Socioeconomic Impact of Establishment of University of Embu on Small Scale Farmers in Nthambo Sub-Location, Kenya

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Authors' contributions

This work was carried out in collaboration between both authors. Author GJA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author CGN managed the analyses of the study. Both authors managed the literature searches, read and approved the final manuscript.

Original Research Article

Abstract

The University of Embu is one of the fast developing and recently chartered University in Kenya. It is located in Nthambo sub-location, which is an agricultural potential area. Universities establishment have considerable influence on the activities of community that stays around it. Despite the fact that several studies have been conducted on the socioeconomic impact of establishment of different Universities to the community they reside in, a research on the socioeconomic impact of establishment of University of Embu on small scale farmers in their agricultural activities have never been done. Given that the University of Embu has been established on the agricultural potential area, this study sought to investigate the impact of the establishment of University of Embu on agricultural resources and productivity, describe the community diversity and living standards of the community. Methodology used in this research was descriptive survey design and stratified random sampling technique obtaining a sample of 100 households which was proportionate to the population. Using SPSS software for cross-tabulation, the results indicated that: the rate of both livestock and crop production have been declining with supporting evidence of (60.2%) and (66%) of the households respectively, the community was diverse (87.2%) with majority being university students (68.1%), most of the small scale farmers had access to electricity

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connection (78.1%), even though farming activity remains main economic activity of community within the area, it has been declining from (95.3%) to (53.2%), business activities have increased from (3.5%) to (41.5%), most of the households (54.3%) have constructed rental houses majorly to earn more money (70.2%). The researchers recommend that Embu County government should adopt a policy such that the communities surrounding University of Embu must develop, implement and enforce mechanisms for effective preservation of productive agricultural land (i.e. Urban growth boundaries, purchase of development rights, exclusive agricultural zoning among others).

Keywords: University of Embu; agricultural potential area; households.

1 Introduction

Small-scale farmers are individual persons who are involved in the production of crops and livestock on a small-piece of land without using advanced and expensive technologies. Though the definition of size of these farms is a source of debate, it can be argued that farming on family pieces of land, on traditional lands and smallholdings on the periphery of urban areas, fall in this category. This type of farming is usually characterized by intensive labor and in most cases, limited use of agrochemicals and supply to the local or surrounding markets [1]. Unlike large-scale commercial agriculture, it plays a dual role of being a source of household food security as well as income from sale of surplus. Economically, small scale agriculture enhances local economic development as it is a source of employment and keeps most of the income local as the market is predominantly localized. Socially, especially on traditional lands, the produce is first meant to feed the household thereby contributing to food security. The socioeconomic livelihood of small scale farmers may be influenced by urban growth such as university institution. University is an institution of higher learning providing facilities for teaching and research, and authorized to grant academic degrees [2]. The University of Embu is located in Nthambo sub-location, which is a potential agricultural land. It was established as a constituent college of the University of Nairobi via a Legal Notice (No. 65 17th June, 2011) by his Excellency the president Mwai Kibaki. The University of Embu formally awarded a charter by H.E President Uhuru Kenyatta at a function held at State house Nairobi [3]. By considering universities as an element of urban gentrification, establishment of university institution in an area can greatly affect the socio-economic livelihood of the community in which it resides in. Many universities and colleges will undergo studies to state this socio-economic effect to the fluctuating livelihood of the surrounding households. The most obvious manner in which universities and colleges affect the local economy is through employment and direct purchase of goods and services [2] and argues that universities and colleges act on their neighborhoods in indirect ways such as by developing real estates.

The study by Khatibi [4], majored on the effect of establishment of university on the economic, cultural and social development in Hamadan province of Iran. The research methods used were both quantitative and survey based for random cluster sampling and multi-stage. The results indicated that the university impact on urban development included cultural development (55.97%), cultural development (54.84%) and economic development (43.6%) and regression shows that there was a significant relation between university establishment and urban development.

The study by Turner [5], tackled the economic impact of university on its environment in which the paper focused on the establishment of new university in Dockland areas of East London, the Royals University College, and looked at the possibility of using that opportunity for long-term study of the role of the university in stimulating the local economy. The results indicated that the universities have positive contribution to their immediate environment.

The study by Desima et al. [6], investigated the impact of off-campus students on the local neighborhood in Malaysia. The method used was direct interview through filling up questionnaires. The results indicated that in Malaysia, there was approximately a total of 1.2 – 1.5 million students 2009 and generally, the majority of

Shah Alam local residence were happy with those off-campus students and therefore, there was a need for more cooperation between stakeholders, off-campus students and the universities.

The study by Anamaria [7], investigated the impacts of university campuses on Disperse Urban Context in Brasillia, Brazil. The researchers used the concept of magnet and enclaves. The results indicated that Universities acts like a magnet by their power to attract people and economic activities to the surrounding and at the same time represents enclaves due to their large dimension that causes discontinuities in the urban fabric.

The study by Steinacker [8], researched on the economic effect of urban colleges on the surrounding communities in US. The researcher used the approach of two simple adjustments such that the standard impact study can produce an estimate of typically urban college's economic impact matched to its surrounding community. The results indicated that even a small US college with a predominantly commuter population has a significant effect on the city in which it was located.

The study conducted by Li et al. [9], on the relationship between primary changes occurring to China's agricultural land – the urban expansion of agricultural land and agricultural land use intensity. The econometric model was used and the results indicated that urban expansion is associated with a decline in agricultural land use intensity.

Although several studies have been conducted to establish the socioeconomic effect of establishment of university institution to the community it resides in, the socioeconomic effect of establishment of University of Embu to livelihood of small-scale farmers in relation to agricultural resources in Nthambo sub-location have not been studied. Despite the fact that establishment of University is known to bring influx of students and professionals, very little is known about impact of University of Embu. This raises three important questions: What are the causes of rapid urban expansion into agricultural potential areas surrounding the University of Embu? What are the economic livelihood changes in relation to agricultural activities? Is there association between the influence of establishment of University of Embu and socioeconomic livelihood of small scale farmers?

