana crop in Mt Kenya region (Karanja and Nyoro, 2002). This change offered farmers with hope and freedom to diversify from coffee production to other crops especially bananas. Many coffee farmers shifted to banana production after long periods of low coffee returns, poor management of co-operative societies, rising cost of farm inputs and low yields (GOK, 2002). According to GOK (2012), the leading counties in banana production in Kenya are Meru (40%), Kirinyaga (21%), and Tharaka Nithi (19%). In Meru County, banana is a key livelihood source and is grown on 2.2% of the County's total agricultural land. In 2015, a total of 382,390 metric tonnes were produced earning the farmers approximately KES 3,700 million.

Despite the increased investment in agriculture, the challenges of food supply and farming are among the most bewildering and frustrating to mankind in contemporary society. Food problem is the apparent inability of the world's people to access food adequately and consistently (Abere & Waithaka, 2014). The world grain stocks were noted to have dwindled to low levels, indicating fragility of food supplies in a world where the population is rising (FAO, World Food Summit in Rome Italy 2009). With Kenya's population growth rates of 2.3%, the future food production and consequently food security is highly threatened (KNBS, 2019). To cope with challenges of food security, the government has provided for invigorating mechanisms for improving agricultural production through diversifying flagship crops which now include maize, potato, rice and bananas.

Food security has been defined by (FAO, 1996) as a state when everyone has accesses adequate and nutritious food, physically, economically, socially always so as to satisfy their dietary needs and food preference for an energetic and healthy lives. It depends on accessibility, availability and resources stability, (FAO, 2017). In this study, food security refers to the availability and accessibility of food. Data has shown that over 10 million people are food insecure in Kenya with majority of them relying on food relief. Households are also incurring huge food bills due to the high food prices. Maize, potatoes and rice being staple food due to food preferences, is in short supply and most households have limited choices of other food stuffs. The current food insecurity problems are attributed to several factors, including the frequent droughts, high costs of domestic food production due to high costs of inputs especially fertilizer, high global food prices and low purchasing power for large proportion of the population due to high level of poverty. Farmbiz Africa (2019) noted that more than 2,200 small scale farmers in Meru County who were previously practicing coffee and miraa production have found a new venture in banana farming in the area. To eliminate hunger and improve food security, efforts to accelerate agricultural and rural development is necessary in order to increase current levels of food

production proportionate to population growth, and thus provide adequate food. There is therefore need to diversify on the food crops that can mitigate the food security occurrences in the regions. This study sort to evaluate the relationship between land use changes and banana production to food security in Imenti South sub county of Meru Kenya.

2. Purpose of the study

The purpose of this study was to evaluated the effects of banana production on food security and economic implications in Imenti South Sub-county in Kenya.

3. Reserch hypothesis

This study was guided through by the following null hypothesis:

H01: there is no statistically significant relationship between banana production trends and its implications on food security in Imenti South Sub-County in Kenya.

4. Rationale of the study: Theoritical and imperical background

The study was anchored in Rational Choice Theory (RCT) theory. This was because it's a framework of understanding social and economic behaviors. The fundamental premise RTC theory encompasses the social behaviors of an individual in making personal decisions. It also focuses on determinants of the individual adoptions (methodological individualism. In this study, for farmers, imminent changes in production cycles call for rational decision making while factoring the benefits expected weighed on implicit and explicit production factors. Further, such as production costs, environmental and market factors dictate on production systems including usage of land, types of crops and farmer investment choices. This theory is critical in understanding the farmers' choices while utilizing the land, adoption of banana production and possible effect of food security study area. Thus, it shall enhance constructs for land use change, effects on food security and coping strategies in this current study making it worthy a literary work.

