

Article

# Perspectives on Agricultural Land Use Conversion and Food Security in Rural Ghana

Divine Odame Appiah <sup>1,\*</sup>, Felix Asante <sup>1</sup> and Bernice Nketiah <sup>1</sup>

<sup>1</sup> Department of Geography and Rural Development, Kwame Nkrumah University of Science and Technology, Kumasi, 00233, Ghana; couzon\_species@yahoo.com (F.A.); bnketia22@gmail.com (B.N.)

\* Correspondence: dodameappiah@gmail.com; Tel.: +2335-555503640.

Received: 11 March 2019; Accepted: 12 March 2019; Published: 18 March 2019 (Version 1, doi: 10.3390/sci1010014.v1)

**Abstract:** Rapid peri-urbanization has resulted in increasing demand for and pressure on peri-urban lands at the expense of agricultural lands. Households' decision to convert from agricultural land uses to residential and commercial land uses is driven by a myriad of factors, ranging from social to economic, in the Asante-Akim South district of the Asante region, Ghana. The paper examined the effects of agricultural land use trade-off on food production in the district. Using a triangulation of qualitative and quantitative methods, 115 household respondents were proportionately sampled from three selected communities in the district, for the collection of data through the administration of questionnaires. The data were subjected to the Pearson's chi-square, embedded in the SPSS V.16, to test for association among the variables. We report that the increasing rate of agricultural land uses conversions was as a result of increasing demand for residential and commercial land usage at the expense of agricultural land uses. Converting prime agricultural lands into other land uses was seen as profitable to agricultural expansion. A re-examination of the district land use plans by the Ghanaian Physical (Town and Country) Planning Department in tandem with the Lands Commission is therefore recommended.

**Keywords:** agriculture land use; conversion; peri-urbanization; food security; Asante-Akim South; Ghana

---

## 1. Introduction

Continued growth of the human population has brought about peri-urban growth, leading to competition for limited land resources [1,2]. The process of urbanization has led to rapid conversion of large prime agricultural lands to urban land use in the peri-urban areas [3]. Busck et al. [4,5] and the authors of [6] have described the peri-urban areas as those areas adjacent to built-up areas of high population concentrations (that is, urban), specifying that they are the zones where traditional farming activities come into conflict with alternative economic, residential, and recreational interests. Land use conversions play a crucial role in determining the amount of food production.

A number of studies have investigated the effects of factors driving peri-urban expansion at the expense of other land uses, especially agriculture [7–9]. However, little seems to have been done to examine the influence of peri-urban expansion on smallholder agricultural land use, in Juaso and the surrounding communities. This study seeks to find out the effect of peri-urbanization on food security in selected communities in the Asante Akim South District of Ghana. The high demand for land for residential, industrial, and commercial purposes has led to decreased farmlands, resulting in low agricultural productivity and food insecurity in peri-urban areas [10,11].

In peri-urban Kumasi and other urban areas, such as Konogo-Odumasi, most of the lands are owned by the traditional authorities [12]. Access to lands is basically by leaseholds and regulated by

local stool lands and/or heads of clans. Unfortunately, these custodians use their position to allocate the lands to wealthy dwellers to the detriment of the poor indigenous smallholder farmers in the peri-urban areas [13]. The selected communities in the Asante Akim South District, as peri-urban areas, are not exceptional, since, due to residential land use expansion, land for agriculture has declined. The trend in land acquisition is one that seeks to promote peri-urbanization in the District.

Rural and urban land uses are totally different in the sense that rural areas are dominated by agriculture, horticulture, dairy, etc., whereas urban areas are primarily characterized by residential facilities, manufacturing units, commercial, and other user services. Though the exact definition of the peri-urban area varies from one area to another, some common ones include the peri-urban zone being seen as a space between these two areas (rural and urban) where exchange of resources takes place [14]. The peri-urban zone can also be seen as a transition from the rural to urban. It is neither rural nor urban. It is, however, seen as an outcome for others and a process for other people [15].

Because the peri-urban zone is a transition between urban and rural, with time, it undergoes more changes in agriculture land use than the city or the rural area [16]. Due to rapid urban growth, the peri-urban interface is experiencing substantial land transformation as the urban core or activities expand into the peripheries. The increase in population in these zones has led to high demand for other land uses against agriculture land use. This has increased conversion of agricultural lands into other land uses [14].

### *1.2. Peri-Urbanization and Food Security*

The growing population in developing countries can also be a major factor contributing to the conversion of lands in the urban fringes. In Ghana, Kumasi in the Ashanti region, for instance, is experiencing the second fastest annual growth rate of 5.4% of population in the city [17]. As such, the growth in conjunction with increased land values and congestion in the cities has resulted in over-exploitation of natural resources in the urban peripheries. The high demand, change in lifestyle in the urban areas, and preference for location of houses, industries, and commercial development have resulted in most lands being converted to physical development [18]. Land is dominantly owned by individuals and local institutions in the peri-urban settings; as such, landlords easily convert their lands to other uses to avoid loss of their farmlands [19].

According to the World Food Summit in 1996, "Food security exists when all people at all times have physical or economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" [1]. In addition, the Food and Agricultural Organization's (FAO's) State of Food Insecurity report in 2011 stated that food security included four elements: Food availability, food accessibility, food utilization, and food system stability. Defining the various elements, availability of food focused on food production, whereas accessibility focused on the ability of people to obtain food, either through production, purchase or transfers. Utilization of food also aimed at the ability of the human body to ingest and metabolize food, whilst stability of food focused on the stability of supply of food and easy access.

