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SOCIO-ECONOMIC DETERMINANTS OF TECHNICAL EFFICIENCY AMONG COOPERATIVE CASSAVA FARMERS IN OGUN STATE, NIGERIA

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Introduction

Cassava is an important crop grown by both male and female farmers. The married and single, educated and illiterate farmers alike partake in its cultivation. However, Abdulai, Ngegbe and Donkoh (2013), as well as Onumah, Al-Hassan and Anumah, (2013) argue that female farmers are less likely to be technically efficient than their male counters. In other words, the technical efficiency of farmers is dependent upon a number of factors, amongst which is their socio-economic condition.

Makinde, Balogun, Bello and Afodu (2015) were of the view that as a farmer becomes older, his or her ability to adopt improved technology that can enhance efficiency decreases, while bad experience of a particular technique is likely to make the farmer to be skeptical about adopting newer technology that might enhance efficiency. Again, as men dominate the cultivation of yam in some cultures, so also are the women to cassava production in another (Ayoola, 2013). This suggests that gender inequality could influence crop and technical varietal preferences. Nwaru (2013) posits that male and female farmers have unequal decision power or differences in resource management efficiency. This gender sentiment may not just influence the choice or technical priorities of both farmers, but could also affect productivity and cultivation of this important food crop.

Ironkwe, Ewuziem and Ekwe (2013) infers that membership of cooperative, extension contact, age and farm size can significantly influence technical efficiency of male farmers, while land ownership, household size, education, farming experience and farm size may positively influence that of their female counterparts. Similarly, Nwankwo, Ewuim and Asoya (2013) argue that cooperative has the potency to exert positive influence on efficiency of their members. To Akerele, Odojukan, Yangomodou, Olugbemi, Solana, Ilori and Fadipe (2019), socio-economic condition of farmers can influence their technical efficiency on cassava production. This suggests that a unit increase in the socio-economic characteristics of cassava farmers could bring about a significant increase in their productive technical efficiency.

On the contrary, studies by Hailu et al (2015) as cited in Olagunju, Ogunniyi, Oyetunde-Usman, Omotayo and Awotide (2021), and that of Wollni and Brummer (2012) informed that membership of cooperative societies have an insignificant impact on farmers in Ethiopia and Costa Rica, respectively. Olagunju et al (2021) attributed possible reasons for this mixed evidence to differences in the structure, formation and operation of cooperatives, as well as estimation techniques employed. The disagreement and unclear socio-economic factors that influences technical efficiency of farmers presents a gap in knowledge, especially as it pertains to Ogun State.

Objective:

To examine the socio-economic determinants of technical efficiency among cooperative cassava farmers in Ogun State, Nigeria.

Hypothesis:

H_0: Socio-economic determinants do not have significant influence on technical efficiency of cooperative cassava farmers in Ogun State.

H_1: Socio-economic determinants have significant influence on technical efficiency of cooperative cassava farmers in Ogun State.

Conceptual Review

Concept of Cassava

Cassava (Manihot esculenta) is a perennial woody shrub with an edible root, which grows in tropical and sub-tropical areas of the world. Cassava originated from tropical America and was first introduced into Africa in the Congo basin by the Portuguese around 1558. Today, cassava supports the livelihood of over 300 million Africans (IITA, 2021). Nigeria is adjudged as one of the world's largest producers of cassava, while Thailand is the largest exporting country of dried cassava and in the subtropical region of Southern China, cassava is the fifth largest crop produced (Akerele, Idowu, Oyebanjo, Ologbon & Oluwasanya, 2018).

Cassava is Africa's second most important food staple, after maize, in terms of calories consumption. Cassava is a major source of calories for roughly two out of every five Africans. In some countries, cassava is consumed daily and sometimes more than once a day. In the Democratic Republic of Congo, cassava contributes more than 1000 calories per person per day to the diet and many families eat cassava for breakfast, lunch and dinner. Cassava is consumed with a sauce made with ingredients rich in protein, vitamins and minerals. In the Congo, Madagascar, Sierra Leone, Tanzania and Zambia, cassava leaves are consumed as vegetable (Jones, 1959; Haggblade & Zulu, 2003). Cassava leaves are rich in protein, vitamins, and minerals (FAO, 1979).