5. Research methodology
5.1 Description of study area

The study was conducted in Imenti South Sub-County that covers Abogeta East, Abogeta West, Igoji East, Igoji West, Nkuene and Mitunguu wards of Meru County (Figure 1). It is on the lower side of Mount Kenya, on the windward side and lies at an altitude ranging between 850m and 2240m above sea level. The study covered Abogeta East and Mitunguu Wards which have high concentration of banana farms. These two wards are located between latitude 000N and 050N and longitude 350E and 370E. The study area experiences modified tropical climate of the Kenya highlands (GoK, 2008), with moderate amounts of rainfall and has temperatures ranging between 12.40C and 24.50C. Rainfall pattern is bimodal with average of between 800mm and 2000mm which is well distributed throughout the year. Long rains are experienced from October to December and the short rains from March to May every year. The soils are dark brown moderately fertile loam soils that are well drained with the main economic activity in the area being agriculture. The area is well drained with permanent rivers where farmers get water for irrigation. The two main permanent rivers which supply water for irrigation in this study area are River Thingithu and Kithino (MoA, 2013). There are also several intermittent streams, swamps, boreholes and springs in the Lower Imenti Forest areas. Different types of economic activities are practiced here ranging from dairy farming, banana growing, tea farming and coffee growing.
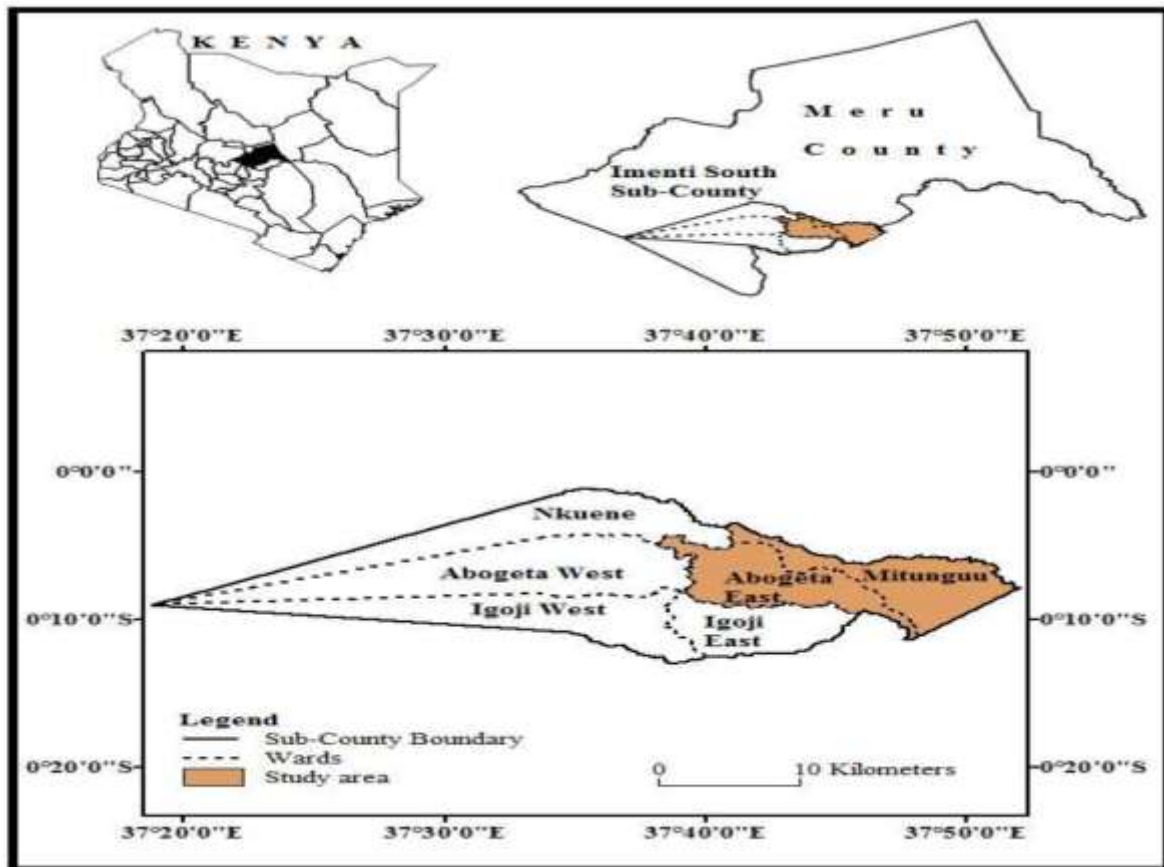
Figure 1. Map of the Study Area showing Imenti South Sub County Source: Kenya Forest Service -GIS department,2020.

5.2   Sampling design

The study adopted mixed research design to evaluate banana production, land use under banana and food security in the region. The study area was purposively selected to include diverse locations in Abogeta and Mitunguu wards in Imenti South Sub County where banana farming has been intensively practiced. The study involved use of triangulation of methods whereby both qualitative and quantitative techniques were adopted to collect data.

Simple random sampling method was used to select the respondents for the study. The target population consisted of smallholder's banana farmers. According to KNBS (2019) population statistics, the population of Imenti-South was approximately 205,487 of 64,186 households. The sample size was thus calculated following Krejcie and Morgan formulae (1970) as follows: $S = X2\ NP\ (1-P) \div d2\ (N-1) + X2\ P\ (1-P)$. Thus, a sample size of 377 respondents was obtained from a total population of 64,186 households. Further to determine the sample size for the two wards, proportionate method was used and actual sample size of 185 and 166 respondents for Abogeta and Mitunguu respectively was obtained. A total of 351 (93.1%) questionnaires were fully filled and returned after the data collection.

5.3   Data collection
5.3.1   Methods and procedures

Primary and secondary data were used for the present study. The primary data (quantitative and qualitative) was collected from sample households through structured and pre-tested questionnaires. In addition, Rapid Rural Appraisal (RRA) tools such as key informant interview, focus group discussion, were used to extract qualitative data. Secondary data was reviewed from published and unpublished sources from the Ministry of Agriculture, Kenya Meteorological Department and County Integrated Development Program and other pertinent sources. Historical data on banana production (in tonnes) and land acreage were acquired from Imenti South Agricultural offices to enrich collected data.

5.3.2 Data analyses
Data gathered from household survey through questionnaires were cleaned, coded and entered in SPPS Version 21 (SPSS, 2012) for analysis. Descriptive statistics such as percentage, frequency, mean standard deviation and cross tabulation were employed to analyze the data. Qualitative data extracted through focus discussion groups were transcribed, organized and interpreted.

6. Results and discussion
6.1 Demographic characterization of the respondents
The variables of age distribution, gender and level of education were examined. The study revealed that 64% of the respondents were male while 36% were female (Table 1). Men are the household heads who are involved in decision making regarding land use. Majority of the respondents (50%) were aged between 29-39 years while 26.7% were aged above 40 years. Thus most of the respondents had sufficient exposure and experience of farming activities in the study areas. The youthful respondents (18 -28 years) constituted 23.3%. A majority of the respondents (60%) had college level of education; 26.7% had attained up to secondary level education, 10% had university education while 3.3% had basic education. Hence majority of the respondents were literate enough to make decisions on what to do with the land owned.

Table 1.

Demographic characterization of the respondents.

Variable	Description	Frequency (N = 304)	Percentage
Gender Distribution	Male	195	66%
	Female	109	36%
	Total	304	100%
Age Distribution			
	19- 28 years	71	23.3%
	29-38 years	152	50.0%
	40 years and above	81	26.7%
	Primary	10	3.3%
	Total	304	100%
Level of education			
	Secondary	81	26.7%
	College	182	59.9%
	University	31	10.0%
	Total	304	100%

Total population in Imenti South was 205,487 in 64,186 households (GoK, 2019), thus this was an indication of pressure on the available land resource in the area. High population pressure was the main indirect cause of agricultural land degradation and shrinking of farm sizes in the region. A large population meant higher demand for food and land for cultivation and settlement. Increase in population demanded changes in land use where more land was converted to banana cultivation for more food production. Without expansion areas, the intensity of land use was increased leading to depletion of soil nutrients.