The study of the socioeconomic impact of establishment of university of Embu would assist in understanding the rate at which small scale farmers have given up in the act of farming predominant cash and food crops like coffee, bananas thus changing their occupation and have converted their land to real estates among others. The study aimed at creating awareness to key stakeholders like County Government and National Government, institutions of planning and development among others about: threat of food security in the region, emerging source revenue base in rental houses, possible decline in external source of foreign reserves via cash crops, potential skilled and semi-skilled human capital in the area as well as act as base-line data for future researchers who may want to engage in similar study in future. The specific objectives of this study include to: investigate the association between establishment of University of Embu and socioeconomic livelihood of community staying around it, describe the community diversity and living standards of the community.

2 Methods and Materials

2.1 Area of the study

The study area was partitioned into strata named Kangaru, Ntahmbo A, Nthambo B, Kiatwe-Kia-Mgaa and Rondisho. They were located within 2 KM radius from University of Embu. These strata lie in agro-ecological zones with soils ranging from clay loam to sand [10]. The areas experience bimodal rainfall, April- May (long-rain) and October to December (short-rain) with amount of rainfall ranging from 800 mm to 1400 mm [11]. Crops grown in these areas are both cash and food crops and they include tomatoes, kales, mangoes, passion fruit, sunflower, macadamia, pawpaw, coffee and tea. Similarly, small-scale farmers keep dairy cows, sheep and goats, beekeeping, poultry, pigs and rabbits [12].

2.2 Design of the study

A qualitative approach in form of a descriptive survey research design for gathering information about prevailing conditions or situations for the purpose of description and interpretation [13], and cross-sectional designs [14] adopted to get information about the sampled elements of the population as a whole. This is because, despite the fact that the researchers move from one homestead to another, one household interviewed once. Purposive Proportionate stratified random sampling conducted and qualitative data generated. The study primarily depended on interviewing of the respondents (household head or the spouse).

2.3 Population of the study

According to Plan [15], Kirimari ward has 10344 households. It has five sub-locations i.e. Dallas, Nthambo, Njukiri, Kathangari and Kithungururu. Through manipulation of the figure, the study targeted a population of approximately 400 small-scale farmers in Nthambo sub-location where the respondents were strictly the household head or the spouse.

2.4 Sample and sampling techniques

The researchers obtained representative sample for the population as follows

$$n_o = \frac{z^2 \, pq}{e^2},$$

See Cochran [16], where e is the desired level of precision, z^2 is the abscissa of the normal curve that cuts off an area α at the tail. $(1-\alpha)=90\%$ is the desired confidence interval, p- estimated proportion of success while q- probability of failure from the pilot test. Therefore $n_o = [(1.64)^2*0.856*0.144]/ (0.05)^2 = \sim 133$. For proportionately more information about the above population size,

$$n = \frac{n_0}{1+[\frac{n_o-1}{N_o}]},$$

See Israel [17]. That is to say, n = 133/ (1+ [(n$_o$-1)/400] = 100. The researchers considered five villages as strata then adopted simple random sampling without replacement in each stratum of 20 sample to represent a stratum. This was to achieve equal representation of the village residence during the study. The researchers ensured homogeneity within a stratum in terms of the location of the household.

2.5 Instrument for data collection

The instrument for data collection was a structured questionnaire, which was designed by the researchers to elicit responses from the respondents. The instrument was divided into five major sections. Section I: Details of the respondent, Section II: University of Embu Development, section III: Social livelihood, Section IV: Economic livelihood, Section V: Agricultural resources. These included both closed and open questions where the respondents could express their opinions.

2.6 Reliability of the instrument

The researchers carried out a pilot test using the designed and structured questionnaires. They carried out pre-test before the actual survey was conducted. The purpose of pilot test was to enable the enumerators to familiarize themselves with data collecting procedure and establish whether the interviewee really understands the questions as they were framed as well as possible period the interview could take. A reliability analysis was carried out on the perceived task values scale comprising of 11 items. Cronbach's alpha showed the questionnaire to reach acceptable reliability, $\alpha = 0.81$. Most items appeared to be worthy of relation, resulting in a decrease in alpha if deleted. The most exception to this was "level of agricultural water exploitation in the area", which would increase alpha to $\alpha = 0.83$. The errors experienced during the pre-test were corrected before the actual study.

2.7 Method of data collection

The focus of data collection was on households instead of the entire population. A household was taken to be 'a group of persons, who normally cook, eat and live together,' and these people may not necessarily be related but have one person regarded as the household head [18] 100 questionnaires were administered through direct interview. This implies that the researchers individually administered and collected the questionnaires. The researcher adopted this technique helped in clarification issues and matters, which may be ambiguous, drive out fear from the respondent thus avoiding bias responses, allow the researcher, observe body language and facial expressions, easily identified and understood, and finally, allows for in more in-depth data collection and comprehensive understanding.

2.8 Method of data analysis

For the analysis of data, the researchers used Microsoft Excel spread- sheet to enter, edit and code the raw data, then exported to SPSS. Generally, the researchers used descriptive statistical analysis and compare mean analysis, which involved descriptive statistics frequencies i.e. to measure the degree of respondents' responses, descriptive statistics descriptive and descriptive statistics cross tabulation- To test for relationship between the dependent variables and dependent variables using 90% level of significance for one tailed test, thus the null hypothesis rejected if p-value <=0.1. The researcher also adopted Likert scale method to measure the respondents' attitude through computing median of the responses [19].
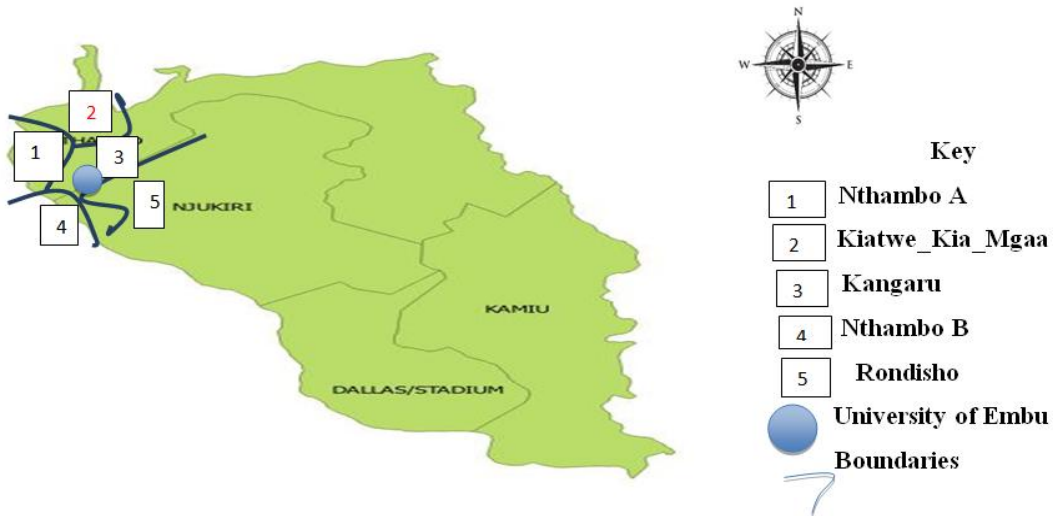