With regard to the aspects of food security, food production is very important to consider in terms of sustaining rural and urban livelihoods [20]. However, over the years, there have been records of low food production followed by a rise in food prices [21]. Food prices are mostly determined by a complex combination of various factors, among them massive increase or decrease in agriculture production and output [22]. The effects on food prices by the changes in agricultural land use has not been embraced by many policy makers and scholars given that other factors come into play in determining food prices other than agriculture land use changes. However, the authors of [23] argue that no matter how insignificant the conversion of agriculture land seems to be, it plays a role in determining availability of food and its prices.

In rural Ghana, about 60% of the population are engaged in agriculture as their main source of livelihood, which is typical of most agrarian communities [24]. However, the sector has experienced a decline over the years due to a number of factors, key among them being the effect of rapid peri-urbanization on the urban peripheries. According to Reference [20], development in the periphery is characterized by progressive conversion of agricultural and forested land to peri-urban uses. The

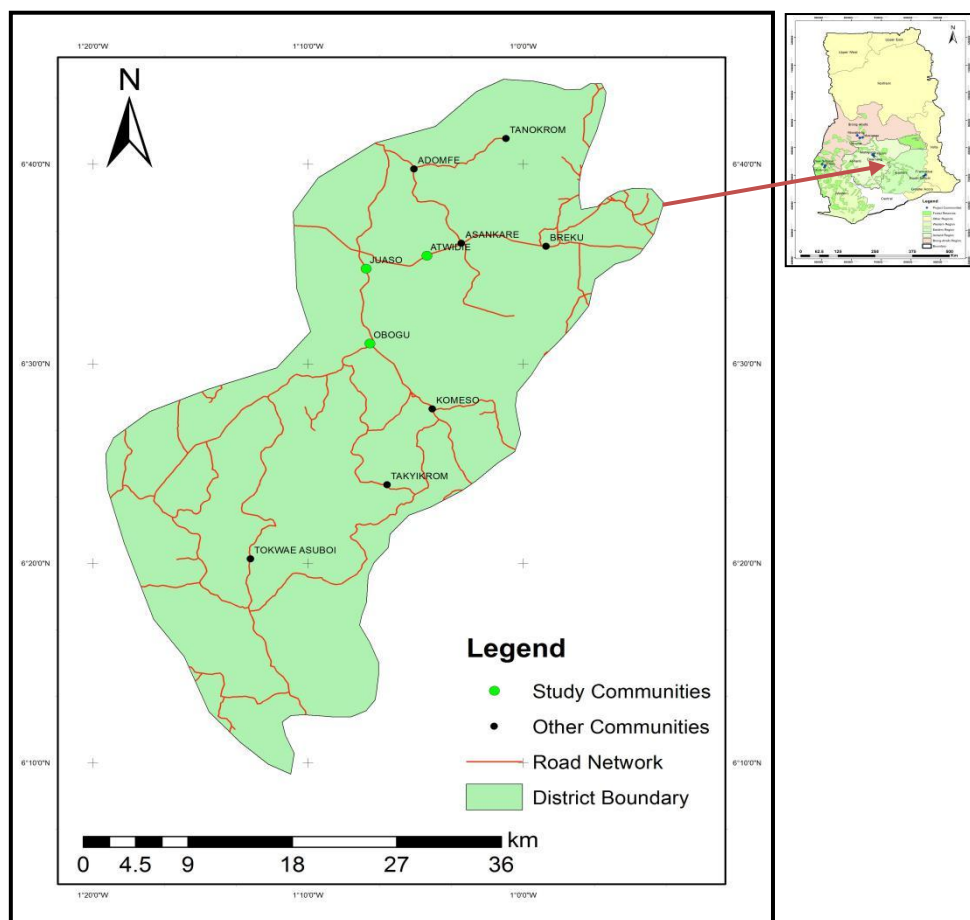
land use in the study area is usually converted into residential, commercial, and industrial uses. This is leading to low agricultural production, although it used to be one of the major food baskets of the District.

In spite of the worrying changing agricultural land use trend, especially arable land use conversion, in the country in general and in the district in particular, little research attention seems to have highlighted the food security implications of this trend in the district. The Ministry of Food and Agriculture’s assertion that the district is one of the major food baskets of the Ashanti region of Ghana, therefore, stands threatened if proactive implementation of land use regulations, supported by empirical data, does not take place. The research question driving the study is: What are the causes and effects of agriculture land conversion trade-off on food production in the Asante-Akim South District of the Ashanti Region of Ghana?

**2. Materials and Methods**

*2.1. Profile of the Study Area*

The study was conducted in the Asante-Akim South District located within latitudes 6°10’ N and 6°40’ N and longitudes 0°50’ W and 1°17’ W in the Ashanti Region of Ghana, with Juaso as the District capital (Figure 1). The agricultural sector is mainly food and cash crop farming with little livestock rearing activities. The maximum temperatures are recorded between March and April, and the minimum temperature in August. The mean monthly temperature is 26 °C. The district also experiences a double-maximum rainfall between April and July, reaching its climax in June. The minor rainy season occurs between September and mid-November. The mean annual rainfall ranges between 1500 mm and 1700 mm [17].



