

## AGRICULTURAL MODERNISATION FOR RURAL TRANSFORMATION AND FOOD SECURITY IN GHANA

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**Abstract:** *The dreadful situation of food insecurity has been drastically minimized in most developed countries by the introduction of agricultural modernisation techniques. The paper examines the potentials of agricultural modernisation for rural transformation and food security of smallholder food crop farmers in the Sekyere Central District of the Ashanti region of Ghana. Using a triangulated research design, purposive snowballing sampling technique was used in selecting the farmers. A total of 150 partially pre-coded questionnaires were administered to smallholder food crop farmers from 4 different communities: Beposo, Asuafua, Amoamang and Ankumadoa. Data were analysed in the cross-tabulation and frequency tools embedded in the statistical package for social sciences (SPSS), version 17. The study revealed that farmers (41.4 percent) have adopted modernized agricultural technology and has resulted to high availability and accessibility of food at the modernised agricultural communities than the traditional agricultural communities. On the other hand, majority (58.6 percent) are still practicing traditional agriculture due to financial constraints as proved that modern technology requires huge some of capital and the technical know-how.*

**Keywords:** Agricultural, Modernization, Smallholder, Food security, Sekyere Central, Ghana

### Introduction

Agricultural modernisation is a process of change from traditional agriculture practices of using rudimentary techniques of production to advanced and mechanised techniques of agriculture; and the strategies to achieve them through increase in modern science and technology (Prajapati et al., 2014). According to this definition, it can be deduced that agricultural modernisation encompasses the use of modern tools, improved seeds, inorganic fertilizer application, irrigation schemes and plant protection chemicals (herbicides, insecticides and pesticides) and this phenomenon is to meet current standards (Viegas, 2003). The dreadful situation of food insecurity has been drastically minimised in most developed countries by the introduction of agricultural modernization techniques. Africa is the continent that gets least yield from a hectare of land and Asia getting about three times that of Africa whereas European Union and North America get an average of 4.5 times more yield. This is because of the primitive techniques of agriculture in most of the developing countries (Anderson, 2010a). Food security, is operationally defined by this paper as the processes that ensure that food is available, accessible, affordable and to an extent, usable.

The sustainable intensification of smallholder farming in Africa, Latin America and Asia is a solemn option for achieving global food security in 2050 and also alleviate persistent poverty (McIntyre et al., 2009; Hounkonnou et al., 2012). However, Sub-Saharan Africa seems far off in realising this option because technology-driven productivity growth in these areas has mostly failed (Hounkonnou et al., 2012). In Ghana, little research attention has been given to the potential of mechanised farming among smallholder food crop farmers in rural Ghana. Several research works have extensively explored the dynamics between climate change and agriculture (Laube et al., 2012), gender and agriculture (Steel, 1981). A research work by Amanor and Pabi

(2007) looked at the impact of agricultural modernisation on the regional economy. The regional scale looked at the average and this does not give a clear representation of how the livelihoods of these farmers have been affected by agricultural modernization at the household scale. In the Sekyere Central District of the Ashanti region of Ghana, even though farmers at *Amoamang Zongo*, *Ankumadoa*, *Asuafua* and *Bepos* communities have adopted some form of modern methods like the use of improved seedlings to attain high yield, they still remain food-insecure and poor because they lose most of their produce after harvesting due to few storage facilities to preserve their produce. Thus, there is the need to examine the potentials of agricultural modernisation on food security and livelihoods of smallholder crop farmers in rural Ghana, using the Sekyere Central District as a case in the Ashanti Region. The main objective of this paper is to examine the potentials of agricultural modernisation on food security of smallholder food crop farmers in the Sekyere Central district of the Ashanti region of Ghana.

### **Theoretical grounding of the paper**

The paper is placed within the theoretical discourse of the relationship between environmental processes and societal interactions, emphasised by political ecology (Forsyth, 2008). According to Bubolz and Sontag (1999), political and social ecological ideas are the driving factors of human and environmental state determination. The relationship between human population growth and societal response to the changing environmental resources for development, are some of the reasons why certain decisions are taken. The utilisation of the different modes of agricultural production in the form modern and advanced technologies and traditional, rudimentary methods, as espoused by the paper, can be articulated within the context of the political economy of the local actors at the community scale as well as the national scale policy making and implementation agents.