Fig. 1. Kirimari ward map, Embu County

3 Results and Discussion

This section begins with description of the respondents' profile; Majority of the respondents who were within the homesteads and interviewed were female (66%) while (34%) were male. This implied that those who accessed the questionnaires and gave the responses were mostly female. For the responding gender who gave the responses, we found out the relationship of the respondent to the household head, the majority of the respondents were the household head (57.4%) while (42.6%) were the spouse to the household head. Most of the household head in various families were men i.e. (55.3%) of all the respondents. On the other hand, (45%) of the respondents were female household head. It showed that, even though majority of the household head were men, a significant number of women are household head in some of the households.

This might have been due to divorce, early death of their husbands, some had their husband retired from employment and even others not employed at all which was the study did not major on. From descriptive analysis, most of the respondents who were small- scale farmers (either the spouse or household head), have on averagely settled in Nthambo for approximately 37 years. The minimum period of settlement of the respondents was 3 years while the maximum period of settlement of the respondents was 83 years.

3.1 Presentation of results

Majority of the respondents accepted that the society surrounding the University of Embu was diverse by people from different communities i.e. over 80%. Less than 20% stated "NO" meaning there was no community diversity in that there was no other community apart from the original people who settled before. Since most of the respondents said "YES", clearly we could conclude that indeed, individuals from different background had settled in the area surrounding the university. It was of greatest interest to know what kind of community diversity has occurred around the University of Embu. Therefore, the following were different opinions given by different respondents since it was an open question where each respondent could give his/her opinion. From the above, the majority of the respondents (68%) of the total respondents described the diversity of the community as students from different ethnic groups all over the country settling for the period of their studies. Approximately (11%), of the respondents claimed the community settling close to the University was diverse by settlement of other communities among which they specified these communities like Kikuyu, Kamba, and Kalenjin etc. Similarly, approximately (11%), the diversity was due to intermarriages. Finally, 10.6% of the total respondents the community staying around the University of Embu are the initial inhabitants. The community diversity and reasons for land sub-division had a significant association to each other (P=.068). Most of those who sub-divide land for selling purposes and those that give their children have recognized and accepted that there is change in community diversity. Most of the individuals who built new houses said there is no community diversity, refer from Fig. 2.
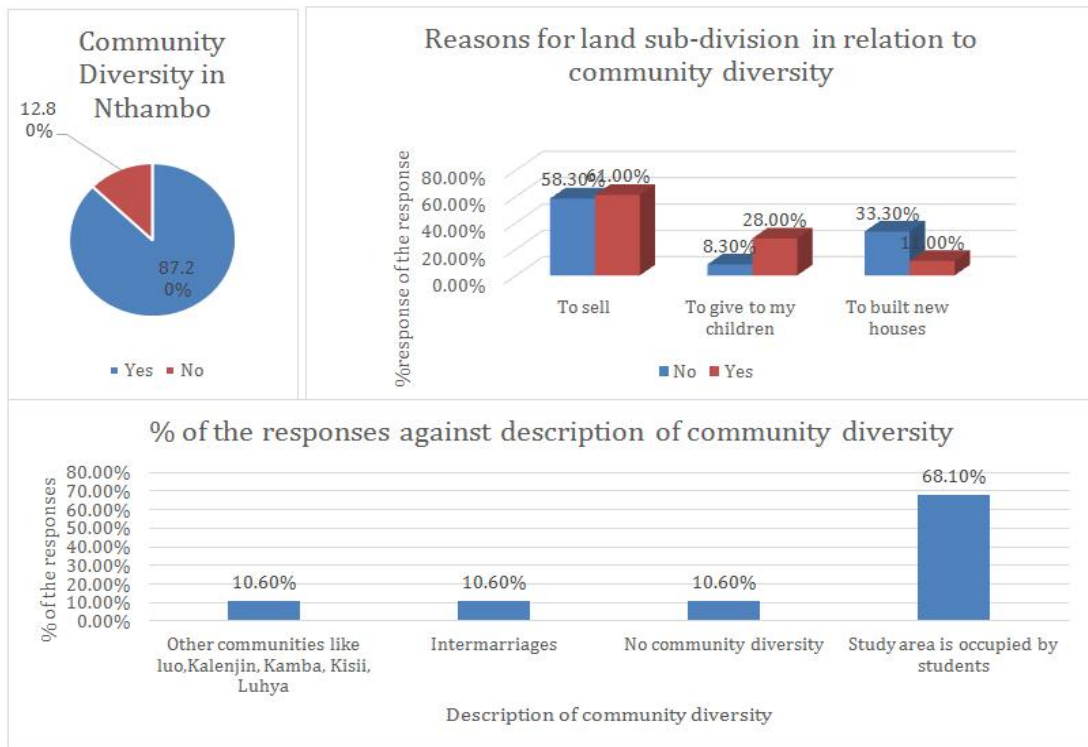