6.2 Total land acreage and banana Production
The study revealed that a majority (72%) of the farmers in the region are small holders with land sizes of less than 5 acres. The study also revealed that 15% of the respondents had land sizes of 6-10 acres while 10% and 4 % had 11-15 acres and 16-20 acres respectively (Figure 2).
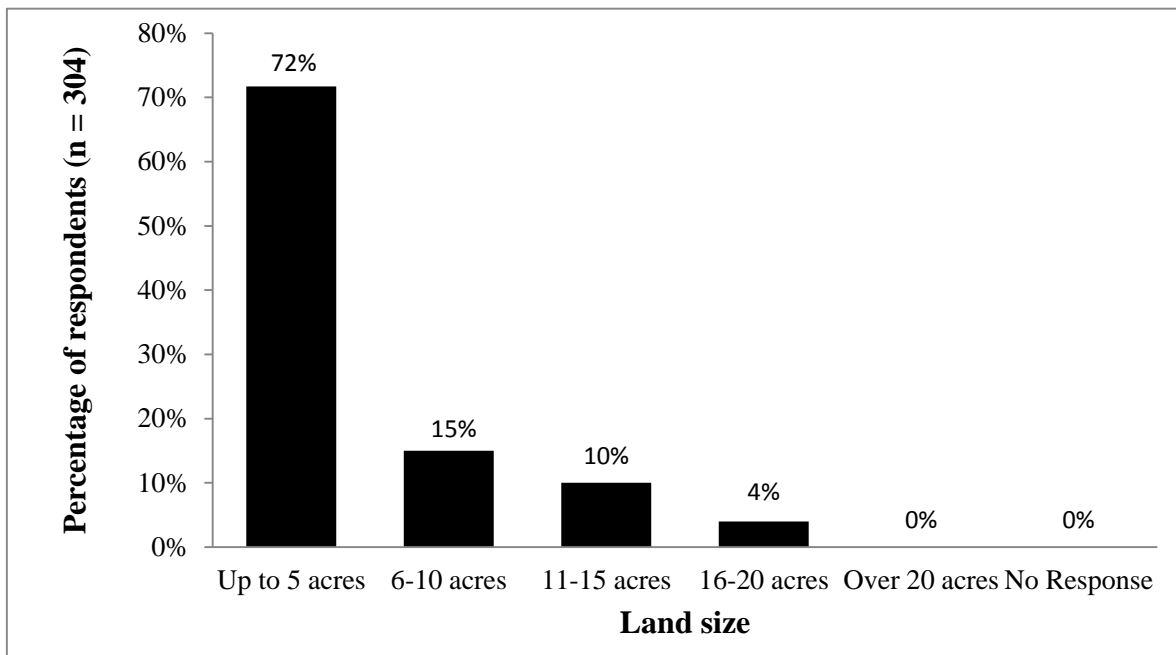
Figure 2. Land Acreage and distribution in the study area

Most farmers resulted to innovative approaches for optimization of production by adopting growing of bananas which is a high value crop. In the earlier 1980s most people in the area had most of their land under coffee but this has since reduced with time paving way for banana farming when the prices of coffee dwindled. The study results further revealed that (40%) of the respondents owned small parcels of land sizes mostly less than 1 acre which is a limitation towards to large scale banana production, but instead they produce them for home consumption and small volume for sale (Table 2). Findings of a study by Birthal et al., (2007) showed that scarcity of land as an economic resource limits agricultural production among the small holder farmers. Population increase is exerting pressure on the available land hence leading to fragmentation among the beneficiaries of inherited land hence small sizes of land under banana production. Moreover, most farmers have shifted to innovative approaches to maximize production such as practice of mixed farming and adopting high yielding varieties of bananas.

Table 2.
Land acreage under Banana farming.

Land sizes in acres	Percentage of respondents
Less than 1 acre	41%
2-3 acres	31%
4-5acres	22%
Over 5 acres	6%
Total	100%

Land utilization for banana production over a span of 10 years and banana production in tons per year over the same period was evaluated side by side for the period between the years 2009 to 2019. The results showed that banana acreage and production has been increasing in the period between 2009 and 2019 Imenti South (Figure 3). Land under banana production increased gradually in Imenti South Sub County starting at 960 hectares in 2009 of land in 2009 increasing up to 3,509 hectares in 2019. GOK, (2008) noted that horticulture farming where banana production falls is among the fastest growing industry within the agricultural sector in Kenya, recording an average growth of between 15% and 20% per annum. Banana production increased from 17,280 tonnes in 2009 to 168, 980 tonnes in 2019. This could be due to the fact banana production is an all year-round enterprise and it depends on a variety of reasons both human and ecological.
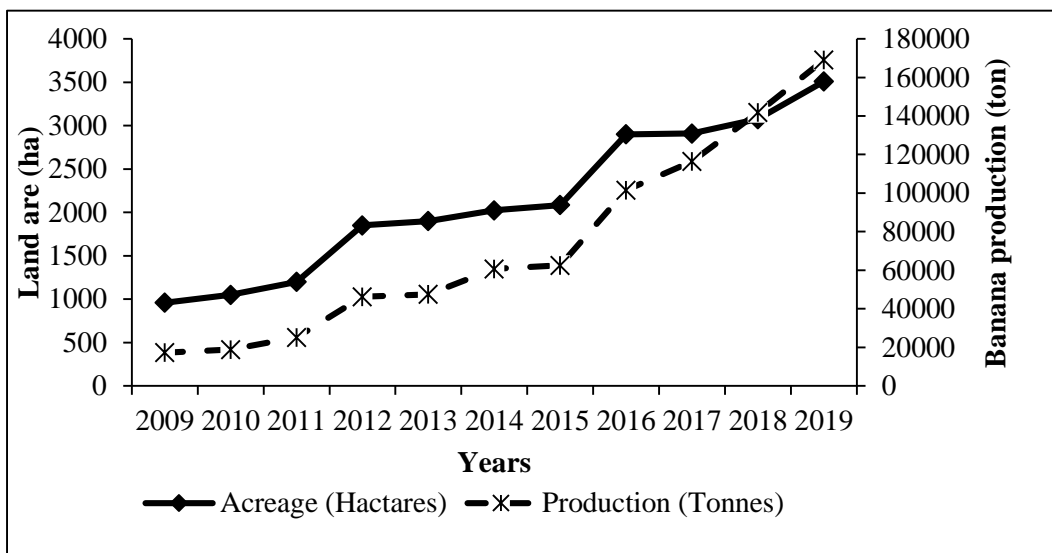
Figure 3. Agricultural land size and banana production in acreage in tonnes