### **Materials and Methods**

#### **The study area**

The *Sekyere* Central district is in the northern part of the Ashanti region and shares boundaries with *Mampong* Municipal, *Atebubu* district, *Sekyere East*, *Sekyere South* and *Ejura Sekyere Dumase*. The district with *Nsuta* as its capital is geographically located within latitudes 6.55° and 7.30° N and longitude 0.05° and 1.30° W. It covers a total land area of about 1,631.1 km<sup>2</sup>, and has about 150 settlements with about 70 percent rural population. The population of the *Sekyere* Central district is 71,232 representing almost 1.5 percent of the region's total population. In the rural communities, 8 out of 10 households (86.6 percent) are agricultural households while in the peri-urban communities, 68 percent of households are involved in crop farming agriculture.

#### **Research and Sampling Design**

Both primary and secondary data were used. The former was collected by administering a total of 150 partially pre-coded questionnaires to the target group consisting of smallholder food crop farmers from four different communities: *Beposo*, *Asuafua*, *Amoamang* and *Ankumadoa*. Secondary data were also obtained from published relevant online peer-reviewed articles and books. Purposive snowballing sampling technique was used in selecting the farmers. Therefore, the proportionate quota of food crop farmers selected from each community included 45 from *Beposo*, 35 from *Asuafua*, 30 from *Ankumadoa* and 40 from *Amoamang Zongo*. This sample size is based on respective community population. Both qualitative and quantitative data were subjected to re-checks and spot-checks to ensure consistency and quality. The cleaned data was coded and analysed using cross-tabulations and frequency in tools in the statistical package for service solution (SPSS) v.17. The generated results from the SPSS was then exported to excel for editing and it was analysed using descriptive analytic tools such as pie charts and bar graphs for better visual presentation. Thematic classification and analyses were also employed on the qualitative data from the interviews and focused group discussion to buttress the results from the quantitative analyses.

#### **Results**

This section presents the results of the study through a combination of qualitative and quantitative techniques with the use of tables, charts and graphs in presenting the relationships between the variables. Among the major sub-themes covered under this section include the forms of agricultural modernisation undertaken in the communities, the potential of agricultural modernization on food security in the communities.

### **Mode of agricultural activities in the communities**

The study sought to identify the modes and forms of agricultural activities practiced by the farmers in the two clusters of communities. The use of modern methods and inputs like tractors, irrigation facilities, improved seedlings, storage facilities and agrochemicals like fertilizers, pesticides and weedicides were classified as agricultural modernisation. On the other hand, the inability to adopt these modern methods and implement in farming activities was deemed as traditional form of agriculture. This was to enable for easy comparison of the results of the study. The study revealed that, out of the 150 farmers contacted, majority (58.6 percent) practiced traditional mode of farming. The remaining (41.4 percent) farmers identified with modern mode of farming. It was realized that all respondents 80 (53.3 percent) of the first cluster of communities (*Asuafua* and *Beposo*) were into traditional agriculture. However, with the second cluster of communities, the results deferred. Majority of the respondents from *Amoamang Zongo* 38 (25.3 percent) and *Ankumadoa* 24 (16 percent), respectively, engaged in modern mode of farming, with the remaining 2 (1.3 percent) and 6 (4 percent) farmers from *Amoamang* and *Ankumadoa*, respectively, practicing traditional agriculture. From the analysis, even in the communities where agricultural modernisation has taken root, not all farmers are practicing the new method.