**Figure 1.** Map of the Asante-Akim South District with Ghana Insert.

The district falls within the moist semi-deciduous forest vegetation zone where different species of tropical hard woods with high economic value can be found. The trees species found in the district include: Wawa (*Triplochiton scleroxylon*), Denya (*Cylicodiscus gabunensis*), Mahogany (*Khaya ivorensis*), Asanfena (*Aningeria* spp.), and Onyina (*Ceiba pentandra*). In certain parts of the district, however, the original forest cover has been turned into secondary forest and grassland through indiscriminate exploitation of timber and inappropriate farming practices such as the slash and burn system. Currently, the district can boast of 5 major forest reserves covering a total land area of about 110 km<sup>2</sup>.

## 2.2. Sampling Design, Instruments, and Data Analysis

Probability simple random sampling was used to select the respondents from the district list of farmer household population size of about 17,540. This approach was done because the population of the communities is fairly homogeneous in terms of their occupational activities. This technique reduced biases and also helped to draw general conclusions from the various household heads. The main targets for study were the heads of household in the district. The selected communities were Juaso, Obogu, and Atwedie. These communities were selected based on their co-existence of both rural and urban activities as a result of peri-urbanization and proximity to the urban city as they were found at the peripheries.

In order to ensure generalization and a fair representation from the three selected communities, the proportionate sampling method was used to select 45 households from Juaso, 35 households from Obogu, and 35 households also from Atwedie; these were based on their respective population sizes. Further, five key informants were purposively sampled from the District Directorate of the Ministry of Food and Agriculture and the District Assembly. In all, a total of 120 respondents constituted the sample size for the study.

The questionnaire consisted of a blend of partially pre-coded and pre-coded questions that were administered to the respondents. The collected data were analyzed using the embedded tools of frequency, cross-tabulation, and Pearson's Chi-square in the Statistical Package for Service Solution (SPSS) version 16. Qualitative data were also analyzed thematically in a descriptive and explanatory manner and used to support the quantitative results. Tables and graphs have been produced in Microsoft Excel software to illustrate the distribution of observed phenomena.

## 3. Results

### 3.1. Sociodemographic Characteristics of Respondents

Table 1 displays the various sociodemographic characteristics of the respondents at a cursory glance. Regarding the gender of the heads of household, 61% heads of household interviewed were males, while 39% were females. In all the communities, the heads of the household interviewed were predominantly male farmers. Information about their educational background showed that 68% of the 115 respondents had middle school education, 16% had vocational or secondary education, and 12% had never been to school.

**Table 1.** Demographic characteristics of respondents.

Variables	Characteristics	Frequency	Percentage
<b>Gender</b>	Male	70	61
	Female	45	39
	<b>Total</b>	<b>115</b>	<b>100</b>
<b>Education level</b>	No Education	14	12
	Primary	2	2
	JHS/Middle School	78	68
	SHS/Tec/Vocational	16	14
	Tertiary	5	4
	<b>Total</b>	<b>115</b>	<b>100</b>
<b>Occupation</b>	Farming	59	51
	Teaching	26	24
	Trading	6	5
	Others	22	19
	<b>Total</b>	<b>115</b>	<b>100</b>
<b>Household size</b>	1–5	60	52
	6–10	42	37
	11–15	13	11
	<b>Total</b>	<b>115</b>	<b>100</b>

Source: Authors' fieldwork.

The majority of the respondents had had formal education only up to the junior high school/middle school level; thus, they do not have qualification for white-collar jobs. This explains why farming is the predominant occupation in the communities. In addition, the study revealed that 51% of the household heads were farmers, 24% were teachers, and 5% were traders, whilst the remaining were engaged in other occupations. Most of these smallholder farmers have very low incomes which influence them on making decisions for the use of their farmlands.

The various factors that influence the conversion of agriculture lands to other uses are indicated in Table 2. From the three communities, it can be inferred that at Juaso, 17 of the household heads said agriculture land use is changing due to economic incentives, while 12 of them also said it is determined by changing demands in land use activities. Easy access to land formed the major factor determining agricultural land use conversions in Obogu and Atwedie, as reported by 15 and 14 respondents, respectively. However, 13 respondents in Atwedie expressed the view that a changing demand trend in land use is also a key factor determining land use conversion.

**Table 2.** Determinants of agricultural land use conversion.

Factors	Communities			Total
	Juaso	Obogu	Atwedie	
Easy access to land	7	15	14	36
Changing demand trends in land use	12	5	13	30
Deteriorating livelihoods of landowners	6	5	5	16
Economic incentives for land use conversion	17	11	5	33
<b>Total</b>	<b>46</b>	<b>36</b>	<b>37</b>	<b>115</b>

Source: Authors' fieldwork.

Some respondents indicated that their motivation to convert their agricultural lands to other uses was based on the fact that there is easy access to land in the communities. On the part of respondents from Juaso, the district capital, a lot of urban development, especially residential activities, is being undertaken to meet the growing population. In view of this, building houses for rental and leasing of lands for the construction of other infrastructures have become more profitable

than leasing same for agricultural production. This has influenced farmers to no longer consider agriculture as lucrative, and they have hence proceeded to convert agriculture lands to other uses.

Another reason is that subsidies and incentives for farming are no longer encouraging. Commercial activities have had more value than agricultural activities in recent years, as stated by one respondent. In support of this, one farmer sorrowfully commented that:

*“The agricultural inputs are so expensive and so we are not able to buy them to help us on our farms. As a result, many people are shying away from farming and engaging in other livelihood activities especially, in petty trading”* (Key Informant, Juaso).