Table 3.

Summary of Pearson Moment Correlation between land acreage under Banana Farming and Banana Yield in tonnes per Hectare.

		Acreage in Hectares	Yield in tons
Acreage in Hectares	Pearson Correlation	1	0.617**
	Sig. (2-tailed)		0.004
	N	20	20
Yield in tons	Pearson Correlation	0.617**	1
	Sig. (2-tailed)	0.004	
	N	20	20

** Correlation is significant at the 0.01 level (2-tailed)

Using results from Table 3 of Pearson moment correlation, there was a positive and statistically significant relationship (r =0 .617; p =0 .004) between land under banana farming and banana yield thus indicating that land use change and banana production were statistically related.

6.3   Climatic variables (Rainfall and temperature) in the study region

Agricultural production is highly dependent on climatic conditions specifically on rainfall and temperature. The average rainfall for Imenti South showed a declining trend when compared to the annual average which may have affected agricultural production for the smallholder farmers who mainly rely on rain-fed agriculture. The region recorded the lowest amount of rainfall (598mm) in the year 2000 while 50% of the period under study showed rainfall below the average annual rainfall of 1207mm. Mean annual temperature ranged between 12.40C to 13.70C while maximum annual temperature ranged between 23.50C to 24.70C (Figure 4). According to Meru County CIDP report (2018-2022), the region has temperatures ranging between 230C to 250c in the central parts of the county where Imenti South is located.

The study also revealed that the region is endowed with deep, well-drained, relatively fertile soils with suitable climatic characteristics such as good rainfall. The main cash crop grown was tea and coffee while food crops includes cereal crop farming such as maize, beans, millet, sorghum, peas, bananas and horticultural crops. The soils were of good fertility and drainage but overused. Farmers in the region encountered numerous problems, which led to low crop productivity, including continuous cropping on low fertile land, nonuse of the suitable manures and poor crop husbandry. Poor soil management practices, use of unimproved low yielding crop varieties had culminated to low living standards. In order to increase the per capita land banana productivity artificial fertilizers were used.
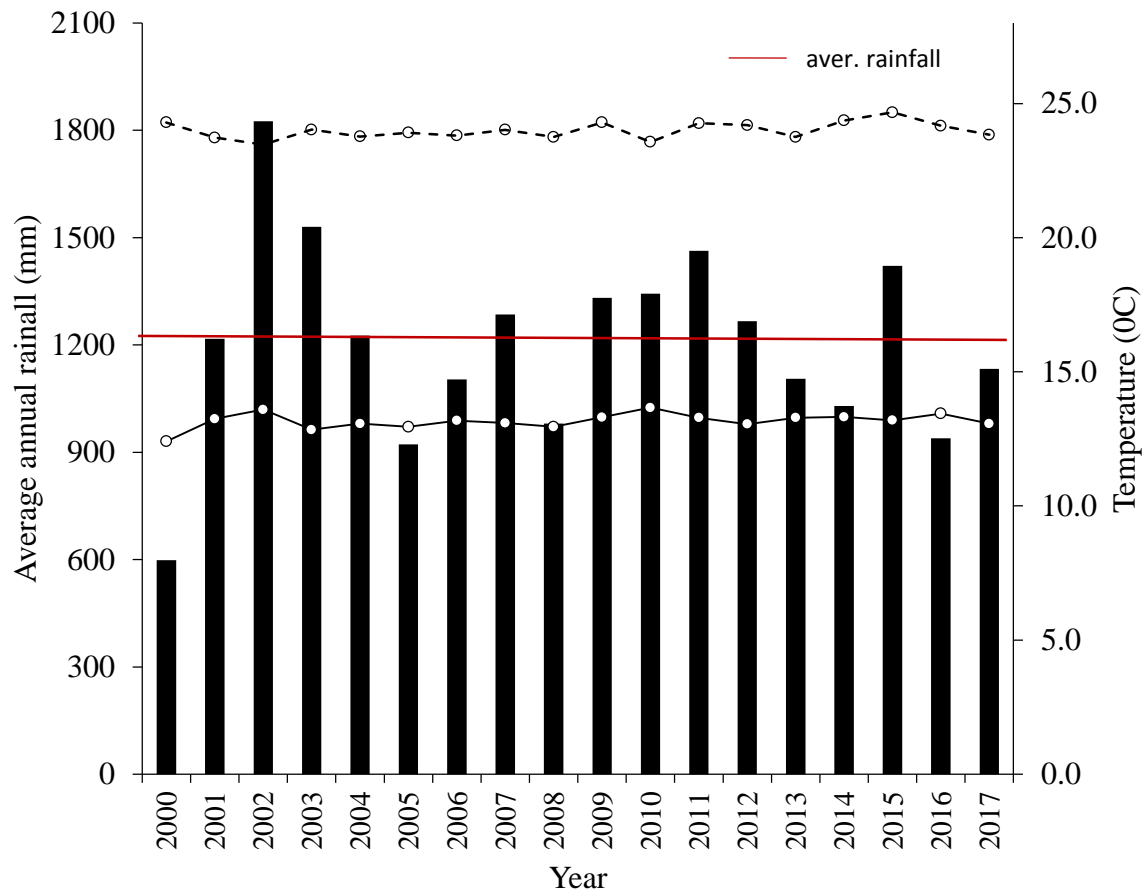
Figure 4. Total and average rainfall and temperature in the study area