Fig. 2. Community diversity in Nthambo location

Even though (45.7%) of respondents have not constructed rental houses within agricultural potential zones, majority of them (54.3%) of them have constructed rental houses. Reasons for constructing rental houses: According to the study, most of the individual households who have constructed rental houses was to earn more money from the land (70%). Only (30%) of these households constructed rental houses to serve the growing population. This implied that most households who have constructed rental houses, finds it more beneficial than to carry out agricultural activities on the land. This serves as one of the urban development that has led to encroachment into agricultural potential areas, refer from Fig. 3.
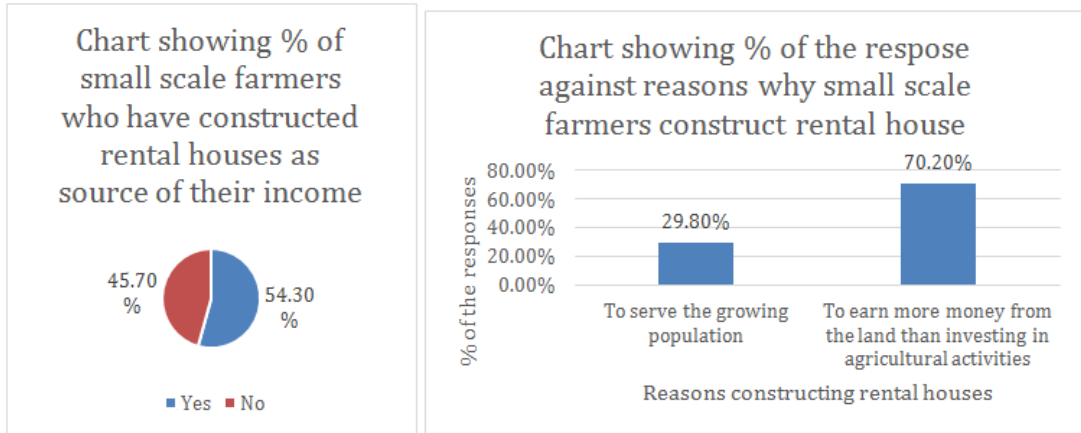
**Fig. 3. Urban expansion into agricultural potential zones**

From Fig. 4, majority of small-scale farmers residing around the University of Embu have electricity connection (78.7%) while (21.3%) have no electricity connection. There was a significant relationship between the type of household and electricity connection (p=0.001). Majority of those who have no electricity connection have semi-permanent houses while none of the household having electricity connection lives in a temporary house.
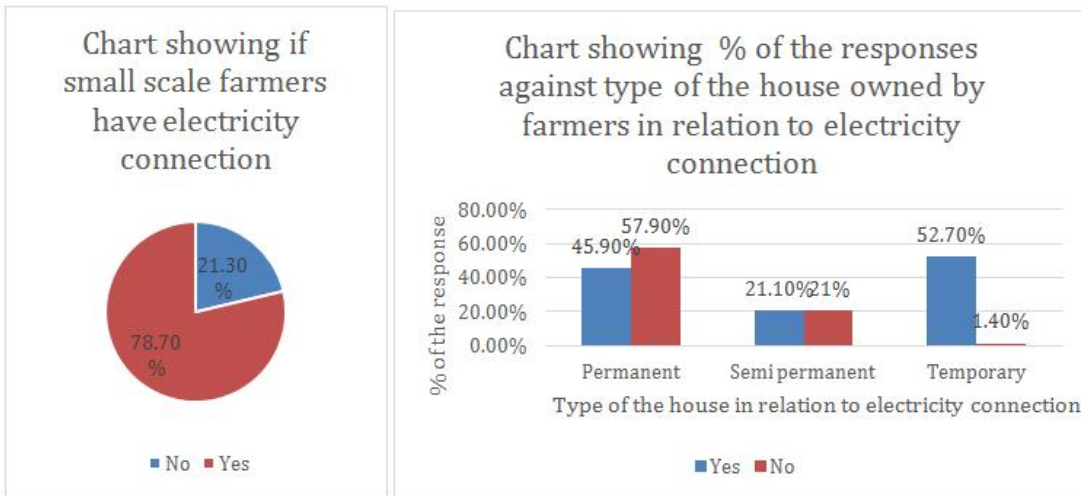

Fig. 4. Electricity connectivity

Most of the household head were self- employed when we conducted the research, many informally employed and just a few formally employed. This implies that most of the household head do not wait to be