In sub-Saharan Africa (SSA), cassava is mainly a subsistence crop grown for food by small-scale farmers who sell the surplus. It grows well in poor soils with limited labor requirements, and provides food security during conflicts. Cassava is usually intercropped with vegetables, plantation crops (such as coconut, oil palm, and coffee), yam, sweet potato, melon, maize, rice, groundnut, or other legumes (IITA, 2021). Cassava roots can be harvested between 6 months and 3 years after planting. Cassava in Nigeria is almost exclusively grown as a small-farmer crop, with plantings of between 1 and 5 ha, with only a handful of large commercial farms. Most cassava production in Nigeria goes towards the small scale processing of fufu and gari (a fermented gelatinized product) regularly consumed by a significant number of ethnic groups across the country. Nigeria is the largest importer of wheat in the world, importing four million tons, to the tune of $4 billion every year. Eager to promote self-sufficiency, successive Nigerian governments have been promoting the use of cassava flour (HQCF) as a partial substitute for wheat imports (Abayomi & Adegoke, 2016). HQCF is unfermented with potential uses that include the production of glucose syrups, industrial alcohol and bakery products, the production of adhesives, as an extender for plywood glues and as a source of starch in textile sizing.

Cassava is one of the world's most important food crops, and one of the most important carbohydrate sources in developing countries, especially Nigeria. The plant grows to a height of 1 to 3m and several roots may be found on each plant. Although cassava leaves are sometimes consumed, the major harvested organ is the tuber, which is actually a swollen root. The plant is propagated mostly from stem cuttings. According to Tonukari (2004), cassava ranks very high among crops that convert the greatest amount of solar energy into soluble carbohydrates per unit of area. Among the starchy staples, cassava gives a carbohydrate production which is about 40% higher than rice and 25% more than maize, with the result that cassava is the cheapest source of calories for both human nutrition and animal feeding (Akinnagbe, 2010).

Cassava products are increasingly becoming popular in Nigerian food and agricultural markets. Hence, it provides a strong incentive for more economic agents to be involved in the cassava market. According to FAO (2018), cassava is a choice crop for rural development, poverty alleviation, economic growth and ultimately, food security. Ikuemonisan, Mafimisebi, Ajibefun and Adenegan (2020) observed that the above usefulness of cassava had made critical stakeholders to continue to contribute immensely to shape development of the sub-agricultural sector in Nigeria. Eke-Okoro and Njoku (2012) captured the phases in efforts to improve cassava production in Nigeria as the emergent stage that spread from 1940 to 1953; a primitive stage that stretched from 1970 to 1990 and the anticipatory stage that spanned from 1995 to date.

Apart from food, cassava derivatives and starch are applicable in many types of products such as foods, confectionery, sweeteners, glues, plywood, textiles, paper, bio-degradable products, monosodium glutamate, and drugs. Cassava chips and pellets are used in animal feed and alcohol production (IITA, 2021). Medium to large private farms in the major producing countries like Nigeria and Mozambique support some of these industrial uses of the crop. It contains significant amounts of calcium (500 mg/100g), phosphorus (400 mg/100g), and vitamin C (25 mg/100g). Cassava is also a source of protein and also rich in amino acid (lysine). The cassava crop consists of 15% peel and 85% fresh tuber flesh. The tuber consists of 20 - 30% starch, 62% water content, 2% protein, 1 - 2% fiber with trace of vitamin and minerals (FAO, 2001). These attest to the value-chain of cassava and its derivatives.