6.4   Banana production and its implications on food security

The relationship between banana production and food security was determined by Probit model analysis for correlation and data was in numerical form. Results in Table 4 show statistical value of food security explaining variables and their significance at 10%, 5% and 1%. The factors with a positive significant relationship with food security in Imenti South were access to markets (coefficient =0.621, p > 0.001), indicating that availability and access to banana markets enhanced food availability and access and therefore food security.

Table 4.

Definition and measurements of variables used in the Probit regression model

Definition of variables	Nature and units of measurement of variables	Expected sign
Dependent variables		
Food Security	Dummy	(Yes/no)
Independent variables		
Gender of Respondents		(Male/Female)
Highest education level	Schooling in years	+
Land Use Change		
Land Size	Acres	-
Land Tenure Systems	Yes/no	+/-
Infrastructure Development	Yes/no	-
Soil suitability	Yes/no	+/-

Banana Production

Production levels	Cultivated area (ha)	+
Weather Patterns	Yes/no	+/-
Climatic Conditions	Yes/no	+/-
Pests and Diseases	Yes/no	+/-
Banana incomes	Yes/no	+
Government Policies	Yes/no	+/-

Farming Practice

Source of farm labour	Types	+
Water Source	Types	+
Commercial Production		+/-
Market Access	Yes/no	+/-
Strategies for sustainable production	Types	+

As revealed by the descriptive statistics and during focus group discussions, market for bananas influenced change in land use resulting to higher production and consequently enhanced food security in Imenti South. This factor is also consistent with the banana production levels which had a high and positive coefficient (0.67, p > 0.001). These two variables were also found to also have a high marginal effect (markets, 65.9% and production levels, 62.4%) on food security. Conversely, the factors having a negative but significant relationship with food security were: water source (coefficient = 0.65, marginal effect = 6.6%); land size (coefficient = 0.62, marginal negative effect 6.59%; weather patterns (coefficient = 0.059, negative marginal effect of 6.1%) and climatic conditions (coefficient =0.062, negative marginal effect of 6.1%).

Table 5.
Results of Econometric model results for the probability of food security in Imenti South

Variables	Coefficients	Robust Std. Error	Marginal effect	Marginal effect (%)
Gender distribution	0.04*	0.004	0.004	4
Age distribution	0.021	0.018	0.0018	1.8
Highest Education level	0.012	0.054	0.0012	1.2
Land size	-0.62***	0.314	-0.0659	-65.9
Land Tenure System	-0.010*	0.008	-0.0008	-0.8
Infrastructure development	-0.001	0.05	-0.0001	-0.1
Banana production levels	0.67***	0.135	0.0624	62.4
Weather patterns	-0.059***	0.122	-0.0613	-61.3
Climatic conditions	-0.062***	0.008	-0.0608	-60.8
Pests/Diseases	- 0.621**	0.311	0.0717	71.7
Banana incomes	0.617**	0.611	0.0602	60.2
Source of farm labour	0.711	0.003	0.0003	0.3
Water source	-0.65***	0.0121	0.0655	65.5
Government Policies	-0.001	0.05	-0.0001	-0.1
Access to markets	0.621***	0.314	0.0659	65.9
Sustainable production strategies	0.045**	0.015	0.0041	4.1
Constant	-1.859*	1.104		
Test statistics				
No of observation= 304				
Prob > Chi square 0.000				

Significant *at 10%, ** at 5% and *** at 1% probability level.

The factors with a positive but moderate relationship with food security were: banana incomes (0.617) marginal effect (6%) and sustainable production strategies (0.045) marginal effect (4%). Factors

with a low effect were gender distribution (0.04) with a marginal effect of 0.4% on food security. These results show that the size of farm land and tenure systems affect land use change and food security.

These results show that the size of farm land and tenure systems affect land use change and food security. In banana production, environmental factors posed a major challenge as the negative marginal effects indicate. In farm practice, markets and access to water were the main challenges due to their significant marginal effects (Voora et al., 2020). It is thus deduced that changes in land size due to population pressure increased fragmentation of arable land, diminishing acreage for banana production, hence enhancing food security risks. Change to banana production is apparent, though weather and climatic conditions affect production levels and food security. While undertaking banana production, farm practices and factors of markets and water source were critical for food security. Thus, results show that there is a significant relationship between land use change to banana production and food security in Imenti South Sub County.