employed rather they created their owned job opportunities. This reduces dependency rate. Majority of the community surrounding the University of Embu at the time of settlement of the respondents had farming as their major economic activity (95%). According to the study, just a few had formal employment as well as business as their economic activity. Since the time of settlement of the respondent, are there any changes concerning the economic activity. Majority of the households still practices farming as their major economic activity (53.2%). On the other hand, (41.5%) embraced business as main occupation and (5.3%) formally employed. In comparison to main occupation of the community at the time of settlement, farming have significantly reduced from (95%) to (53.2%) of the sample. The rate of business as an economic activity has significantly increased from (3.5%) to (41.5%) of the sample. This was a clear indication that agricultural activities are reducing among the communities that settled around the University of Embu while the number of people carrying out business activities has significantly increased. Main source of income of the household depended on the main occupation of the community at the time research was conducted. i.e. (P= 0.004). Those who said main occupation of the community now is formal employment, majority obtain main source of income from formal employment. Those who said the main occupation of the community now is informal employment, majority have farming as their main source of income and finally, those who said the main occupation of the community now is business, majority have business as their main source of income to the household from. Main source of income of most of the households is informal employment (39.4%). A significant number of people depend on business for their main source of income and finally, many formally employed (27.7%), as shown the figures of Fig. 5.
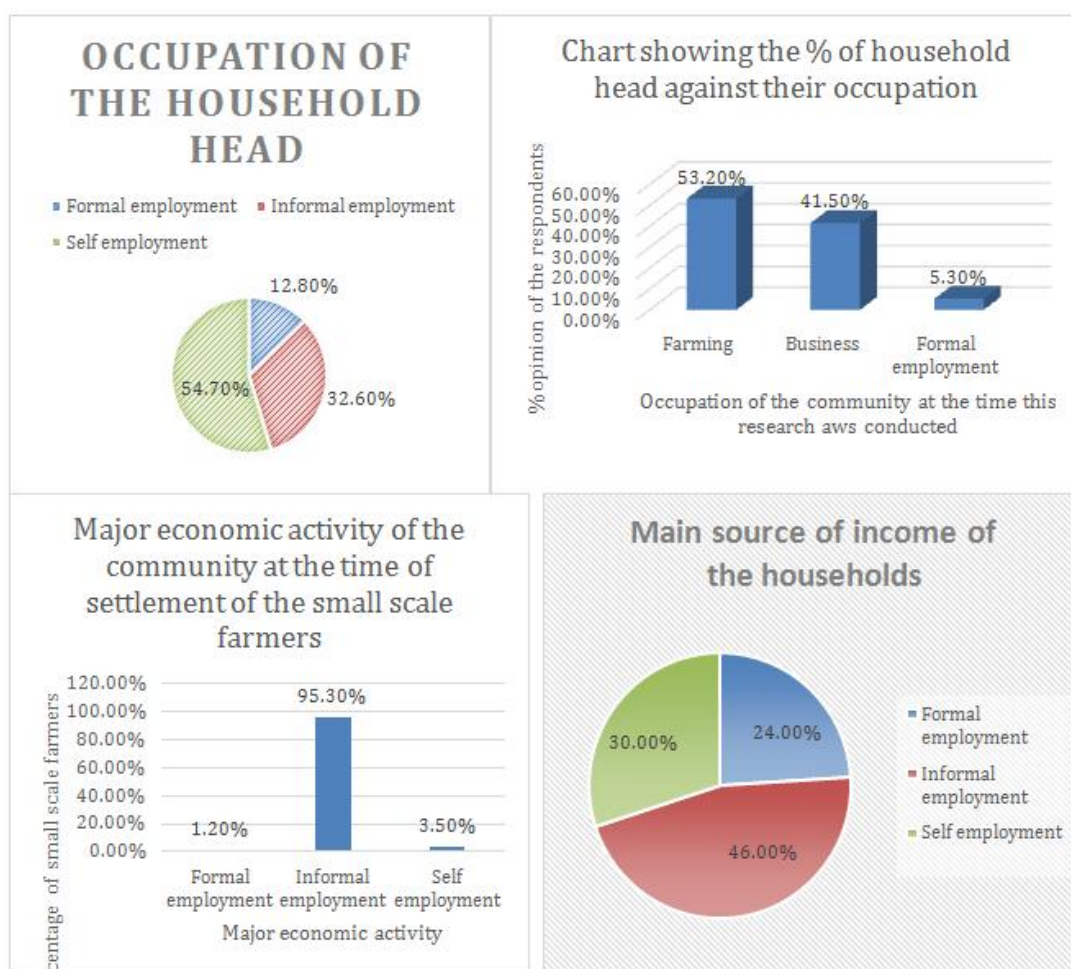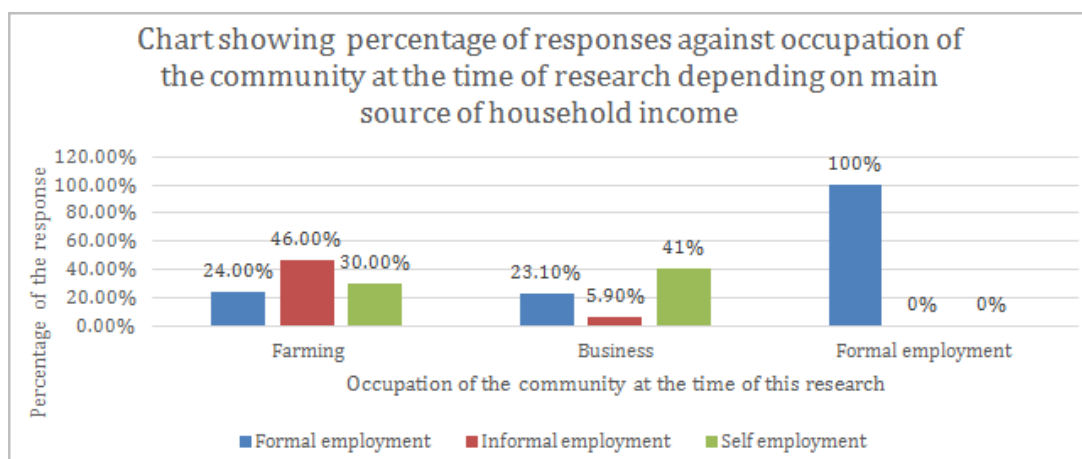
Fig. 5. Economic livelihood changes in relation to agricultural activities

Most of the respondents said the level of livestock production have been declining i.e. (60%). (34%) of the respondents said that the level of livestock production has been increasing while (5.4%) claimed that the level of livestock production has remained the same.

Crop and livestock production; Most of the respondents perceived that the level of crop production within their respective areas of living has been declining. i.e. (66%). While approximately (31.9%) claimed that the level of crop production has been increasing and finally, (2.1%) of the respondents observed no difference in the level of livestock production. The relationship between main source of domestic water and rate of livestock production was considerable (p=.05). 100% of those who use river as main source of domestic water perceived that livestock production has been declining. Similarly, majority of those who use tap water (59.6%) said livestock production decreases. Equal number of those who use tap and spring/well (50%) each said level of livestock production have been the same and declining respectively. None the farmers said livestock production has been increasing except those that use tap water as main source of domestic water. Occupation of the community now significantly depended on the level of crop production (P=0.065). Majority of those who said the main occupation of the community staying in the surrounding of the University of Embu is farming and business claimed that the rate of both food and cash crop production has decreased. None of the respondents who said the occupation of the community now is ether business or formal employment claimed that the rate of both food and cash crop production has been the same. Most of the respondents observed that the rate of land sub-division in the area has been fast since the University of Embu was established i.e. (57.4%). This implies that most of the agricultural potential area has been sub-divided into small pieces for various purposes, which may include, selling, building rental houses or even residential houses. It is clear that most of the respondents (47.9%) argued that major reasons for land sub-division, is because of selling purposes, an average of (34.5%) said the land is being sub-divided into pieces to give to children and finally, (17.6%) of the respondents said that the land was being sub-divided to build new houses like rental houses. The state of roads in the area depended on rate of land sub-division (P=0.001). The rate of land sub-division is very fast in areas with walking paths (57.1%), this implies that the land has been sub-divided such that small space walking paths are available. Similarly, land sub-division is fast in areas with earth road. Even though most of those who stay around the tarmac roads said the rate of land sub-division is fast, it is very low in areas with tarmac roads with a significant number of response (33.3%). None of the small-scale farmers who stay around either the earth or walking paths said the rate of land sub-division is very low. The perception of the rate of land sub-division depended on whether the respondent has constructed rental houses or not (P= 0.003). There was no small-scale farmer who has constructed rental houses and has rated the level of land sub-division as very low. Majority of the small-scale farmers who have constructed rental and commercial houses into agricultural potential areas perceived that the rate of land sub-division in the area is very fast. The differences between the perceptions of the

