International Journal of Food and Agricultural Economics
ISSN 2147-8988, E-ISSN: 2149-3766
Vol. 9, No. 1, 2021, pp. 59-71

COMMERCIALIZING AGRICULTURE IN DEPRIVED REGIONS OF GHANA: A CASE OF THE EKUMFI DISTRICT, CENTRAL REGION

Frederick Kwame Yeboah
Gansu Agricultural University, College of Finance and Economics, China
Email: fredyk87@ gmail.com, ORCID ID: https://orcid.org/0000-0001-9695-0569
Samuel Adingo
Gansu Agricultural University, College of Forestry, China
ORCID ID: https://orcid.org/0000-0001-6904-5395

Cephas Paa Kwesi Coffie
University of Electronic Science and Technology, School of Management and Economics, China
ORCID ID: https://orcid.org/0000-0002-8644-1418

Daniel Ayisi Nyarko
Szent Istvan University, Hungary. Economic and Regional Sciences.
ORCID ID: https://orcid.org/0000-0002-4537-9427

Abstract

The subsistence nature of farming is commonly prevalent in poverty-stricken areas of Ghana. This is because a high number of farm households cultivate land sizes below 5 hectares purposely for ensuring household food security and basic survival needs. The Ekumfi district due to its position as one of the poorest districts in the central region of Ghana with a suitable Agricultural environment and the high concentration of small-scale farming activities has drawn the attention of previous and successive Governments. Employing binary logistic regression, the study focused on determining the contributing factors influencing the commercialization of agriculture with particular reference to the Ekumfi District. This is to guide future research and policy drafting concerning Agricultural commercialization interventions in the district. Soliciting views from 512 randomly sampled farmer population from 15 farming zones primarily with the aid of structured questionnaires and interviews. Among 13 demographic and production factors, 5 production factors namely market, income, credit, location, and labour statistically predicted the response variable with varying marginal effects. A chi-square statistic of 0.1% and a predictive power of 96.9% further prove the suitability of the adopted model. The study suggests similar studies in other deprived regions of the country to serve as a guide for regimented resource allocation and formulation of long term agricultural policies in the light of Ghana's Agricultural industrialization Agenda.
Keywords: *Commercial farming, subsistence, production factors, interventions, logistic.*
JEL Codes: *Q12, Q13, Q15, Q19*

1. Introduction

Ghana, a member of the sub-Saharan African region also characterized by subsistence agriculture employs about 57% of its working population within the Agricultural sector, playing a vital role in poverty alleviation within rural regions where its activities are mainly

concentrated (SSD, 2018). Findings of Bawa, (2019) argues that although smallholder in nature, economic growth indicators reveal positive contributions and prospects of the sector in revenue generation proven by a 5.5 consistent growth rate. With the growing middle-class population, food insecurity challenges, and demand for more export of horticultural crops, efforts are gradually being lifted to transform the sector from a subsistence level into a commercially oriented segment. The evidence of these efforts can be accounted for by the regionally dispersed Government Agribusiness interventions and donor agencies' involvement in smallholder farming linkages with food importers and domestic industries within the country (Wolter, 2009).

As Ghana strives to achieve the United Nations development goals with particular emphasis on achieving zero Hunger, improving producers' income levels and increasing productivity twice the current volume, scaling up farm sizes and upgrading farmers' productivity status remains the key focus point for Government and policymakers (Wongnaa & Awunyo-Vitor, 2018). Also, Ghana's membership with the International Trade Centre has earned the country many trade partners across Africa, Europe, and Asia, raising the country's export potential. These calls for a necessary rapid transformation of the agricultural sector into a more export-oriented sector to meet the pressing demand from both local and foreign trade partners. Despite these numerous potentials, the sector like many others in the sub-Saharan African region is faced with Institutional, political, Economic, and Production constraints (Riwthong et al., 2017). There has been a consistent increase in the number of small and medium-scale farmers within the agricultural regions of Ghana whilst the number of commercial farms is not encouraging across the country considering previous investment direction (Whitfield, 2017).

In recent times, many national initiatives have been directed towards commercialization of agriculture to enhance food production; an example of such initiatives is the Ghana commercial Agricultural project which is geared towards lifting the country from a subsistence level of production into commercial production of industrial crops and food stables to support agro-industries and supplement the national food requirement (Osis et al., 2019). To achieve this, it has become necessary to empower commercial farmers and potential investors in the agricultural sector to exploit large areas of unutilized agricultural lands to meet domestic consumer demand and to increase exports of industrial crops to major trading countries. Several studies (Abu & Haruna, 2017; Carletto et al., 2017; Linderhof et al., 2019; Ogutu & Qaim, 2019; von Braun, 1995) across the globe have appreciated the significance of agricultural commercialization for increasing revenue, export development and sustaining of domestic food security. Other findings (Andersson Djurfeldt et al., 2014; Wiggins, 2018) also points out the limitations and challenges associated, however, studies focusing on farmers' perspectives in relations to factors influencing the commercialization of Agriculture in less endowed regions of Ghana are few and as the country strives to develop the agricultural sector there is a need to understand how these factors affect farmers' decision to guide policymakers, donors and development agencies in drafting and implementing results-oriented policies to improve Agricultural commercialization in the region.