6.5   Aspects of food sufficiency and availability in the region

Results in (Figure 5) shows there was sufficient food mainly from September to December according to 47% of the respondents in the study area. This period corresponded to the long rain season when the rainfall was the highest. During the April to August period, 31% of the respondents indicated there was sufficient food while 22% reported that from January to March, food was sufficient. However, food shortage or insufficiency was experienced in the study area for more than two months according to 38.5% of the respondents, while 28.9% and 32.6% of the respondents

(a)

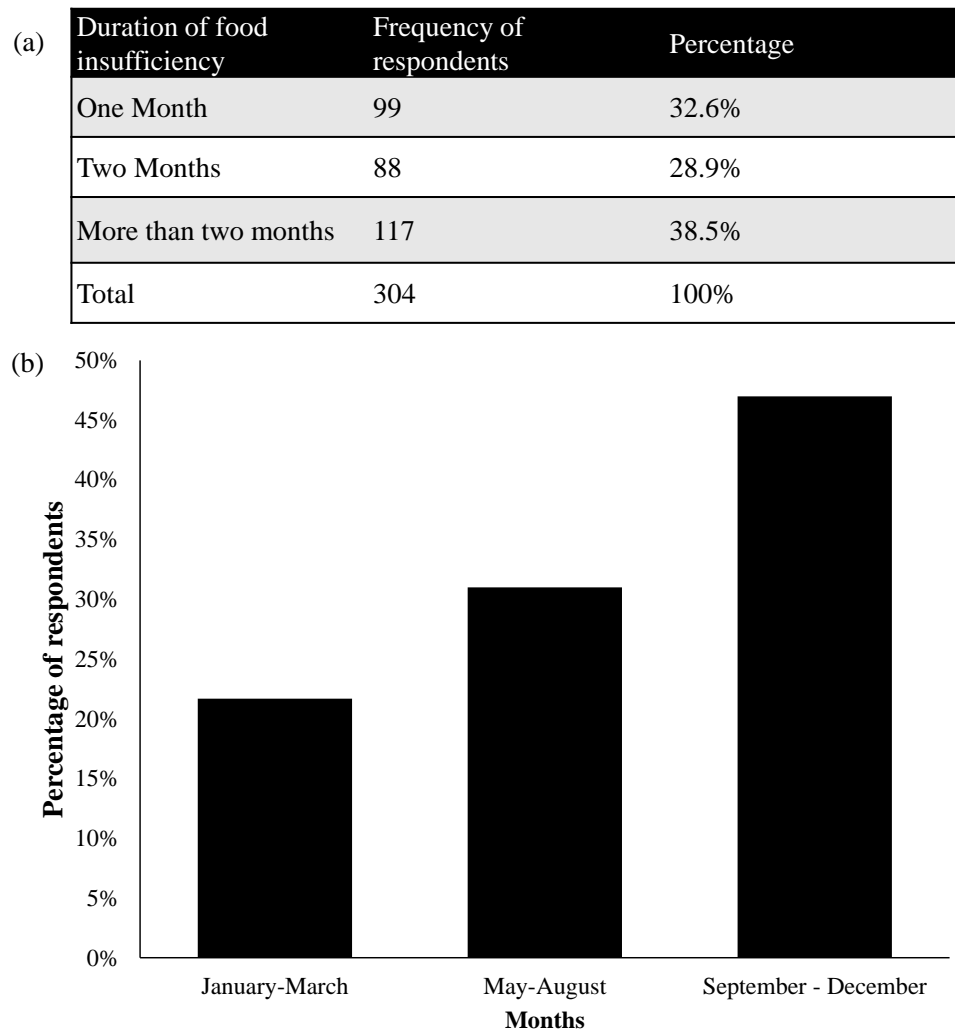| Duration of food insufficiency	Frequency of respondents	Percentage
One Month	99	32.6%
Two Months	88	28.9%
More than two months	117	38.5%
Total	304	100%

(b)

Figure 5. Duration food insufficiency (a) and periods in the year when there was food sufficiency (b) in Imenti South subcounty.

reported to have experienced food shortages for two months and one month respectively (Figure 5). These results show that the effect of food shortage in households was for several days, a factor considered to be akin to transient food insecurity.

Smallholder farmers had experienced food shortages at some point in their lives in the study region. Regarding food sufficiency and availability situation in South Imenti, 92% of the respondents indicated that food security had improved from the year 2000 as indicated in Table 5 while in 2018 there were incidences of food insufficiency as observed by the respondents. This could be attributed to low

rainfall received in 2018 (Figure 4). The respondents perceived food insufficiency when the households did not have enough food and were forced to skip a meal at some point, or buy from the market and neighbors. Increase in population demanded changes in land use where more land was converted to crop cultivation for more food production to ensure food sufficiency.

Table 6.
Respondents perception of food sufficiency and availability in the study region.

Period	Perception (Percentage)					
	Better	Same	Worse	Better	Same	Worse
2018	22	11	271	7.2	3.6	89.1
Last 5 years	89	73	142	29.3	24.0	46.7
Last 10 years	137	37	130	45.1	12.2	42.8
Last 15 years	264	30	10	86.8	9.9	3.3
Last 20 years	280	0	24	92.1	0.0	7.9

6.6   Impacts of banana production on livelihoods

Finally, this study further sought to evaluate farmers' understanding of how banana production has impacted their livelihoods. The most significant effect of increased banana production was higher incomes as reported by 47% of the respondents, higher living standards (21.7%) and adequate food for the households (14.5%) (Figure 6).
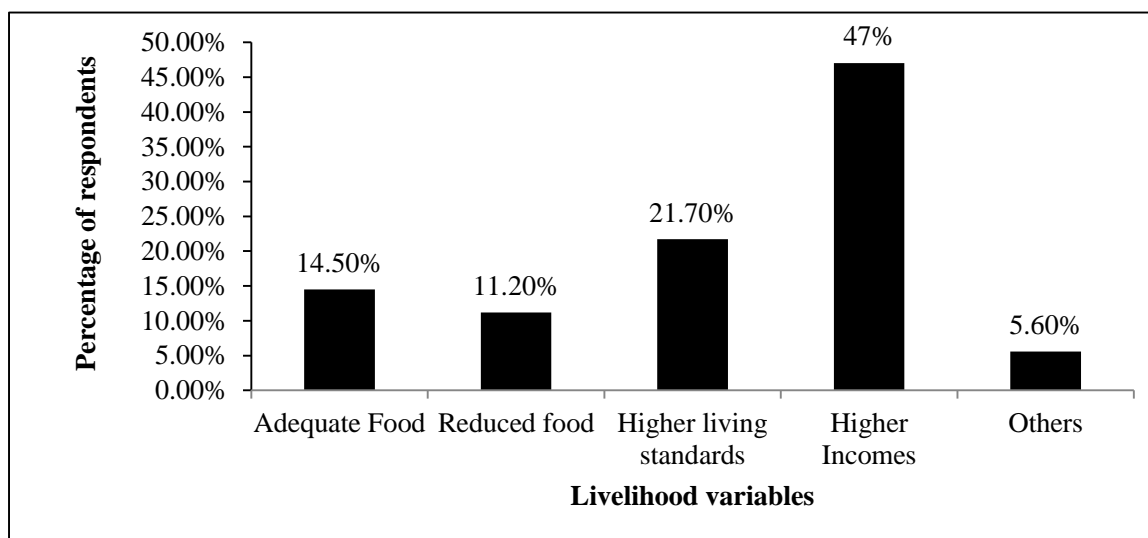