Another reason was the changing demand trends for land use. This is connected to economic incentives in the sense that, because agriculture is no more lucrative in these areas, demand for land for agricultural purposes has changed. People now acquire land for other activities, such as commercial, residential, and recreational. A few of them said that land uses are changing due to deteriorating livelihoods of land owners; given that reason, people tend to give out their lands for other activities when they are faced with financial challenges, in return for financial gains. In the light of this, the study also sought the views of the household and family heads on their motivation to lease part of their land for uses other than agriculture (Table 3).

**Table 3.** Factors determining household decisions to convert agricultural lands.

Factors	Frequency	Percentage
Excess land sizes	9	8
Changing demand trends in land use	10	9
Deteriorating livelihoods of household	41	36
Economic incentives for land use conversion	45	39
Others	10	9
<b>Total</b>	<b>n=115</b>	<b>100</b>

Source: Authors’ fieldwork.

About nine percent of the respondents said that they would convert their agricultural lands to other uses because they have excess land size and the demand trend for land use is changing. Additionally, 36% of the them indicated that they would convert their agricultural lands to other activities as a result of deteriorating livelihoods, whilst 39%, representing the majority of the respondents, said economic incentives for land use would influence them to convert their agricultural lands to other land uses (Table 3). This category of respondents explained that though agriculture is important, it is no longer as lucrative as other forms of land uses. Using lands for residential activities is more profitable because buildings last longer, and their owners can easily and quickly make a profit from rent. It is important to add that lands are sometimes leased for other activities when the livelihoods of the land-owning families deteriorate. For instance, a household head can easily lease their land for money when they become financially bankrupt.

The study sought to ascertain the association between the responses to the general factors determining agricultural land use conversion and the factors that influence household decision to convert agricultural lands to other land uses. The Pearson chi-square statistical analysis was not significant at  $p > 0.05$  significance level, with the following statistics ( $\chi^2 = 17.592$  at  $df = 12$ ,). The Cramer’s V test of strength ( $V = 0.226$ ) of association between the variables was too weak to reinforce that there is really any significant association between the factors that determine agricultural land use change and the factors that influence households’ decision to convert agricultural lands to other land uses in the study communities.

### 3.2. Peri-Urbanization on Arable Land Availability

Assessing the relationship between peri-urbanization and agricultural lands, 10% of the respondents indicated that they had more than six hectares of farmland ten years ago. However, seven percent indicated that they still have the same size of farmland currently. It can therefore be

inferred that three percent of the respondents have had a reduction in the sizes of their farmland over the ten-year period. Further, out of the total respondents, 15% claimed they had lands between four and 10 hectares (ha) about ten years ago, whereas four percent still had their farm sizes remaining about the same size range over the same period.

This means that 11% of the respondents had lost their agricultural lands over the ten-year period. Furthermore, 37% of the respondents had farmlands up to four hectares in the past ten years. However, 34% still have the same size of land currently. The following deductions can therefore be made: Some of the respondents who had farm lands up to 6 ha currently have their farmlands reduced up to 4 ha, representing a percentage of 34% of the respondents. Approximately 34% of the respondents indicated no lands for agricultural activities ten years ago, while 39% have lost their lands to other land uses.

In addition, to substantiate this claim, the total size of farm land from the 115 respondents 10 years ago sums up to 244 ha, while the total size of farm land from 115 respondents presently summed up to 196 ha. The difference between them (48 ha) firmly indicates that the size of farm lands available ten years ago has been reduced now.

### 3.3. Agriculture Land Use Trade-off on Food Production

In farming, the size of farmland influences the size of farm output. With the alarming increase in peri-urbanization and its associated activities, there is no doubt that demand for agricultural lands for residential and commercial use is also increasing. The reduction in cultivated lands also affects food production. At the moment, peri-urban areas are seen to provide quality farm produce to urban areas; however, increased conversion of agricultural lands to other land use would have a negative effect on food production. This study sought to find out the trend of food productivity five years ago with increasing peri-urbanization.

The data obtained from the respondents with regard to the effects of agricultural land trade-off on food production in Juaso show that food production has decreased tremendously following the increasing conversion of arable lands to other purposes. This was confirmed by a cumulative percentage of 68 of the respondents who shared their sentiments on grounds that food production in the community has dwindled in output.

That notwithstanding, a combined set of respondents of 27% were of a contrary view of increasing productivity, different from the general trend of food production observed in the communities (Table 4). They argued that food production in the community is relatively high compared to other communities; however, they also acknowledged the fact that the size of arable lands has reduced. Thus, they attribute the increased food production mainly to intensification of agricultural lands coupled with fertilizer application by some farmers.

Other respondents, however, expressed mixed feelings regarding the level of agricultural output in the community. According to about five percent of the respondents, food production in the community is unstable not mainly because of peri-urbanization but also due to unreliability in rainfall pattern and lack of motivation in farming as an occupation. They believed that most of the youth are not encouraged to engage in food crop production because the occupation does not fetch them much money compared to mining and industry.

**Table 4.** Perceived effect of agricultural land use change on food production.

Response	Frequency	Percent
Very low production	11	9.6
Low production	67	58.3
High production	24	20.9
Very high production	7	6.1
Neutral	6	5.2
<b>Total</b>	<b>N = 115</b>	<b>100</b>

Source: Authors' fieldwork.