Considering recent interventions made by the government to transform less endowed agricultural districts into large-scale Agricultural production hub for job creation and improved livelihood, a prior understanding of what drives farmers' decision concerning agricultural commercialization is thus vital for appropriate resource investment in an attempt to empower farmers and increase productivity. This study, therefore, focuses on analyzing the contributing factors influencing the commercialization of farms in the Ekumfi District, one of the poorest districts in the Central Region of Ghana with particular emphasis on farmers' demographic characteristics and production factors.

2. Method

2.1. Study Site

The Ekumfi District due to its Agricultural Characteristics and poverty status were selected for this study. 53.6% of the inhabitants are skilfully engaged in Agriculture with a high number of small scale crop farmers (92.6%) spread across the rural and urban areas of the district (GSS, 2014). The soil is sandy loam in nature, agronomical suitable for vegetable production with temperatures between 22ºC and 34ºC, and a coastal savanna related binomial rainfall pattern due to its closeness to the Atlantic Ocean (Dickson & Benneh, 1988; Markwei et al., 2010). Covering a total land area of 276.65 square kilometres, representing 0.12% of Ghana's total Land area the district is located in the central coastal region of Ghana. The main economic activities include Fishing, Salt production, clay mining, crop production, and small-scale trading. The current population is about 61,747According to the 2020 projected population report from the statistical service department cited by Ayerakwa et al., (2020).

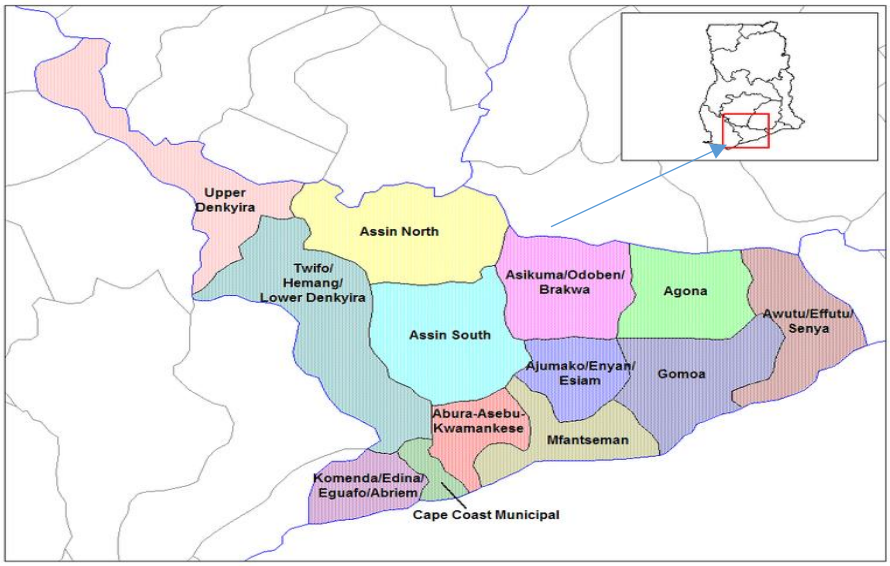

Figure 1. Map of Ekumfi District **Source:** Ghana Statistical Service Department, 2010.

2.2. Study Population

The Population for the study is made up of crop farmers from both urban and rural towns out of the 55 communities within the district captured by the Efutu District Ministry of Food and Agriculture.

2.3. Sample Size and Data Collection

Critical case purposive sampling Technique was employed to select 512 registered crop farmers from the 8 councils in the district as a representative of the entire study population. The approach is well known and adopted by many researchers (Ames et al., 2019; Barratt et al., 2015; Guarte & Barrios, 2006; Islam et al., 2020). To arrive at a finite proportion of the

sample size for the study we employed the statistical formulae [z2 * p * (1 - p) / e2] / [1 + (z2 * p * (1 - p) / (e2 * N))]

Where: z = 3.29 for a confidence level (α) of 99.9%, p = proportion (expressed as a decimal), N = population size, e = margin of error.

z = 3.29, p = 0.5, N = 521, e = 0.01

n = [3.292 * 0.5 * (1 - 0.5) / 0.012] / [1 + (3.292 * 0.5 * (1 - 0.5) / (0.012 * 521))]

n = 27060.25 / 52.9391 = 511.158

n = 512

The sample size with finite population correction is equal to 512.