Figure 6. Farmers perception of the effect of increased banana production on livelihoods

From this study, banana farming had improved farmers' living standards. Majority of the farmers linked banana farming with better opportunities like increased household income levels and improved living standards. Banana production has ensured food sufficiency and availability in the study area. Farmers Group Discussions discussants affirmed these findings by explaining that the money from banana sales was used to purchase other food items. This is in line with study results by Van de Berg et al., (2007) who reported that expectations and/or experience of higher pay and crop returns motivated farmers to shift to banana farming.

6.7   Farmers coping strategies to food insecurity in the area

This study also evaluated mechanisms farmers use to reduce cases of food insecurity. The study revealed that growing bananas was the most significant strategy (34%) of coping with food security issues while 13% of the respondents revealed that they planted other crops types. Twelve percent (12%) of the respondents reverted to using different varieties of crops and 8% practiced crop diversification as shown in Figure 7 below.
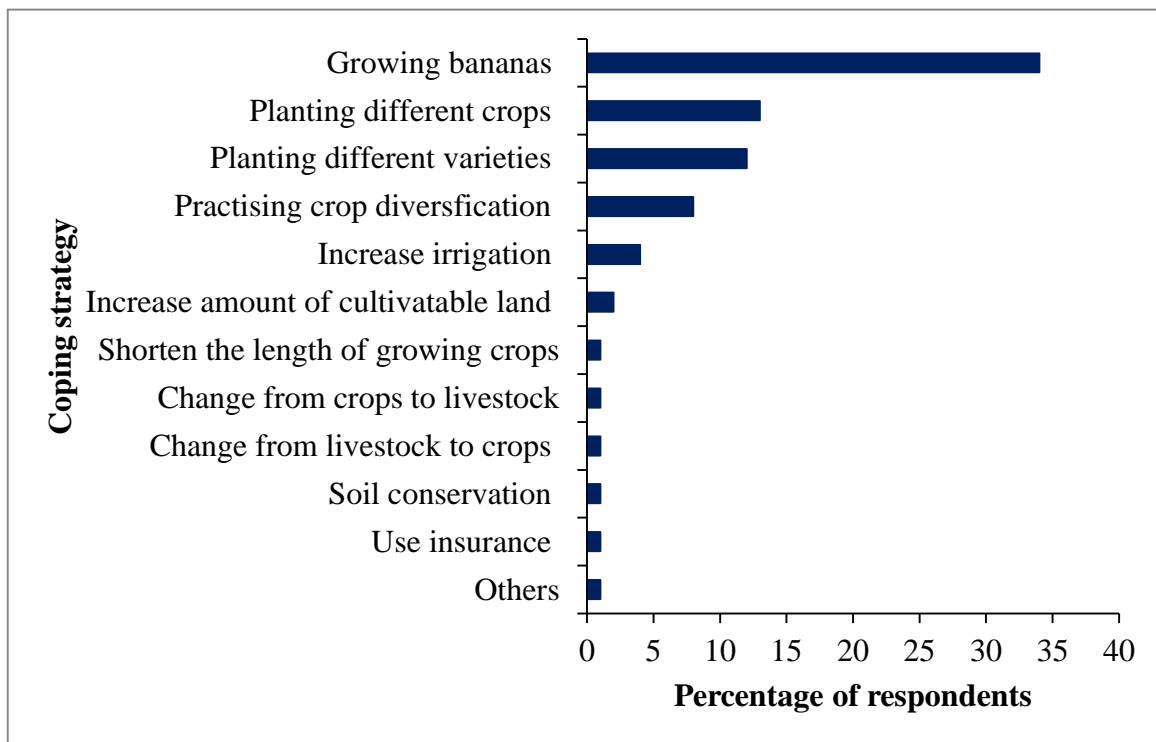
Figure 7. Respondents coping strategies to food insecurity in Imenti South

Majority of the respondents reported that banana production has promoted availability and sufficiency among households. These findings are in agreement with Mwendia (2019), who observed that banana farming was an enterprise practiced by many smallholder farmers due to its resilience to erratic rainfall patterns and suitable markets. Bananas are regarded highly in terms of economic value and food security as opposed to other crops, (GoK, 2013; Voora et al., 2020). During focus group discussions, it was revealed that the area had become more food secure since the introduction of banana farming in early 2000 unlike in the previous years when the main cash crop was coffee and tobacco, and when they used to experience perennial food shortages. Banana is grown for both subsistence and commercial purposes, which has led to improved living standards, more income for the farmers and promoted food security. These findings agree with those by Abere & Waithaka, (2014) who revealed that acreage of land under tea and coffee was declining while land under crops such as maize, finger millet and beans increased in the region.