The importance of cassava to many Africans is epitomized in 'Ewe', a language spoken in Ghana, Togo and Benin in the name for the plant, "Agbeli" meaning "there is life". Cassava varieties are

often categorized as either sweet or bitter which signifies the absence or presence of highly toxic level of cyanogenic glucosides which are linamarin and lotaustralin, respectively (Akerele et al, 2018). They informed that a dose of 40mg of pure cassava cyanogenic glucoside is sufficient to kill a cow, and that societies that traditionally eat cassava generally understands that one form of processing (drying, soaking, cooking, fermentation, etc.) is necessary to avoid getting sick.

Since 2010, the world's cassava production has been on the increase from about 240 million metric tons. Within the same period, Nigeria alone produced about 42.5 million metric tons which is estimated to be about 18% of total global production. As at 2018, Nigeria's share of world production had risen to 21.5%, suggesting an impressive improvement. FAO projects that by the year 2025; about 62% of global cassava production will be from sub-Saharan Africa (FAOSTAT, 2020).

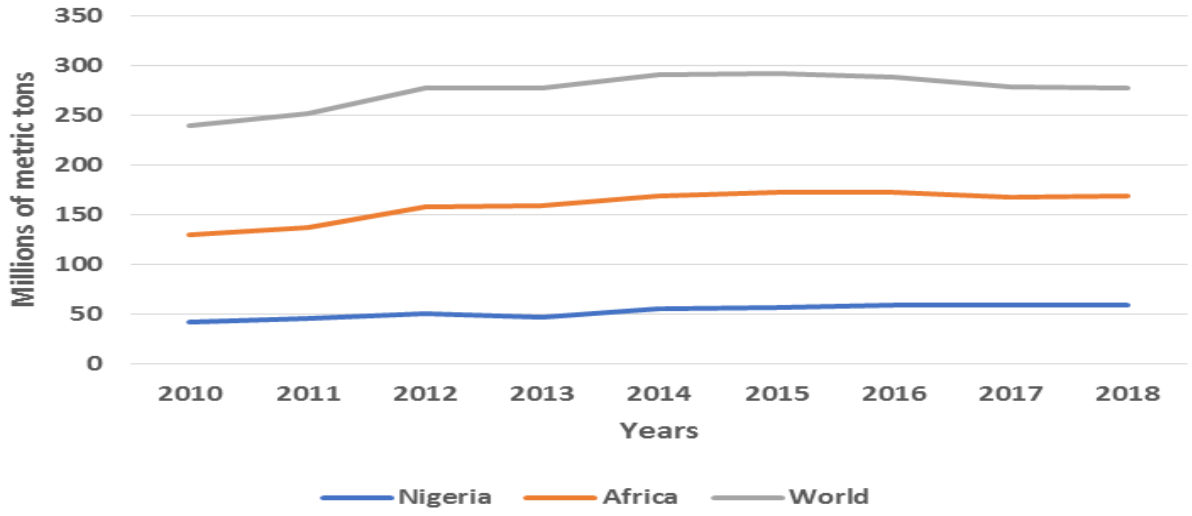

Figure 1: Cassava Production from 2010 to 2018.
Source: FAOSTAT (2020).

Figure 1 indicates that in recent past, Africa and Nigeria in particular has witnessed a gradual but steady rise in cassava production. It also suggests that the future is bright for cassava farmers and production in the country. The growth in cassava production in Nigeria has been traced to a number of factors, such as rapid population growth, large internal market demand complemented by the availability of high yielding improved varieties of cassava. Other factors include a relatively well-developed market access infrastructure, the existence of improved processing technology and a well-organized internal market structure (Federal Department of Agriculture, 2017). Another

important factor is the location of the International Institute for Tropical Agriculture (IITA) which has its main research station in Ibadan, South-west, Nigeria (Ogunyinka & Oguntuase, 2020). This is within the same region for this present study's location. The Institute conducts research on and releases new varieties of root crops among others in the sub-Saharan Africa. This placed South-west in advantageous position and as most leading region in cassava production in Nigeria.