2.4. Data Collection Procedure

The open-ended questionnaire was designed besides Face to face interviews to solicit information from the 512 respondents with the help of district technical officers of the Ministry of Food and Agriculture, Ekumfi District. A structured questionnaire was carefully designed regarding previous related studies (Ogutu & Qaim, 2019; Rayasawath, 2018; Riwthong et al., 2017) to capture relevant information relating to the study preference.

2.5. Statistical Tool and Analytical Procedure

The binary Logistic regression model was employed for the study due to the binary nature of the response variable under study and the suitability for this kind of study (Kilic, 2015; Kim & Shin, 2019; Rayasawath, 2018). The model allows for the response variable (Y) and determinant variables (X) to be estimated using the formulae below:

$$Model \rightarrow 1: CmFarm(y_i) = \beta_0 + \beta_1 DemF + \beta_2 ProdF + \varepsilon_i \quad (1)$$

Where y_i represents the proxy for the commercialization of farms in the district, β_1 which represents the demographic factors including gender, age, education, household, location, and income respectively. Again, β_2 captures the production factors includes water, land, government, credit, labour, market, and soil. β_0 is the intercept whereas B_1 and captures the effects of and on with ε_i representing the error term. However, because the response variable is dichotomous, the model in equation (1) can be rewritten in a binomial distribution as follows:

$$model \rightarrow 1a: \pi(CmFarm_i) = \frac{\exp(\beta_1 DemF + \beta_2 ProdF + \varepsilon_i)}{1+\exp(\beta_0 + \beta_1 DemF + \beta\ ProdF + \varepsilon_i} \quad (2)$$

Where $\pi(CmFarm_i)$ is a probability estimate showing the likelihood of commercializing farms in the district, β_1 and B_2 in this case, represents the multiplicative effects of demographic factors and Production factors on farm commercialization in the district whilst β_0 denotes the intercept. Before adopting the binary logistic model, percentage, multi-collinearity, chi-square, and R-square values were employed to test the suitability of the model.

Firstly the percentage is measured in percentage correctly predicted expressed over 100% this means a high percentage is appropriate in predicting the accuracy of the model. Our model achieved a percentage of 96.9% implying that it has a very high predictive power.

Secondly, a multi-collinearity test is used to test the level of association among dependent variables so that multicollinearity exists if a Pearson correlation exceeds 0.8. In the case of our analysis, the correlation among the variables was below 0.5 meaning there was no evidence of multi-collinearity.

Lastly, the Chi-square and R-square test is used in testing the Goodness of fit of the model which is considered significant at 1.0%. Also, the Cox and Snell test and the Nekelkerke test proved significant in testing the Goodness of fit since its value was between 0-1 according to the analytical results.

2.6. Variables Selection for the Model

The response variable(Y) was coded 0 if the farmer was willing to adopt commercial farming and 1 if the farmer was not willing to adopt commercial farming and predictor variables (X) were made up of 13 determinants consisting of both demographic and production factors and were coded as presented in Table 1.

The variables used were categorized into two (a) demographic factors and (b) Production factors which are explained as follows;

(a) Demographic factors: this deals with how the personal factor of farmers corresponds with their intension to adopt the commercial scale of farming. Gender has proven over the time to be one of the main predictors of success in farming due to the historic cultural determinants of who has control over natural agricultural resources thus making gender a possible predictor of decision making in the scale of farming(Lu & Horlu, 2019; Twyman et al., 2015). Age one of the major indicators of labour strength has a predictive force in envisaging a person's physical and mental readiness in making decisions and exercising dominance with regards to occupation choice and scale of operation (Rubhara & Mudhara, 2019).

Table 1. Predictor Variables used in Hypothesis Test

Variable	**Coding**	**Data Entry**
Demographic Factors		0,1
Gender Category	Gender	Male=0, Female=1
Age Group	Age	18-60years =0, Above 60years =1
Respondents Education Status	Education	Formal=0, Informal=1
Respondents source of Income	Income	Farm=0,others=1
Household income Level	Household	Above Gh¢5000, Below Gh¢5000
Production Factors		
Closeness to Urban Area	Location	Closer to urban area=0,Far from urban area=1
Source of Water for Farming	Water	Irrigation=0,Rainfed=1
Land Ownership Status	Land	Owned=0,Others=1
Government policy and Interventions	Government	Yes=0,No=1
Type of Labour	Labour	Mechanized=0,Manual=1
Market for Produce	Market	Export=0,Domestic
Soil Fertility	Soil	Yes=0,No=1

Note: GH¢1 was equivalent to $0.17 at the time of the study.

Education improves information accessibility which intends leads to better decision making. Also, the adoption and implementation of newer technologies can be highly influenced by the level and form of education a farmer attains (Sroka et al., 2019).

Finally, personal factors such as the household source of income and income levels have the potential in improving or limiting one's ability to intensify the scale of labour and operation in farm business (Islam et al., 2020; Riwthong et al., 2017).