7.   Conclusion

Imenti South is a food insecure region where by agricultural land is already degraded and densely populated with moderate poverty indexes. Growing food crops for the current population on the already degraded agricultural land is quite impossible. Bananas are considered best in wealth accumulation, poverty alleviation and food item for many households. The national government, county and other stakeholders should make small holder banana farmers to adapt good farming practices and land tenure systems which will ensure that the growing population and the utilization of natural resources are taken care of and ensure food security. This would always check on how far the available natural resources especially land can sustain the population. In this case, actions to combat population growth rates and land resource utilization would be determined. The risks of human's life's future in terms of land, food accessibility and availability.

8.   Recommendations and policy impilcations

The study recommends;

1.   Both national and county governments to provide adequate facilities and infrastructure for banana value addition such as processing facilities, marketing of the banana products and kick out

brokers and middlemen in the production process to improve benefits associated with banana farming and optimize a return that benefits the farmer.

2. Institutionalize farmers' support systems and structures such as well managed, equipped institutions to provide technical and material support (i.e. supply of irrigation water, good market price regulation and farmer training) to the farmers at the local level to help cushion the banana farmer.

3. The county government needs to come up with follow-up programs to establish whether the issues raised during the research are implemented so as to give confidence to banana farmers for them to get more returns from the banana proceeds.

4. The county governments should utilize follow up programs to address the issues raised by the banana farmers so as to improve production and the quality of the bananas in devolved governance.

5. Stakeholders in County governments should establish departments that independently identify, analyses, monitor and educates the famers on the new technologies that improves and increases banana production.

References

Bhattacharyya, R. (2008, May). Crop diversification: a search for an alternative income of the farmers in the state of West Bengal in India. In International Conference on Applied Economics–ICOAE (pp. 83-94).

Birthal S., Joshi K., Roy D., Thorat A. (2007). Diversification in Indian Agriculture towards high value crops: The role of small holders. IFPRI Discussion Paper 00727, November, 2007.

Boulanger, P., Dudu, H., Ferrari, E., Mainar-Causapé, A., Balié, J., & Battaglia, L. (2018). Policy options to support the Agriculture Sector Growth and Transformation Strategy in Kenya. A CGE Analysis, EUR, 29231.

FAO. 2009. World Food Report. Rome: FAO.

Farmbiz Africa (2019) Ready Market Excites over 2,200 Meru Farmers to Grow Bananas. Markets.HITS 2268. Meru. Kenya

Food and Agriculture Organization (FAO), (1996). FAO agriculture series no. 29. Rome Italy the state of food and agriculture ISBN 92-5-103858-9

Food and Agriculture Organization (FAO), (2017) Resilience Analysis in Isiolo, Marsabit and Meru counties (Kenya)2016. Analyzing Resilience for Better Knowledge Targeting and Food and Agriculture Organization

Food and Agriculture Organization FAO. (2018). Banana Market Review 2017. www.fao.org/fileadmin/templates/est/COMM_MARKETS_MONITORING/Bananas/ Documents/web_Banana_Review_2018_Final_DV.pdf

Government of Kenya (GOK) (2015) Kenya Coffee (General) regulations, 2015, GOK, Nairobi

Government of Kenya (GOK) (2019) Meru County: 2019 Long Rains Food and Nutrition Security Assessment Report - July 2019.NDMA. Nairobi.

Government of Kenya (GOK), (2002), Horticulture Division Annual Report, Government Press Nairobi

Government of Kenya (GOK), (2008), Domestic Horticulture Marketing and Market infrastructures in Kenya, Nairobi Imaging Centre, Nairobi

Government of Kenya (GOK), (2011), Ministry of Agriculture Validated Report 2011, Karuri Ventures, Nairobi

Government of Kenya (GOK), (2012), Ministry of Agriculture Validated Report 2012, Karuri Ventures, Nairobi

Kabunga, N. S., Dubois, T., & Qaim, M. (2014). Impact of tissue culture banana technology on farm household income and food security in Kenya. Food policy, 45, 25-34.

Karanja, A. M., & Nyoro, J. K. (2002). Coffee prices and regulation and their impact on livelihoods of rural community in Kenya. Tegemeo institute of agricultural policy and development, Egerton University, 27-29.

KNBS – Kenya National Bureau of Statistics (2019): The 2019 Kenya Population and Housing Census; Volume II: Population Distribution by Administrative Units: Nairobi, Kenya.

Krejcie, R.V & Morgan D.V (1970) "Determining Sample Size for Research Activities" Educational and Psychological Measurement

Meru County (2018). County integrated development plan 2018-2022. County Government of Meru,

Ministry of Agriculture (MoA) (2013) Report on: Food and Crop Situation, Imenti South sub-County, Meru County, Kenya.

Ministry of Agriculture, Livestock and Fisheries, MoALF, (2019) Agriculture Sector Transformation and Growth Strategy; 2019-2029.

Mwendia, A.S (2019) An Investigation of the Drivers of Diversification to Banana Farming Among Households in Meru County, Kenya. Unpublished Masters of Arts In Geography. Kenyatta University, Nairobi

Ogechi, B. A. (2014, January). Land use land cover changes and implications for food production: A case study of Keumbu Region Kisii County, Kenya. In Scientific Conference Proceedings.

SPSS, I. (2012). IBM SPSS statistics version 21. Boston, Mass: International Business Machines Corp, 126.

UNEP, (2011) Towards a Green Economy: Pathway to Sustainable Development and Poverty Eradication, United Nations Environment Programme. www.unep.org/green economy.

Van der Berg M.M., Hengsdijk H., Wolf J., Ittersum M.K.V., Guanghuo W. Roether R.P. (2007). The Impact of Increasing farm size and Mechanization on Rural income and Rice production in Zheijiang Province, China. Agricultural Systems, 94: 841-850.

Voora, V., Larrea, C., & Bermudez, S. (2020). Global Market Report: Bananas.