According to the respondents, activities like galamsey (illegal artisanal small-scale mining) in Juaso, chainsaw operation and sand winning activities, especially in Obogu, had rendered the soil infertile, due to land degradation. For instance, with sand winning, crops on the parcel of land earmarked for the activity are destroyed to allow easy access for collection of the sand. During the process, sand is scooped, sometimes reaching the water table. This leaves large pits filled with water that is unproductive and useless. Most of the farmers complained about how sand winning activities had rendered their farmland unproductive and decreased their crop production. Another problem had to do with chainsaw operators. Most of these contractors operating chainsaw machines do not seek permission from farmers on whose lands they are to fell trees but go into the farms in the dead of the night and cut down the trees. In the process, crops on the farms are destroyed and, unfortunately, the affected farmers are not compensated by the loggers.

One respondent said that, in the near future, food would be very scarce because a lot of people are building houses on agricultural lands. This has even become a competition among the landowners. He puts it more bluntly as *“Hunger will kill us if we do not manage our lands effectively”* (Key informant, Obogu). At Atwedie and Obogu, most of the farmers have now resorted to cultivating trees with economic value and cocoa, since they are relatively more lucrative ventures than the production of food crops.

About 70% of the household heads indicated the prices of foodstuff have increased over the past 5 years. A number of these household heads were among those whose agricultural lands have been reduced, due to conversion to uses other than farming. According to the respondents, prices of foodstuff have increased because the demand for food by the increasing population is high compared to the quantity of food supplied in the market. The respondents indicated that the high cost of factors of food production, such as transportation and farm inputs, have also contributed to the increase in food prices.

The respondents added that farmers walk long distances to their farms to cultivate their crops and transport them back to the markets, adding to their production cost, which consequently inflates the price of food stuffs in the market. Additional information obtained from the respondents revealed that food prices have neither increased nor decreased. This was confirmed by 19% of the respondents. According to them, the prices have remained stable for the past ten years. However, 11% of the respondents thought otherwise. They said that prices of foodstuff have decreased, because they believe food abounds on the market, especially during local periodic market days.

## 4. Discussion

### 4.1. Drivers of Agriculture Land Use Change

Globally, land is used for various activities. These range from agriculture to commercial. Agriculture is the traditional and major use of land in most rural areas in most geographical settings. However, due to urbanization characterized by increased population and its associated demand for land for alternative uses other than agriculture, this has resulted in the conversion of agricultural lands to other land uses, such as residential, commercial, and recreation [25]. In this connection, urban sprawl is seen as encroaching on agricultural lands. This pattern of land use has the tendencies to reduce the amount of arable lands in peri-urban Juaso. The study therefore observed a similar trend of land use changes postulated by Reference [25] in the surrounding communities of Juaso.

The conversion of arable lands to residential and other commercial uses, as was observed among respondents, was because it was relatively cheaper to pay the rent/ground rents on land in the rural setting. This involves less cumbersome procedures to acquire the same, as compared to other urban areas in the region where land is expensive and scarce, yet residential accommodation was relatively higher, and it was therefore lucrative to engage in housing rental business. This observation confirms that of the author of [10], who stated that in most peri-urban areas, lands are owned by individuals, and the procedure for acquisition is usually devoid of the cumbersomeness otherwise experienced in other settings. At the same rate, the authors of [26] inferred that economic returns from agriculture are not sufficient to maintain production. This is because most of the farmlands have been invaded



by urban activities. Additionally, continuous cultivation of the farmland without a fallow period has reduced the fertility of the soil, leading to low yield of agriculture produce.

On the changing land use due to deteriorating livelihoods of land owners, the reason given by the people implies the lands are given out for other activities when they are faced with financial challenges, in return for financial gains. This view corroborates the ideas expressed by the authors of [27] that human decision to convert landed assets into profitable uses emanate from a rational economic reasoning. In that, they are out to better their lot and enhance their livelihood.

The land tenure system in the Asante-Akim South District is not different from what is enshrined in the 1992 Constitution of Ghana, namely, public and customary private lands [12,28]. In the Asante-Akim South District, farmlands are owned by heads of clans where other household members or members of the lineage access land through the heads. Traditionally, these lands are used purposely for agriculture and related activities. However, more recently, these lands are being used for purposes other than agriculture.

There are a number of factors that influence land owners to convert their lands to other uses; however, it is clear from the study that economic reasons are the major factors. Low incomes earned from sale of agricultural produce have made the sector less lucrative, deterring farmers and the youth from engaging in it. Further, declining farm yields due to loss of soil fertility and the high cost of farm inputs, such as fertilizers, seedlings, and farm tools, make it difficult for poor and smallholder farmers to practice intensive agriculture. In the study communities, most of the youth have migrated to cities in search of alternative livelihoods, leaving agriculture for the old and poor farmers.

In the light of this, in-migrants who are individual-oriented rather than communal-oriented come with better and enticing offers on how to use the lands [29,30]. This, therefore, motivates farmers to lease their lands for uses other than agriculture. Thus, the trade-off between agricultural land use for other uses is greatly motivated by economic incentives available to land owners. In a related study, Reference [31] observed that incomes accrued from lease of lands to private and estate developers are generally higher than those from agricultural purposes, hence the preference of landowners to lease out lands for purposes other than agriculture. Similarly, Reference [26] stated that agriculture is a marginal profit activity, and decline in the farming returns has the tendency to cause production to reduce.

The factors that influence household decisions to convert the land from agriculture to others implies that there are other reasons extraneous to the data that determine the decisions to convert agricultural lands to other land uses irrespective of the household's decision. Studies by the authors of [26] and [27] are thus applicable in Juaso and the surrounding communities, where reasons other than monetary were the main drivers of land use decisions.