(b)Production factors: This constitutes elements that directly influence Farm production efficiency levels. The type of agricultural labour employed can affect operational cost consistency, efficiency and the scale of land to be operated (Bjornlund et al., 2019). Irrigation source and fertility of soil constitute the natural forces that support agricultural production hence it scarcity or availability can affect the extent to which an agricultural enterprise can operate (Bjornlund et al., 2019). Credit availability, government interventions, and Land tenure issues particular ownership status do have predictive influence in scaling up the implantation of sound agricultural decisions (Mahaliyanaarachchi & Bandara, 2010). Furthermore, market availability for produce and the location of farms affect both pre and post-harvest operations and lead to production decisions (Andersson Djurfeldt et al., 2014; Sroka et al., 2019).

3. Results and Discussion

Table 2 presents statistical results relating to farmers' characteristics and production functions with frequency corresponding percentages. From the results obtained, household income and the source of income mattered most in deciding farmers' readiness to increase the chance of adopting commercial-scale farming as a greater majority of respondents attested to the fact they willing expand their farms if had alternative incomes to support high-cost production activities. Location and market accessibility was seen as drivers' production levels. According to farmers' responds on transportation cost for most agricultural produce especially perishable produce are much higher for farms located in remote rural areas and tends to be lower for a farm near urban areas. Additionally, market availability from farmers' viewpoint had a fair prediction on even the volume and type produce to cultivate since much of the farm produce end up in distant markets due to the high number of agricultural dominated households in the district.

Response regarding soil suitability and water source as a determinant for commercialization of farms shown if farmers had access to an alternative source of water either than rainwater there would be a greater chance for them to increase farm sizes and production level since experiences with rain failure has accounted fatal crop losses in the previous cropping and has weakened the interest of chuck of emerging farmers in crop farming. Farmers also asserted nutritional levels of most soils are inadequate to support plant growth therefore a more suitable fertile soil will encourage crop cultivation on a large. Labour which has been a consistent challenge impeding most farming operations according to the respondents could be greatly averted to help improve commercialization when mechanized since the manual source of labour is unreliable and inefficient on large-scale agriculture. Respondents also expressed their willingness and readiness to embrace commercialization if government interventions and credit facilities were favourable to boost production as well as the marketing of farm produce.

Moreover, policies such as inputs subsidy were highly lauded by farmers as a possible lever that can drive productivity hence improve the scale of farming. The control over and access to arable lands determines the existence and longevity of most farms therefore the ownership status of lands from farmers' perspectives was a major influencer of how large they can operate and farm. More importantly, the cost and transfer procedure of farmlands deter most farmers with a commercial mind-set. It is, therefore, necessary for one to obtain both traditional and legal full land rights to scale up farm sizes

Table 2. Descriptive Statistics Results

Variable	Frequency	Percentage
Farmers Decision to Undertake Commercial Farming (n=512)		
Yes	376	73.4%
No	136	26.6%
Household Income (n=512)		
Above 5000	331	64.6%
Up to 5000	181	35.4%
Location (n=512)		
Closer to Urban	272	53.1%
Far from Urban	240	46.9%
Source of Income (n=512)		
Farm	364	71.1%
Others	148	28.9%
Water Source (n=512)		
Irrigated	273	53.3%
Rain Fed	239	46.7%
Ownership (n=512)		
Owned	261	51.0%
Others	251	49.0%
Interventions (n=512)		
Yes	267	52.1%
No	245	47.9%
Access to Credit (n=512)		
Yes	272	53.1%
No	240	46.9%
Type of Labor (n=512)		
Mechanized	350	68.4%
Manual	162	31.6%
Market Type (n=512)		
Export	268	52.3%
Domestic	244	47.7%
Fertility (n=512)		
Yes	315	61.5%
No	197	38.5%

Source: Field Data, 2019.

3.1. Drivers of Farm Commercialization Decision

A model suitability test was conducted to test the predictive ability of the adopted model. The result of the test is presented in table 3. Hosmer and Lemeshow test proved significant at 0.478, a measure of significant opposition to that of chi-square but consistent in the literature (Paul et al., 2013; Yu et al., 2017). with chi-square value significant level at 0.001 and a Wald statistic test value of 39.874 (0.001), the model has deemed fit. Additionally Cox & Snell R Square and Nagelkerke R Square values of 0.605 and 0.882 is an indicator of a good fit of the model. The final test of predictability of fit by percentage was 96.9% meaning the model has a very accurate predictive power.

Table 3. Statistical Test of Model Suitability

Test	Value	Significance
Number of Observations	512	
-2 Log likelihood	117.063	
Cox & Snell R Square	.605	
Nagelkerke R Square	.882	
Hosmer and Lemeshow Test	7.557	.478
Chi-square	475.689***	0.000
Wald	39.874***	0.000
Accurate predicted percentage	96.9	

Note: *** Level significant at 0.001.