Socio-Economic Characteristics Influencing Technical Efficiency of Farmers

Socio-economic characteristics are personal attributes that describe or position someone (like a farmer) in a particular economic activity or social status. Abdulkadir, Mohammed and Bdullahi (2016) conceived socio-economic characteristics as relative standing of a person in the society based on his income, power, background and prestige. Ovute (2009) classified this as to include age, occupation, income, standard of house occupied or rented, family size, education and level of stability among other factors. Illiteracy and lack of adequate education have been identified as prevailing factors militating against agricultural activities (Nwaru, 2007). Low level of women education is a constraint that explains the prevailing low level of women participation in agricultural cooperatives. Evidence has shown that level of education influences women's level participation in agricultural cooperatives (Idris, Sulumbe & Mohammed, 2017).

Mueller and Parcel (1981) posits that socio-economic characteristics are the quality of life attributes as well as the opportunities and privileges afforded to people within the society. They help to define family relative position of individuals within a hierarchical social structure based on their way or control over prosperity, reputation and authority (Ojiagu & Onugu, 2015). According to Holmgren (2011), superior or higher level of education positively impact on both productivity and health of cooperative members. Agricultural cooperative members with higher education appear to be more trusting and have better capacity to adopt improved technologies than those with lower level of education. This suggests that education is an economic variable that can better the lot of cooperative members.

It has been established in literature that socio-economic factors can affect technical efficiency or production process. Akerele, Odojukan, Yangomodou, Olugbemi, Solana, Ilori & Fadipe (2019) posited that socio-economic condition of farmers can influence their technical efficiency on cassava production. The major socio-economic variables that can mostly affect the production process may include but not limited to farmers' land holdings, educational level, farming experience, status of land ownership and farmers' level of income (Audu, Girei, & Umar, 2020). Studies have shown that gender is a determinant factor to efficiency of farming activities. For instance, Abdulai, Ngegbe and Donkoh (2013), as well as Onumah, Al-Hassan and Anumah (2013) posit that female farmers are less technically efficient than their male counters, who were found to be more technically efficient.

Similarly, Abdul-Kareem and Isgin (2016) were of the opinion that gender of a farmer may significantly impact on his/her technical efficiency in the production process. This submission recognizes the undeniable place of age and strength to farming activities. In other words, an aged farmer may not be able to do much as it pertains to technicality than a younger farmer. In Benue State, Nigeria, annual farm income, processing cost, gross margin, farming experience, education and extension contact were found to influence the technical efficiency of cassava farmers (Asogwa, Umeh & Ater 2006).

Furthermore, residential area (rural or urban) has the potency to influence participation in agricultural activities. FAO (2013) reported that rural farmers are more crucial in boosting agricultural activities, nutrition, and food security, than their urban counterparts. While their urban counterparts have easy access to better roads and other social amenities or credit facilities, the rural farmers are less likely to harness those resources and opportunities. This suggests that rural farmers are more likely to be short-changed in agricultural technicality, than their urban counterparts who are more informed or exposed.

Theoretical Framework

Agricultural Development Theory (ADT) was used for this paper. The theory was propounded by Norton, Alwang and Masters (2016). The theory posits that there is an interaction between efficiency in skills and boost in food production. It also suggests that existing agricultural systems in developing nations need improvement to enhance increase of agricultural contribution to

national development (Agbaeze, Ohunyeye, Obamen & Ibe, 2020). This means that when efficiency in skills is improved, there is bound to be improved agricultural production and earnings.

Methods and Materials

This paper adopts survey design and it was considered suited because it allows the use of quantitative tool in data collection. The study was conducted in Ogun State, South-West Nigeria. The State was created in 1976, and it is strategically located as a major economic hub. It has one of the largest concentrations of industries in the country and serves as the major corridor for transportation of goods, services and people between the nation's commercial center, Lagos, and the rest of the country as well as the largest West African markets. Due to her strategic location, it was nicknamed the 'Gateway to Nigeria'. Ogun State is bordered to the East by Ondo State, in the North by Oyo and Osun States and in the South by Lagos State and the Atlantic Ocean and in the West by Republic of Benin, which makes it an access route to the expansive markets of the Economic Community of West African State (ECOWAS) (Ogun State Government, 2021).