Peri-urbanization, as the name suggests, is the development of urban peripheries into urban areas. This is ultimately the conversion of arable lands into urban land uses [32]. This, therefore, reduces the amount of arable lands available in the urban peripheries. The consequential effects of this will be food insecurity and related effects in the peri-urban areas [33]. The study also sought to determine the major effects of peri-urbanization on agricultural lands in Juaso and its surrounding communities.

#### *4.2. Implications of the Perceived Agricultural Land Use Change*

The foregone results further show that peri-urbanization has caused a substantial reduction in the arable lands in Juaso and the surrounding communities. In similar way, Reference [34] supports the finding that agriculture land conversions have occurred in most peri-urban zones across the globe; these have reduced croplands over the past two decades. Though the reduction is occurring at an insignificant rate of 1% per annum, the fact still remains that there is a level of reduction. This is as a result of the high demand for farmlands for residential, commercial, recreational, and industrial activities as urban centers expand outward toward the peripheries as Reference [35] indicated in a related study. These have ample implications for food insecurity.

According to the respondents, many landowners have changed the use of their lands. The unprofitable nature of agriculture and corresponding high prices offered for other land uses in recent

times, have also contributed to majority of farmers converting their lands from agriculture to other uses (see [26,30]). The average farm size ten years ago, which was above four hectares, has been reduced to about two hectares per farmer. Agricultural lands have been reduced, resulting in reduction in the farm sizes. This phenomenon will continue, since development is mainly about shifting of the rural setting dominated by agriculture to an urban setting, which is also characterized by other industries and modern infrastructure, as explained by Reference [36]. Aside from the developmental uses of farmlands, other destructive uses of lands have also contributed to the loss of farmlands. These include sand winning, illegal logging, and mining, especially in Obogu, one of the study communities.

Further, the authors of [37] noted that there is an inseparable connection between sand winning and soil fertility. When farmlands have been worked on for so long a time and are losing their fertility, without money to buy farm inputs, leasing the land out to sand winners is usually the farmer's best option. Respondents also attested that farm inputs, such as fertilizer, farm machines, and seedlings, are very expensive; as a result, poor farmers are not able to purchase these inputs to enhance agricultural production. Such diversions from food crop farming to tree crop farming have led to the reduction in the land devoted to food crop farming and correspondingly decreased the amount of food that is cultivated. This finding confirms the work of Reference [11].

#### 4.2.1. Agriculture Land Availability and Perceived Foodstuff Prices

There is an inverse relationship between agricultural production and prices of foodstuffs [38,39]. An increase in food production would lead to low prices and vice versa *ceteris paribus*. The concept of food security is defined on the basis of the availability, accessibility, and affordability contexts. It is possible that as more arable land is converted to built-up area, it will affect the prices of food. The study therefore sought to find out how the conversion of arable land to other land uses has affected the prices of foodstuff in the study communities [40].

Transportation cost, as was indicated, had increased because the productive agricultural lands have shifted further away from the towns into the forest zones because of the encroachment on the agricultural lands close by settlements. These are in tandem with the views of the authors of [10] and [41] that peri-urbanization of the rural arable landscape has the unpleasant tendency to present rather harsh livelihood conditions for rural communities [42].

## 5. Conclusions

The study identified that loss of arable lands in Juaso and the surrounding communities was as a result of conversion of agricultural lands to other uses such as residential, commercial, industrial, and recreational, as well as other uses by land owners. The farmers perceived a substantial decline in food production due to loss of farmlands. The size of farmlands determines the amount of food produced in farming. Conversion of agricultural lands has reduced the farmlands and hence food yields.

In addition, the paper espouses that the decline in food production has also led to increasing prices of foodstuff. As confirmed by the majority of the respondents, prices of food stuff had risen in the past years. However, some of the prices are determined by the seasons of harvest. The District Directorate of the Ministry of Food and Agriculture stated that prices of foodstuff in the community have increased in the past five years. Agricultural land use changes and its implications for food security, which examines the availability, accessibility, and affordability of food in peri-urban areas, are worth studying.

However, converting prime agricultural lands to other land uses was seen to be more profitable than agricultural expansion. Activities such as sand winning, illegal logging, and gold mining and also known as *galamsey* (the crude pronunciation of 'gather them and sell') have all contributed to the loss of available farmlands, declined soil fertility, declines in food production, and sharp increases in food prices.

This paper recommends, for action, the re-examination and modification of land use planning policies, especially at the District level. In Ghana, land tenure is categorized under state and

customary ownership; customary land ownership is commonly associated with irregular allocations and land use. A re-examination of the district land use plans by the Town and Country Planning Department in tandem with the customary administration systems would be forthright.

**Author Contributions:** The following task sharing occurred among the authors. D.O.A. and B.N. first conceptualized the paper, which was fine-tuned in accordance with the data by F.A. D.O.A. designed the study and performed the statistical analysis with F.A. and B.N., while B.N. and D.O.A. wrote the first draft of the manuscript. All authors conducted the literature searches. D.O.A., F.A., and B.N. managed the analyses and discussions of the data. All authors read and approved the final manuscript before submission.

**Funding:** This research received no external funding.

**Acknowledgments:** We are most grateful to the Department of Geography and Rural Development, Kwame Nkrumah University of Science and Technology, for the office support for this paper. We are also grateful to Miss Awoe Torkonoo for her careful proofreading of the manuscript for grammatical coherence.