Results from the binary logistic regression are presented in table 4 explaining the factors influencing farm commercialization their magnitude of effects. All the proxies or indicators of DemF and ProdF are categorical. Therefore, each of the first categories of the measurements presented in Table 4 is reference points to interpret the multiplicative effects respectively.

3.1.1. Location: With a positive coefficient of 3.9495 and significance level of 0.006, the predictor shows that farmers with farmlands located close to the area of the district are more likely to commercialize their farms and a marginal effect of 0.1189 indicating that, the chances of deciding to commercialize a farm increases by 11.89% with farm closer to urban areas. This could be explained by the poor road network of most distant farms, making transportation of produce and input difficult which may affect farmers future farming decision (ANANG, 2018; Rattanawong & Ongkunaruk, 2018)

3.1.2. Income (Source of Income): Results from the analysis shows that access to an alternate source of income either than farming is more likely to influence farmers' decision to expand their farms and migrate from subsistence level into commercial-scale of farming. a coefficient of 5.4942 and a 0.001 significance supports responses obtained from farmers with a margin of 0.1655 (16.55%) indicating that farmers with an alternative source of income have a chance of 16.55% over those who fully rely on farming as an income source to embrace the idea of commercializing their farms. This results though arguable in explaining farmers decision yet other studies conducted in similar settings support the notion that farmers with alternative income source have a high chance of improving productivity and accessing credit facilities with ease than their counterparts (Bellemare, 2018; Mango et al., 2018)

3.1.3. Credit (Access to Credit): The predictor has a negative coefficient of -3.2457, a significance level of 0.022, and a marginal effect of-0.0977 meaning farmers without credit support are less likely to increase the scale of farming. Moreover, the chances that a farmer will increase the scale of farming decreases by 9.77% if there is no access to credit. This is true for most small and medium-scale farmers in the study area since according to the credit is needed to settle production cost and increase production. Other related Studies on-farm productivity also confirms the effect of credit on improved labour and production efficiency (Akudugu, 2016; Chandio et al., 2019). Other findings also argue that credit could render farmers poorer and small-scaled if not properly channelled for the intended purpose considering the higher household dependency in farming communities (Owusu, 2017; Sekyi et al., 2019).

Table 4. Logistic Regression Results of the Drivers of Farm Commercialization

Decision	Coefficients	Standard Error	P.Value	Marginal Effect
Constant	-5.4532***	0.8636	0.001	
DemF				
Gender	0.3229	0.6013	0.591	0.0097
Age	-0.6045	0.5469	0.269	-0.0182
Education	1.2036	2.2354	0.590	0.0363
Household	-0.8967	1.0111	0.375	-0.0576
Location	3.9495**	1.4281	0.006	0.1189
Income	5.4942***	0.7455	0.001	0.1655
ProdF				
Water	-1.2514	2.1033	0.552	-0.0377
Land	-0.0953	0.5422	0.861	-0.0029
Government	0.3064	0.5412	0.571	0.0092
Credit	-3.2457*	1.4126	0.022	-0.0977
Labour	2.9329***	0.6196	0.001	0.0883
Market	-1.9135*	0.9607	0.046	-0.0270
Soil	1.4595	0.9209	0.113	0.0439

Note: *Level of Significant at 0.05, Level of significant at **0.01, ***Level of Significance at 0.001

3.1.4. Labour (Type of Labour): The type of labour employed was significant at 0.01 (0.001) with a coefficient of 2.9329. This means farmers are more likely to increase their scale of farming if they have access to mechanized systems either than the traditional form of manual labour which is heavily reliant on household size in most farming communities. 0.0883 marginal effect of labour also means that farmers with access to mechanize labour are 8.83% more likely to commercialize their farms. A shift from household-based labour which is currently unrealizable due to the changing dynamics of household characteristics is more vital in influencing farmers' decisions. According to Boone and Wilse-Samson 2019; Foster and Rosenzweig 2011; Ojha and Kwatra 2016,) improving labour efficiency leads to improved production levels that support growth and expansion more rapidly than rudimentary choices.

3.1.5. Market (Type of Market): A coefficient of -1.9135 and a 0.046 significance level for markets indicates that farmers relying on the domestic market are less likely to go on a commercial scale as compared with those focusing on export market potentials. A marginal effect of -0.0270 also points to the fact that farmers with export market focus are 2.70% less likely to go on commercial-scale farming. This result proves the rationale of the commercialization of most agricultural farms in the area as they are highly motivated by export potentials which according to farmers offer more surety in terms of market readiness and pricing for commodities. Previous studies by (Balat et al., 2009; Bobojonov et al., 2016; Muriithi & Matz, 2015; Wiggins, 2018) have shown related results confirming the notion that for most developing economies, export market demand is a major determinant of commercialization and high production levels.