### **Farmers' utilization of Farm Machinery**

The farmers' views on the use of farm machinery were sought. The majority 76(61.3 percent) of the total 124 respondents who indicated they do not use tractors on their farms were from the first cluster of communities (*Beposo* and *Asuafua*). The remaining 48 (38.7 percent) respondents, on the other hand, were from the second cluster of communities (*Amoamang Zongo* and *Ankumadoa*). As the results indicate, majority of the respondents from both clusters of communities do not engage the services of tractors in their farming activities. However, it could be seen that, except *Amoamang Zongo* in the second cluster of communities, all the remaining communities had lower percentages of the farmers engaging in the use of tractor services partly due to low income levels to rent them. The implication of the results from the study on tractor usage is that, even in communities which are classified as traditional in its agricultural activities, there is the gradual adoption of modern methods of farming. Again, not all agricultural modernisation farmers are able to afford the use of tractors as demonstrated by only 2 out of 30 respondents from *Ankumadoa* using tractor services. The little use of tractor service could partly be attributed to the challenge posed by the dense vegetation of the area. However, this challenge does not impede the use of machinery on farms by residents of *Amoamang Zongo*. It was, however, noted from further probing that accessibility was a major factor to them under utilisation of tractors in the farms.

### **Respondents' use of Fertilizer**

As the analysis reveals, fertilizer application as a farm input was a common phenomenon among majority of farmers from *Amoamang Zongo* (43.20 percent) and *Ankumadoa* (23 percent) who practiced agricultural modernisation as compared to *Beposo* (13.50 percent) and *Asuafua* (20.30 percent) where traditional farming system dominates. Majority of the respondents (72.4 percent) who attested were not using fertilisers for their production activities were traditional farmers from *Beposo* (46.10 percent) and *Asuafua* (26.30 percent). According to the study, at *Asuafua* and *Beposo*, low income or financial capital is a major hindrance to accessing fertilisers for majority of the respondents in *Asuafua* and *Beposo*. The results also highlight that low yields are obtained in *Beposo* and *Asuafua* communities because of least fertilizer application

### **Respondents' use of Pesticides**

The findings on the use of pesticides were similar to the use of fertilizer among the two clusters of communities. Majority of the respondents who use pesticides were from the *Amoamang Zongo* (41.80 percent) and *Ankumadoa* communities (29.10 percent). In contrast to the results from the modernized agricultural communities, majority of the respondents who were not using pesticides were from the traditional agricultural communities, i.e. *Beposo* (52.10 percent) and *Asuafua* (28.10 percent). The reason- of not using these inputs was no different from those given for that of fertilizers, which is financial constraint. On the basis of the results, most farmers in *Asuafua* and *Beposo* are likely to lose their crops to pest and disease attacks as some complained was the reason for their low outputs. This will in turn have a negative implication on food security in the communities with low modern inputs usage.

### Respondents' use of Irrigation

The study found that the main source of water for all respondents in their agricultural activities in the two clusters of communities was rainfall. This is in agreement with Seidu (2011)'s findings, which states that the main stay of the local economy of Ghana is mostly rain-fed agriculture with a few people who resort to dams and dug outs for irrigated agriculture, during the dry season. Other source of water for irrigation available to the farmers in Sekyere Central District was streams; though according the respondents, they are mostly dried up by the high temperatures during the dry seasons. The high dependency on rain-fed agriculture was a predominant phenomenon characterizing *Beposo* and *Asuafua* communities. This explains the few respondents who used irrigation equipment in these two communities: *Asuafua* (3.8 percent) and *Beposo* (15.4 percent). Whilst majority of the respondents from *Amoamang Zongo* (46.2 percent) and *Ankumadoa* (34.6 percent) used irrigation equipment. The results are a clear indication that in both farming modes, traditional and modernized agriculture, the use of irrigation equipment is minimal and farmers are likely to suffer at the hands of the harmattan.

### Potential of agricultural modernization on food security

Food availability and accessibility are important in the measure of the level of food security in any particular locality. As one of the core objectives of the study, the level of food security in the two clusters of communities was to be identified in connection with the mode of farming practice adopted.

### Implication of Agricultural Modernization on Food Availability

From the analysis it is revealed that there is food availability when it comes to food security in their communities as indicated by respondents from *Ankumadoa* (93.3 percent), *Amoamang Zongo* (92.5 percent), *Beposo* (26 percent) and *Asuafua* (19 percent) communities. However, from the analysis, it is observed that there is high availability of food at the modernized agricultural communities (*Ankumadoa* and *Amoamang Zongo*) than the traditional agricultural communities (*Beposo* and *Asuafua*). This is seen from the very few responses regarding food unavailability at *Amoamang Zongo* (7.5 percent) and *Ankumadoa* communities as compared to the significantly high responses from *Asuafua* (45.7 percent) and *Beposo* (42.2 percent) communities. This is illustrated in Table 1.