**Conflicts of Interest:** The authors declare no conflict of interest.

## References

1. FAO. *The State of the World's Land and Water Resources for Food and Agriculture (SOLAW)—Managing Systems at Risk*; Food and Agriculture Organization of the United Nations, Rome and Earth Scan: London, UK, 2011. Available online: [www.nihonkaigaku.org/ham/eacoex/200prob/210envi/212food](http://www.nihonkaigaku.org/ham/eacoex/200prob/210envi/212food) (accessed on 17 August 2017) (In Japanese).
2. Jareen, H. Adapting the assets of urban low-income households with climate extremes: Experience from Dhaka. *Int. J. Urban Sustain. Dev.* **2013**, *7*, 72–88, doi:10.1080/19463138.2014.977293.
3. Owusu, G.; Agyei, J. *Changes in Land Access, Rights and Livelihoods in Peri-Urban Ghana: The Case of Accra, Kumasi and Tamale Metropolis*; Institute of Statistical and Social Research, University of Ghana: Accra, Ghana, 2007; p 27.
4. Busck, G.A.; Pilgaard, K.S.; Præstholt, S.; Reenberg, A.; Primdahl, J. Land system changes in the context of urbanization—Examples from the peri-urban area of greater Copenhagen. *Geografisk Tidsskrift-Dan. J. Geogr.* **2006**, *106*, 21–34.
5. Anthop, M. Changing patterns in the urbanized countryside of Western Europe. *Landsc. Ecol.* **2000**, *15*, 257–270.
6. Ode, A.; Fry, G. A model for quantifying and predicting urban pressure on woodlands. *Landsc. Urban Plan.* **2006**, *77*, 17–27.
7. Keys, E.; McConnell, W.J. Global change and the intensification of agriculture in the tropics. *Glob. Environ. Chang.* **2005**, *15*, 320–337.
8. Shriar, A.J. Determinants of Agricultural Intensity Index “scores” in a frontier region: An analysis of data from northern Guatemala. *Agric. Hum. Values* **2005**, *22*, 395–410.
9. Jiang, L.; Dengb, X.; Setoc, K.C. The impact of urban expansion on agricultural land use intensity in China. *Land Use Policy* **2013**, *35*, 33–39.
10. Afriyie, K.; Abass, K.; Adomako, J.A.A. Urbanization of the rural landscape: Assessing the effects in peri-urban Kumasi. *Int. J. Urban Sustain. Dev.* **2013**, *6*, 1–19.
11. Naab, F.Z.; Dinye, R.D.; Kasanga, K.R. Urbanization and Its Impact on Agricultural Lands in Growing Cities in Developing Countries: A Case Study of Tamale in Ghana. *Mod. Soc. Sci. J.* **2013**, *2*, 256–287.
12. Kasanga, K.; Kotey, N.A. *Land Management in Ghana: Building on Tradition and Modernity*; International Institute for Environment and Development: London, UK, 2001; pp. 1–42.
13. Quan, J.; Tan, S.F.; Toulmin, C. Land in Africa. Market asset or secure livelihood? In Proceedings of the Land in Africa Conference, London, UK, 8–9 November 2004.
14. Dutta, V. War on the Dream—How Land use Dynamics and Peri-urban Growth Characteristics of a Sprawling City Devour the Master Plan and Urban Suitability? In Proceedings of the 13th Annual Global Development Conference: Urbanization and Development: Delving Deeper into the Nexus, Budapest, Hungary, 16–18 June 2012. Available online: <http://www.gdn.int/admin> (accessed on 11 June 2016).
15. Iaquina, D.L.; Drescher, A.W. Defining the peri-urban: Rural urban linkages and institutional connections. *Land Reform* **2000**, *2*, 8–27.