4. Conclusion

The study area represents most agricultural regions of Ghana and as such most predictors may not be far from the truth in predicting farmers' decision towards farm commercialization. The type of market farmers depend on selling their produce is a vital motivator in deciding the scale and the level of production among farmers. Although the production of most food stables

is seasonally regulated, goods making the way to distant cities and the export markets are mostly from commercial farms. Reports from the Ghana Export promotion council and that of the commercial Agricultural project of the Ministry of Food and Agriculture do affirm that as the demand from foreign buyers increases, the pressure to encourage agricultural commercialization among small and medium scale farmers increases. It is therefore not surprising that most large-scale farm enterprises in developing countries are more export-oriented leaving the domestic food market for small and medium-scale farmers (Bobojonov et al., 2016; Whitfield, 2017).

Manual labour for decades has impeded agricultural growth in the Sub-Saharan Region and most under-developed economies, slowing agricultural production leading to inefficient utilization of arable lands (ANANG, 2018). The study area is therefore not an exception when it comes to how labour influences the scale of farming. The results from the study pointed to the relevance of employing mechanized labour in other to encourage a higher percentage of small and medium-scale farmers to increase the scale of farming since most farmers are forced to rely on family labour which is usually inadequate and unreliable for large scale farming. Several studies do confirm that the adoption of an improved labour system could help farmers shift from the household labour system into a more productive labour system which is likely to increase productivity and size of farm enterprises (Foster and Rosenzweig 2011; Boone and Wilse-Samson 2019).

Location of farms according to results obtained from the study is an influencing factor of farm commercialization in that movement of farm inputs and produce depends on the kind of road network and distance involved there farmers with good road networks which are mostly closer to urban areas are more preferable as sites for commercial agricultural farms than remote areas where goods are near impossible to transport. Most farms in remote regions are often small with limited access to inputs and sources of transport which render them inefficient in terms of production and product marketability. Farmers were of the view that their willingness to increase the scale of farming will greatly depend on the location of farmland closeness to the urban area

Finally, the income level of farmers and the source of farmers' income prove to have a greater on farmer decision to increase the scale of farming. Farmers asserted that they are likely to scale-up their farms if access to credit facilities was flexible and accessible to them, again over-dependency of farmers solely on farm income also rendered most of them poor and unqualified for most credit facilities but an overall majority decision was that, there is a high probability that they will increase their farm size with a slight increase in income levels from alternative sources either than farming. Results of Ellis (2000) indicate that a high number of small scale farmers are unable to transition into commercial-scale due to financial limitation.

In conclusion, Predictors such as water source, the fertility of the soil, Government interventions, Land, Gender, Age, Education, and Household income though not non-predictive in this study is likely to predict farmers decision in other regions of the country due to slight variations in productions and demographic factors therefore further study on the comparison of the drivers of commercialization in different regions of the country and the intensity of the drivers of farm commercialization is recommended to guide government and policymakers in structuring agricultural commercialization projects in the region and especially as the government intends to upgrade and create more Agricultural processing factories in the region under the Agricultural industrialization Agenda. A vivid understanding of what drives the commercialization of agriculture will aid the proper and efficient allocation of resources by Government and relevant Stakeholders for maximum productivity and sustainability of such industries hence improving productivity, farmers livelihood and national Agricultural growth at the long run.

References

Abu, B. M., & Haruna, I. (2017). Financial inclusion and agricultural commercialization in Ghana: an empirical investigation. Agricultural Finance Review, 77(4). https://doi.org/10.1108/AFR-02-2017-0007

Akudugu, M. A. (2016). Agricultural productivity, credit and farm size nexus in Africa: a case study of Ghana. Agricultural Finance Review, 76(2). https://doi.org/10.1108/AFR-12-2015-0058

Ames, H., Glenton, C., & Lewin, S. (2019). Purposive sampling in a qualitative evidence synthesis: A worked example from a synthesis on parental perceptions of vaccination communication. BMC Medical Research Methodology, 19(1). https://doi.org/10.1186/s12874-019-0665-4

Anang, B. T. (2018). Farm Technology Adoption by smallholder Farmers in Ghana. Review of Agricultural and Applied Economics, 21(2). https://doi.org/10.15414/raae.2018.21.02.41-47

Andersson Djurfeldt, A., Djurfeldt, G., & Sarpong, D. B. (2014). Community, cohesion and context: Agrarian development and religion in eastern region, Ghana. Geoforum, 52. https://doi.org/10.1016/j.geoforum.2013.12.010

Ayerakwa, H. M., Dzanku, F. M., & Sarpong, D. B. (2020). The geography of agriculture participation and food security in a small and a medium-sized city in Ghana. Agricultural and Food Economics, 8(1). https://doi.org/10.1186/s40100-020-00155-3

Balat, J., Brambilla, I., & Porto, G. (2009). Realizing the gains from trade: Export crops, marketing costs, and poverty. Journal of International Economics, 78(1). https://doi.org/10.1016/j.jinteco.2009.01.016