Agriculturally, the State is grouped into four zones and they are Ijebu-Ode, Illaro, Ikenne and Abeokuta. According to Wikipedia (2021), the State lies within latitude 40-14N and longitude 30-14E, with a landmark of 16,980.55 km^2 (6,556.23 sq mi). The indigenes of the area are Yorubas and predominant language of the people is Yoruba. According to the Guardian (2020), Ogun State has competitive advantages in the cultivation of food crops such as cassava, plantain, rice, yam, maize and sweet potato, among others and cash crops such as cocoa, oil palm, timbers, kola nuts, cashew and rubber. The choice of the State for this study is based on the fact that it is the highest producer of cassava in South-Western region of the country (Ogun State Government, 2021), with large proportion of small-scale farmers that seem to be technically inefficient.

The population of study is two thousand, three hundred and eighteen (2,318) members of sixty-six registered agricultural cooperatives that specialises in cassava production and processing in Ogun State. The data was generated from the Ogun State Agricultural Development Programme (2021). The sample size is three hundred and forty-one (341) and this was determined using Taro Yamane (1967) formula. Multi-stage sampling technique, which involves successive stratified random sampling were used to select study participants. First, Ogun State was stratified into her four

agricultural zones (Ijebu-Ode, Illaro, Ikenne and Abeokuta), and sixty-one cooperative societies were grouped accordingly. Thereafter, in each of the agricultural zones, six cooperative societies were selected. The selection of the cooperative societies was carried out using balloting method. The major instrument of data collection was questionnaire and data were processed through the aid of SPSS version 22, and descriptive statistics such as frequency count, percentages, mean scores, chart and regression were used for analysis.

Results and Discussion

The generated data were sorted for eligibility and accountability. Out of the three hundred and forty-one (341) copies of questionnaire administered, three hundred and twenty (320) that were properly filled were retrieved and used for analysis. This represent ninety-four percent (94%) response rate and was considered adequate enough for analysis.

Socio-Economic Determinants of Technical Efficiency of Cassava Farmers

Table 1: Analysis of Socio-Economic Characteristics Influencing Technical Efficiency

	Coeff.	*t-val.*	*Sig.*
Constant (Socio-economic characteristics)	273.411	2.445	0.010
X_1 Gender	-0.052	-0.313	0.640
X_2 Age	116.813	4.623**	0.000
X_3 Marital Status	-201.171	-0.914	0.220
X_4 Level of Education	51.336	1.722*	0.041
X_5 Household Size	13.081	3.155*	0.002
X_6 Farming Experience	66.192	21.070*	0.034
X_7 Farm Size	-19.741	-0.203	0.811
X_8 Years of Coop Membership	45.308	11.121*	0.053
X_9 Income	07.675	23.416	0.000
R^2		0.905	
Adj. R^2		0.824	
F		21.519	
N		320	
Dependent variable: Technical efficiency			

**Significant at 1% level, *Significant at 5% level.
Source: Field Survey, 2021.

Table 1 presents the analysis of socio-economic determinants of technical efficiency of cassava farmers in the State. The results of the table revealed that over 82% variations in the farmers' technical efficiency were influenced by their personal factors. The observed coefficiently significant factors were age (0.000), level of education (0.041), household size (0.002), farming experience (0.034), years of cooperative membership 0.053) and income (0.000). This is to the fact that their significance values were below the 0.05 level of acceptance. This implies that age,

educational level, household size, farming experience, years of cooperative membership and income influences cassava farmers' technical efficiency in Ogun State.

Test of Hypothesis

H_0: Socio-economic determinants do not have significant influence on technical efficiency of cooperative cassava farmers in Ogun State.

H_1: Socio-economic determinants have significant influence on technical efficiency of cooperative cassava farmers in Ogun State.