16. Mougeot, L. *Urban Agriculture: Definition, Presence, Potentials and Risks, and Policy Challenges*; Cities Feeding People Programme Initiative; International Development Research Centre (IDRC): Ottawa, ON, Canada, 2000; pp. 1–62.
17. Ghana Statistical Service. *The 2000 Housing and Population Census*; Kumasi Metropolitan Assembly: Kumasi Metropolitan, Ghana, 2011.
18. Amoateng, P.; Cobbinah, P.B.; Owusu-Adade, K. Managing physical development in peri-urban areas of Kumasi, Ghana: A case of Abuakwa. *J. Urban Environ.* **2013**, *7*, 96–109.
19. Tacoli, C. Rural-Urban Linkages and Pro-Poor Agricultural Growth: An Overview. Prepared for OECD DAC POVNET Agriculture and Pro-Poor Growth Task Team Helsinki Workshop. 2004. Available online: [www.oecd.org/dataoecd/25/8/36562896.pdf](http://www.oecd.org/dataoecd/25/8/36562896.pdf) (accessed on 10 May 2016).
20. Mandere, M.N.; Ness, B.; Anderberg, S. Peri-urban development, livelihood change and household income: A case study of peri-urban Nyahururu, Kenya. *J. Agric. Ext. Rural Dev.* **2010**, *2*, 73–83.
21. Bukeviciute, L.; Dierx, A.; Ilzkovitz, F. The Functioning of the Food Supply Chain and Its Effect on Food Prices in the European Union. 2009. Available online: [ec.europa.eu/economy\\_finance/publications/publication15234\\_en.pdf](http://ec.europa.eu/economy_finance/publications/publication15234_en.pdf) (accessed on 23 September 2018).
22. UNEP 2014. *Assessing Global Land Use: Balancing Consumption with Sustainable Supply*; A Report of the Working Group on Land and Soils of the International Resource Panel, 2014.
23. Xu, Z.; Xu, J.; Deng, X.; Huang, J.; Rozelle, S.; Uchida, E. *Grain for Green and Grain: A Case Study of the Conflict between Food Security and the Environment in China*; Working Paper; Center for Chinese Agricultural Policy: Beijing, China, 2004.
24. IFAD 2012. *Enabling Poor People to Overcome Poverty in Ethiopia*. Available online: [www.ruralpovertyportal.org](http://www.ruralpovertyportal.org) (accessed on 17 August 2017).
25. Samat, N.; Hasni, R.; Elhadary, E.; Abdalla, Y. 2011. Modelling Land Use Changes at the Peri-urban Areas Using Geographic Information Systems and Cellular Automata Model. *J. Sustain. Dev.* **2011**, *4*, 72.
26. OECD. *Farmland Conversion. The Spatial Dimension of Agriculture and Land Use Policies*; OECD: Paris, France, 2009.
27. Irwin, E.G.; Geoghegan, J. Theory, Data, Methods: Developing Spatially Explicit Economic Models of Land Use Change. *Agric. Ecosyst. Environ.* **2001**, *85*, 7–23.
28. Kwapong, O. The Poor and Land: A Situational Analysis of Access to Land by Poor Land Users in Ghana. *J. Rural Community Dev.* **2009**, *4*, 51–66.
29. Thuo, A.D.M. Qualitative analysis of land use change pressures, conditions and drivers in rural-urban fringes: A case of Nairobi rural-urban fringe, Kenya. *Int. J. Innov. Appl. Stud.* **2013**, *3*, 820–828.
30. Piore, A.; Ravetz, J.; Tosics, I. *Peri-urbanisation in Europe: Towards a European Policy to sustain Urban-Rural Futures*; Academic Books Life Sciences; University of Copenhagen: København, Denmark, 2011; 144p, ISBN 978-87-7903-534-8.
31. Adjei, R.S. Effects of Action Aid Ghana Land Reclamation Programme on Food Production in the GA West Municipality of the Greater Accra Region, Ghana. University of Cape Coast. 2010. Available online: [graphic.com.gh/archive/.../extractive-sector-damages-environment](http://graphic.com.gh/archive/.../extractive-sector-damages-environment) (accessed on 22 April 2014).
32. Caradec, Y.; Lucas, S.; Vidal, C. Agricultural landscapes: over half of Europe’s territory maintained by farmers. European Commission’s Directorate General for Agriculture and Rural Development, web site. [online] URL: [http://ec.europa.eu/agriculture/envir/report/en/terr\\_en/report.htm\(8\)](http://ec.europa.eu/agriculture/envir/report/en/terr_en/report.htm(8)) (PDF) Future land use and food security scenarios for the Guyuan district of remote western China. Available from: [https://www.researchgate.net/publication/262493493\\_Future\\_land\\_use\\_and\\_food\\_security\\_scenarios\\_for\\_the\\_Guyuan\\_district\\_of\\_remote\\_western\\_China](https://www.researchgate.net/publication/262493493_Future_land_use_and_food_security_scenarios_for_the_Guyuan_district_of_remote_western_China) (accessed on 12 March 2019).
33. Feng, L.; Du, P.J.; Li, H.; Zhu, L.J. Measurement of Urban Fringe Sprawl in Nanjing between 1984 and 2010 Using Multidimensional Indicators. *Geogr. Res.* **2015**, *53*, 184–198.
34. Hamamatsu, L. 2002. Decline in Cropland in China, South Korea, and Japan—Decline in Highly Productive Cropland. 2002. Available online: <https://pdfs.semanticscholar.org/2200/bb9a0627e371fb3a0ff1fc31146edce8e24.pdf> (accessed on 18 August 2017).
35. Ramankutty, N.; Foley, J.A.; Olejniczak, N.J. People on the land: changes in global population and croplands during the 20th century. *Ambio* **2002**, *31*, 251–257.

36. Baker, J.L. Urban Poverty: A Global View. The International Bank for Reconstruction and Development/The World Bank. 2008. Available online: <http://www.worldbank.org/urban/> (accessed on 9 May 2016).
37. Naveen, S.M.; Stalin, P. Soil and Sand Mining: Causes, Consequences and Management. *IOSR J. Pharm.* **2013**, *2*, 1–6.
38. Brown, L.R. *World Food Security Deteriorating: Food Crunch in 2005 Now Likely*; Earth Policy Institute: Washington, DC, USA, 2004. Available online: <http://www.earth-policy.org/Updates/Update40.htm> (accessed on 12 June 2018).
39. Blamey, R.; Rolfe, J.; Bennett, J.; Morrison, M. Valuing remnant vegetation in Central Queensland using choice modeling. *Aust. J. Agric. Resour. Econ.* **2000**, *44*, 3.
40. Sasson, A. Food security for Africa: An urgent global challenge. *Agric. Food Secur.* **2012**, *2*, doi:10.1186/2048-7010-1-2.
41. Zasada, I.; Fertner, C.; Piorr, A.; Nielsen, T.S. Peri-urbanization and multi-functional adaptation of agriculture around Copenhagen. *Dan. J. Geogr.* **2011**, *111*, 59–72.
42. Yang, H.; Li, X. Cultivated land and food supply in China. *Land Use Policy* **2000**, *17*, 73–88.



© 2019 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).