Barratt, M. J., Ferris, J. A., & Lenton, S. (2015). Hidden Populations, Online Purposive Sampling, and External Validity: Taking off the Blindfold. Field Methods, 27(1). https://doi.org/10.1177/1525822X14526838

Bawa, A. (2019). Agriculture and Food Security in Northern Ghana. Asian Journal of Agricultural Extension, Economics & Sociology, 1–7. https://doi.org/10.9734/ajaees/2019/v31i230127

Bellemare, M. F. (2018). Contract farming: opportunity cost and trade-offs. Agricultural Economics (United Kingdom), 49(3). https://doi.org/10.1111/agec.12415

Bjornlund, H., Zuo, A., Wheeler, S. A., Parry, K., Pittock, J., Mdemu, M., & Moyo, M. (2019). The dynamics of the relationship between household decision-making and farm household income in small-scale irrigation schemes in southern Africa. Agricultural Water Management, 213. https://doi.org/10.1016/j.agwat.2018.10.002

Bobojonov, I., Teuber, R., Hasanov, S., Urutyan, V., & Glauben, T. (2016). Farmers' export market participation decisions in transition economies: A comparative study between Armenia and Uzbekistan. Development Studies Research, 3(1). https://doi.org/10.1080/21665095.2016.1262272

Boone, C. D. A., & Wilse-Samson, L. (2019). Farm Mechanization and Rural Migration in the Great Depression. Working Paper.

Carletto, C., Corral, P., & Guelfi, A. (2017). Agricultural commercialization and nutrition revisited: Empirical evidence from three African countries. Food Policy, 67. https://doi.org/10.1016/j.foodpol.2016.09.020

Chandio, A. A., Jiang, Y., Gessesse, A. T., & Dunya, R. (2019). The Nexus of Agricultural Credit, Farm Size and Technical Efficiency in Sindh, Pakistan: A Stochastic Production Frontier Approach. Journal of the Saudi Society of Agricultural Sciences, 18(3). https://doi.org/10.1016/j.jssas.2017.11.001

Dickson, K. B., & Benneh, G. (1988). A new geography of Ghana. In Longman Group UK Limited. Longman House, Burnt Mill, Harlow, Essex, England.

Ellis, F. (2000). The determinants of rural livelihood diversification in developing countries. Journal of Agricultural Economics, 51(2), 289–302. https://doi.org/10.1111/j.1477-9552.2000.tb01229.x

Farm Mechanization and its Behavioral Effects on Displaced Rice Workers of Region III. (2019). International Journal of Recent Technology and Engineering, 8(4). https://doi.org/10.35940/ijrte.d7460.118419

Foster, A. D., & Rosenzweig, M. R. (2011). Are Indian Farms Too Small? Mechanization, Agency Costs, and Farm Efficiency. Journal of Chemical Information and Modeling, 53. https://doi.org/10.1017/CBO9781107415324.004

GSS. (2014). Ghana Living Standard Survey Round 6 (GLSS 6). Ghana Statistical Service (GSS).

Guarte, J. M., & Barrios, E. B. (2006). Estimation under purposive sampling. Communications in Statistics: Simulation and Computation, 35(2). https://doi.org/10.1080/03610910600591610

Islam, M. M., Jannat, A., Dhar, A. R., & Ahamed, T. (2020). Factors determining conversion of agricultural land use in Bangladesh: farmers' perceptions and perspectives of climate change. GeoJournal, 85(2). https://doi.org/10.1007/s10708-018-09966-w

Kilic, S. (2015). Binary logistic regression analysis. Journal of Mood Disorders, 5(4). https://doi.org/10.5455/jmood.20151202122141

Kim, B., & Shin, S. J. (2019). Principal weighted logistic regression for sufficient dimension reduction in binary classification. Journal of the Korean Statistical Society, 48(2). https://doi.org/10.1016/j.jkss.2018.11.001

Linderhof, V., Janssen, V., & Achterbosch, T. (2019). Does agricultural commercialization affect food security: The case of crop-producing households in the regions of Post-Reform Vietnam? Sustainability (Switzerland), 11(5). https://doi.org/10.3390/su11051263

Lu, W., & Horlu, G. S. A. K. (2019). Transition of small farms in Ghana: perspectives of farm heritage, employment and networks. Land Use Policy, 81, 434–452. https://doi.org/10.1016/j.landusepol.2018.10.048

Mahaliyanaarachchi, R. P., & Bandara, R. (2010). Commercialization of Agriculture and Role of Agricultural Extension. Sabaragamuwa University Journal, 6(1). https://doi.org/10.4038/suslj.v6i1.1686

Mango, N., Makate, C., Tamene, L., Mponela, P., & Ndengu, G. (2018). Adoption of small-scale irrigation farming as a climate-smart agriculture practice and its influence on household income in the Chinyanja Triangle, Southern Africa. Land, 7(2). https://doi.org/10.3390/land7020049

Markwei, C., Bennett-Lartey, S. O., & Quarcoo, E. (2010). Assessment of cultivar diversity and agronomic characteristics of cocoyam (Xanthosoma sagittifolium) in Ghana through ethnobotanical documentation. In The Global Diversity of Taro: Ethnobotany and Conservation. Bioversity International.