respondents' response concerning the reasons for land sub-division which seemed to depend on whether a small-scale farmer has either constructed rental houses (P=0.074). Majority of those who have not constructed rental or commercial houses do sub-divide their portion of land for selling purposes, most of the small-scale farmers who sub-divide their portion of land for building new houses, have constructed rental and commercial houses as shown in Fig. 6.
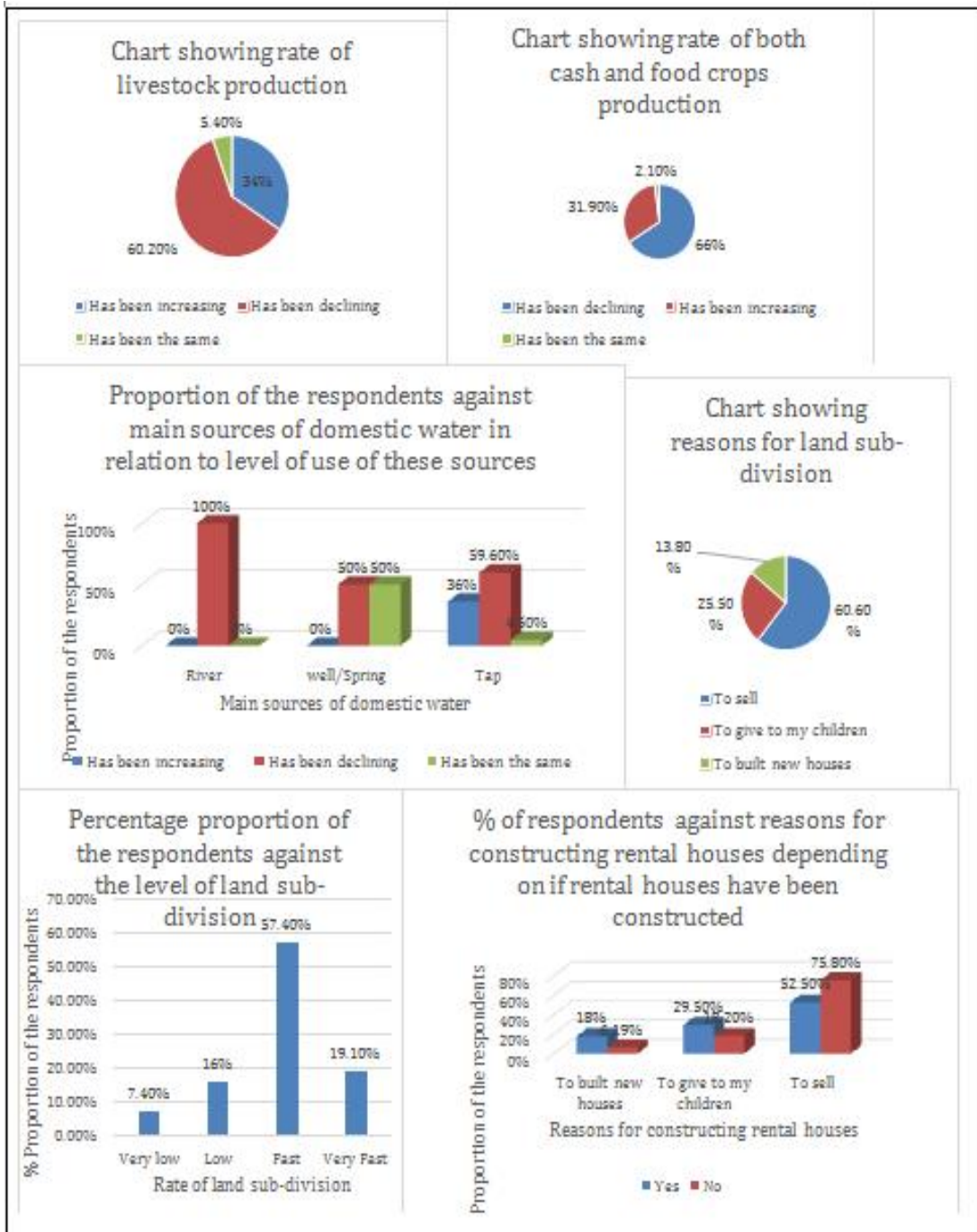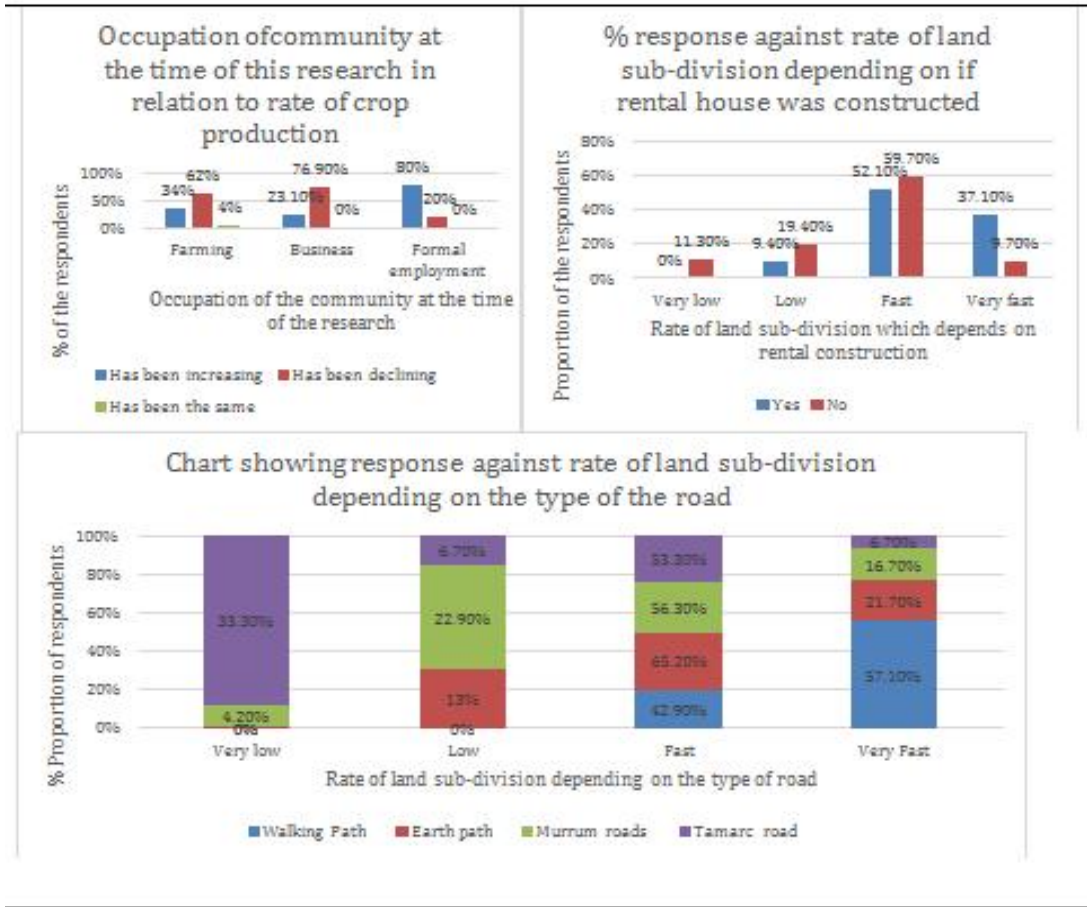
Fig. 6. The effects of urban expansion associated with establishment of University of Embu on agricultural resources and activities