**Table1: Implication of Agricultural Modernization on Food Availability**

Communities		Beposo		Asuafua		Amoamang		Ankumadoa	
		Frequency	%	Frequency	%	Frequency	%	Frequency	%
Food availability	Yes	26	57.8	19	54.3	37	92.5	28	93.3
	No	19	42.2	16	45.7	3	7.5	2	6.7
	Total	45	100	35	100	40	100	30	100

Source: Field Survey (March, 2016).

### Implication of Agricultural Modernization on Food Accessibility

Results on food accessibility as a measure of food security was quite similar to that of food availability in the communities where modernised agriculture was undertaken with *Amoamang Zongo* and *Ankumadoa* (93.3 percent) and *Amoamang Zongo* (90 percent) recording higher rates as compared to *Beposo* (66.67 percent) and *Asuafua* (48.7 percent). Also, the traditional agricultural communities recorded the highest rate of food inaccessibility; *Asuafua* (51.4 percent) and *Beposo* (33.3 percent) as compared to the agricultural modernized communities; *Amoamang Zongo* (10 percent) and *Ankumadoa* (6.7 percent). This is outlined in Table 2.

### Discussion

The study was conducted to reveal the type of agricultural modernization technology in use as well as analysed the impact it has had on the food security and livelihoods of farmers at Sekyere Central District. According to Motes (2010), the necessary increase in food production can be achieved with consistent application of modern technology and without it output declines. The adoption of these practices is then vital to achieving food security. The study clearly showed that although some of the farmers have adopted some form of modernized agricultural technology such as fertilizer, tractors, pesticides, weedicides, irrigation technology, majority of the farmers

are still practicing traditional agriculture. Only a few of the respondent's resort to irrigation in the dry season as agriculture in Ghana is mainly rain-fed (Issaka et al., 2016) and the District has proven to be no exception. The major reason accounting for the lower use of agricultural modernization technology was financial constraints as proved that modern technology requires huge some of capital and the technical know-how (Chief, 2000). In agreement to Ojo et al. (2012) assertion, the element of distance was also at play, as the two closer cluster communities find it easier to adopt the new technology as compared to the two farther clusters of communities as the rate of technology adoption decreases with distance. Rahman (2003) also asserts that education play a major role in raising awareness about modern agricultural technology. However, these contrasts with the study which shows that majority of both traditional and agricultural modernisation practitioners have had no formal education. Despite the low level of education among inhabitants of *Amoamang Zongo* and *Ankumadoa* they have been able to adopt modern agricultural methods.

**Table 2: Implication of Agricultural Modernization on Food Accessibility**

Food Accessibility	Communities (Percent)				Total
	Beposo	Asuafua	Amoamang Zongo	Ankumadoa	
Yes	66.7	48.6	90.0	93.3	74.0
No	33.3	51.4	10.0	6.7	26.0
Total	100.0	100.0	100.0	100.0	100.0

Source: Field Survey (March, 2016).

## Conclusion

The paper has argued that modernising the agricultural sector holds greater prospects for large scale a food production and hence food security in farmers households in Ghana. This approach therefore holds much potential for the rural livelihood transformation in terms of large scale agriculture and the associated agro-based industrialisation. These avenues would, certainly, be one of the various outlets of job creation and rural income improvement, towards the achievement of the sustainable development goals 1 and 2, which aim to end poverty and ensure zero hunger respectively. The challenges that constrain efforts at meeting the goals have largely been access to productive resources, as well as the financial clout for farm expansion. In the Sekyere Central District, like many other districts in the country, smallholder agriculture has characterized most of the food production ventures. The prospect of modernisation would be stymied if the Ministry of Food and Agriculture does not make strenuous efforts towards the mechanisation under the Ghanaian government's flagship sector policy of planting for and jobs.

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