Muriithi, B. W., & Matz, J. A. (2015). Welfare effects of vegetable commercialization: Evidence from smallholder producers in Kenya. Food Policy, 50. https://doi.org/10.1016/j.foodpol.2014.11.001

Ogutu, S. O., & Qaim, M. (2019). Commercialization of the small farm sector and multidimensional poverty. World Development, 114, 281–293. https://doi.org/10.1016/j.worlddev.2018.10.012

Ojha, P., & Kwatra, S. (2016). Development of MSD among the farm women involved in traditional and mechanized method of rice cultivation of northern India. Indian Journal of Traditional Knowledge, 15(1).

Osis, R., Laurent, F., & Poccard-Chapuis, R. (2019). Spatial determinants and future land use scenarios of Paragominas municipality, an old agricultural frontier in Amazonia. Journal of Land Use Science, 14(3). https://doi.org/10.1080/1747423X.2019.1643422

Owusu, S. (2017). Effect of Access to Credit on Agricultural Productivity: Evidence from Cassava Farmers in the Afigya-Kwabre District of Ghana. International Journal of Innovative Research in Social Sciences & Strategic Management Techniques, 4(2).

Paul, P., Pennell, M. L., & Lemeshow, S. (2013). Standardizing the power of the Hosmer-Lemeshow goodness of fit test in large data sets. Statistics in Medicine, 32(1). https://doi.org/10.1002/sim.5525

Rattanawong, A., & Ongkunaruk, P. (2018). Reduce Loss during Transportation: A Case Study of Fresh Vegetables in Thailand. KnE Life Sciences, 4(2). https://doi.org/10.18502/kls.v4i2.1679

Rayasawath, C. (2018). Factors affecting the household succession in agricultural occupation in nakhon ratchasima province, Thailand. Agriculture (Switzerland), 8(7). https://doi.org/10.3390/agriculture8070109

Riwthong, S., Schreinemachers, P., Grovermann, C., & Berger, T. (2017). Agricultural commercialization: Risk perceptions, risk management and the role of pesticides in Thailand. Kasetsart Journal of Social Sciences, 38(3). https://doi.org/10.1016/j.kjss.2016.11.001

Rubhara, T., & Mudhara, M. (2019). Commercialization and its determinants among smallholder farmers in Zimbabwe. A case of Shamva District, Mashonaland Central Province. African Journal of Science, Technology, Innovation and Development, 11(6). https://doi.org/10.1080/20421338.2019.1571150

Sekyi, S., Domanban, P. B., & Honya, G. K. (2019). The impact of informal credit on rural agricultural productivity in the savannah ecological zone of Ghana. African Journal of Economic and Management Studies, 11(2). https://doi.org/10.1108/AJEMS-03-2019-0121

Sroka, W., Dudek, M., Wojewodzic, T., & Król, K. (2019). Generational changes in agriculture: The influence of farm characteristics and socio-economic factors. Agriculture (Switzerland), 9(12). https://doi.org/10.3390/agriculture9120264

Twyman, J., Useche, P., & Deere, C. D. (2015). Gendered perceptions of land ownership and agricultural decision-making in Ecuador: Who are the farm managers? Land Economics, 91(3). https://doi.org/10.3368/le.91.3.479

von Braun, J. (1995). Agricultural commercialization: impacts on income and nutrition and implications for policy. Food Policy, 20(3). https://doi.org/10.1016/0306-9192(95)00013-5

Whitfield, L. (2017). New Paths to Capitalist Agricultural Production in Africa: Experiences of Ghanaian Pineapple Producer–Exporters. Journal of Agrarian Change, 17(3), 535–556. https://doi.org/10.1111/joac.12152

Wiggins, S. (2018). Agricultural growth trends in Africa. Working Paper - Agricultural Policy Research in Africa (APRA), 13.

Wolter, D. (2009). Ghana: Agriculture is Becoming a Business. OECD Journal: General Papers, 2009(2), 9–32. https://doi.org/10.1787/gen_papers-2009-5ks9zs5gt1d2

Wongnaa, C. A., & Awunyo-Vitor, D. (2018). Achieving sustainable development goals on no poverty and zero hunger: Does technical efficiency of Ghana's maize farmers matter? Agriculture and Food Security, 7(1). https://doi.org/10.1186/s40066-018-0223-z

Yu, W., Xu, W., & Zhu, L. (2017). A modified Hosmer–Lemeshow test for large data sets. Communications in Statistics - Theory and Methods, 46(23). https://doi.org/10.1080/03610926.2017.1285922.