It follows from Fig. 7 that, majority of small-scale farmers heavily depends on rainwater as main source of agricultural water i.e. (52.1%). (29.8%) depends on tap water. (12.8%) depends on water from the rivers and (5.3%) depends on well/spring. Main source of agricultural water depended on common mode of transport in the area of the respondent (p=.005). Areas with common mode of transport as public vehicles, private vehicles mostly depended on rainwater as main source of agricultural water. Areas with bicycles as common mode of transport totally depended on only river as main source of agricultural water unlike area with common mode of transport as walking depended on all the above sources of water i.e. river, well/spring, tap and rainwater but mainly tap water. This implies that areas with walking paths as common mode of transport have identified and developed tap water as main source of agricultural water. Level of water exploitation in the various areas of respondents depended on common mode of transport in the area (p=0.005) i.e. less than the default value. There was a relationship between main sources of agricultural water and description of community diversity, (p= 0.05), which is less than the default value= 0.1. Majority of those who use river as main source of water are those households who have not recognized the community diversity. For well/spring and rainwater, majority are individuals who noticed that the community was diverse by other communities such a Kikuyu, Mbeere, Kalenjin, Luo, Meru, Kamba, Kisii, Luhya who has probably settled in the University of Embu to seek for employment. Finally, tap water is mainly used by different people from different ethnic groups who have settled for marriage purposes. Majority of small-scale farmers highly depends on hired labor i.e. (60.2%) while (39.8%) of small scale farmers depends on family labour as main source of agricultural labor.
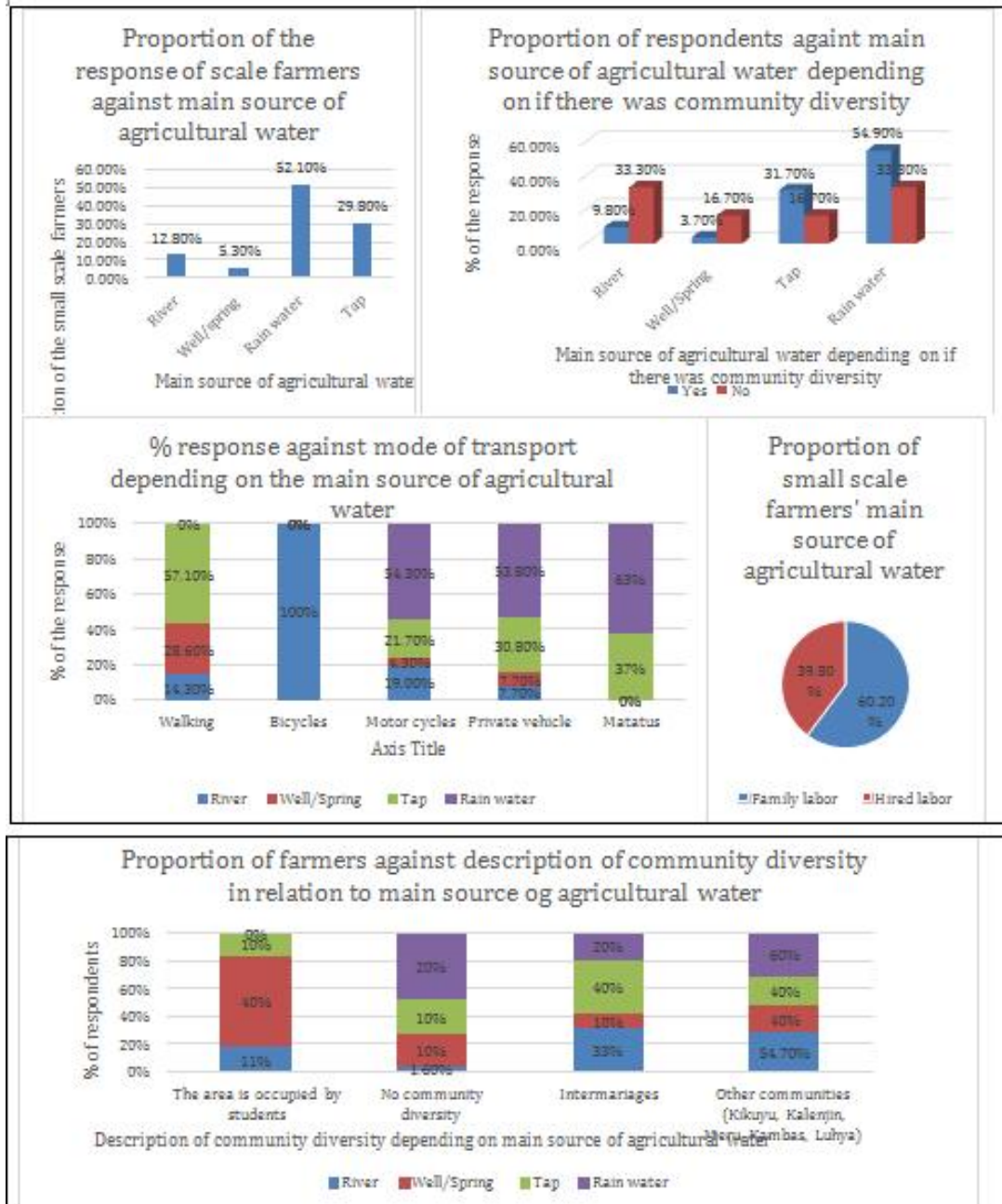
Fig. 7. Agricultural sources of water

3.2 Analysis and discussion

From Table 1, both gender agreed that the rate availability of veterinary services and agricultural extension services in the area were rarely available while agricultural labor and water was available. Even though both gender agreed that that food was easily accessible, female claimed it was accessible but not easily. Agricultural credits were rarely accessible for both gender. There was slight disagreement for female

claiming it was accessible. Food was more easily accessible to male as compared to male (Table. 2). Probably, this is because have more amount of money to purchase food than female. From Table 3, even though both gender agreed that cost of agricultural labour had been declining, male claimed it had been increasing than female. The level of both food and cash crop production has been declining. Level of livestock production in the area has been declining too though more female slightly argued that it had been increasing. In this study, the researchers tend to agree with the above fellow researchers. This research found that establishment of the University of Embu has led to urban expansion within the area through building rental houses, construction of roads thus the researchers came to an agreement with the study conducted by [2] through development of real estate. Even though University establishment has a positive contribution to the intermediate environment through stimulating local economy development [5], according to this study, these contributions depend on what kind of environment. Despite the positive influence on urban development to the host community, who values farming, this study went further in exploiting the influences on agricultural activities and resources. Urban expansion into agricultural potential zones has a negative contribution to the agricultural productivity. The researchers agreed to the study conducted by Jiang et al. [9]. The research found that the residence of the area of study has embraced community diversity, population growth which supports the study by Desima et al. [6].

Table 1. Analysis over availability of agricultural water, labor, extension services and veterinary services with respect to gender

Gender of respondent		Rating of agricultural extension services in the area	Rating of veterinary services in the past one year	Level of availability of agricultural water	Level of availability of agricultural labour
Male	Median	3	3	2	2
	Mean	2.92	2.58	2.17	1.86
Female	Median	3	3	2	2
	Mean	2.91	2.41	2.17	2.06

1= regularly available 2=Available 3=rarely available 4= Not Available at all

Table 2. Analysis over level of access to food and agricultural credit with respect to gender

Gender of respondent		Level of agricultural credit accessibility	Level of access to food
Male	Median	3	1
	Mean	2.89	1.47
Female	Median	3	1
	Mean	3.02	1.72

1= easily accessible 2= Accessible 3= rarely accessible 4= Not accessible at all

Table 3. Analysis of level of production of both livestock and crop and fluctuation of labour cost

Gender of respondent		Fluctuations of agricultural labour cost	Level of crop production in the area	Level of livestock production in the area
Male	Median	2	2	2
	Mean	1.69	1.69	1.86
Female	Median	2	2	2
	Mean	1.84	1.69	1.6

1= has been increasing 2= has been decreasing 3= has been the same

4 Conclusion and Recommendations

This study which is the first of its kind on the socioeconomic influence of establishment of University of Embu on host community over agricultural sector, has been a success even in the face of challenges

associated by language barrier which has been attributed by diverse communities from different speaking language background all over the country, Kenya. From the study, it can be concluded that, influence brought about by establishment of University institution within an agricultural potential zone and socioeconomic livelihood of small-scale farmers have a positive association. From this study, establishment of University of Embu has brought about significant improvement in the Community through infrastructural development, increase in economic and other commercial activities through commercial houses and business activities, increased population growth i.e. diversity of the community. The economic livelihood of the community has significantly changed from farming to business activities due to available marketability. Despite the fact that establishment of University of Embu has a positive impact to community development, from this study, urban development has encroached into agricultural potential zones thus reducing agricultural land and resources at large. Declining rate of crop and livestock production may further lead to fear of food and cash crop shortage in future. Individuals in this area invest much on commercial activities as main source of income. To this end, to ensure food security in the coming future and maintenance on agricultural sector, there is need for government and relevant stakeholders to revisit and make operational the policy frameworks in place such as the urban development brought about by the university institution and town and country planning acts. The environment needs to be protected. The researchers recommend that Embu County government, Kenya national government, private sectors and organizations should adopt a policy such that the communities surrounding University of Embu must develop, implement and enforce mechanisms for effective preservation of productive agricultural land (i.e. Urban growth boundaries, purchase of development rights, exclusive agricultural zoning among others). Agricultural research centers and institutes in co-ordination with University of Embu at large should create awareness on the new developed technologies of high agricultural production quality. Finally, further studies should be carried out to determine to what extent has establishment of University of Embu has affected the Socioeconomic livelihood of small-scale farmers in Nthambo sub-location.

Competing Interests

Authors have declared that no competing interests exist.

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