Table 2: Regression result of hypothesis one

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N		320	

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.962[a]	.905	.824	21792.143	1.874

a. Predictors: (Constant), socio-economic determinants

b. Dependent Variable: technical efficiency

**Significant at 1% level, *Significant at 5% level.
Source: Field Survey, 2021.

Table 2 shows the regression result of hypothesis one. Evidence from the table indicates that variables in the equation explain over 82% of the variations in technical efficiency of the farmers. It can also be clearly seen from the table that six significance coefficients (age, educational level, household size, farming experience, years of cooperative membership and income) influenced their technical efficiency. Age was found significant (0.000) and the coefficient was positive (116.8). Level of education also shows positive and significant influence on technical efficiency of the farmers (0.041). In essence, the coefficient of 51.3 indicates that one year addition on the

level of education leads to 51 units of change technical efficiency. It was also observed that one unit change in household size bring about 13 units of changes in technical efficiency. More still, farming experience also bore a positive and significant coefficient, suggesting that one unit change brings about 66.2 units of change in the farming experience of the respondents.

Years of cooperative membership, which is cooperative effect variable equally shows positive and significant influence to technical efficiency (0.053). The coefficient of the result (45.3) suggests that a year change in cooperative membership leads to significant units of changes in their technique. This aligns with the argument by Nwankwo et al (2013) that cooperatives exert positive influence on efficiency of their members. Furthermore, income had positive and significant coefficient (07.6), suggesting that a unit change in income brings about a marginal 7.6% addition on their income. However, gender, marital status, and farm size bore negative signs, implying that they were not significant to influence technical efficiency of the farmers. The non-significant of gender disagrees with the findings of Abdulai, Ngegbe and Donkoh (2013), as well as Onumah, Al-Hassan and Anumah (2013) who posited that female farmers are less technically efficient than their male counters.

In addition, the Durbin-Watson statistic shows 1.874 and suggests absence of autocorrelation since the value is approximate to 2. It also shows that the estimated model is robust for prediction and forecasting. Based on this evidence therefore, this study rejects the null hypothesis and accepted the substantive. This implies that socio-economic determinants have significant influence on technical efficiency of cooperative cassava farmers in Ogun State. This aligns with Akerele et al (2019) who posited that socio-economic condition of farmers can influence their technical efficiency on cassava production.

Conclusion and Recommendations

The significance coefficients (age, educational level, household size, farming experience, years of cooperative membership and income) were the observed determinants of technical efficiency of the farmers. Age was found significant (0.000) and the coefficient was positive (116.8). This implies that one year change in age of the farmers could bring about one unit addition or change in their technical efficiency. In other words, the more the farmer advance in age the more advancement he/she may likely make in skills.

Again, level of education shows in essence that coefficient of 51.3 implies that one year addition on the level of education leads to 51 units of change in technical efficiency. This suggests that acquisition of formal education or training is most likely to improve one's skills. The importance or validity of education in technological adoption and application cannot be overemphasized. Education has been proven to be a veritable tool for empowerment, be it in agriculture or any other sector. It was also observed that one unit change in household size bring about 13 units of changes in technical efficiency. This means that household size has a positive and significant effect (0.002) on technical efficiency of the farmers. Indeed, since many of the farmers rely on family labour, an increased number of family members is an improved labour availability vice versa. In addition, the positive and significant coefficient of farming experience suggests that one unit change could bring about 6 units of changes in the farming experience. Years of experience is in tune with number of farming years, therefore, a unit change in age of a farmer could bring about a unit change in his technical efficiency.

Moreso, years of cooperative membership, which is cooperative effect variable equally shows positive and significant influence to technical efficiency (0.053). The coefficient of the result (45.3) suggests that a year change in cooperative membership leads to significant units of changes in their techniques. In other words, the older a member gets in cooperative society, the more informed he or she becomes on new techniques. Furthermore, income had positive and significant coefficient (07.6), suggesting that a unit change in income brings about a marginal 7.6% addition on income. In line with the findings, the following recommendations were made;

1. Age and education are vital in agricultural endeavour. Therefore, youth should be encouraged by the government to venture into cassava production as a sure way to not just income generation, but also unemployment reduction. This is giving to the fact that the sector is being dominated by elderly people who are fast aging and with the exploratory nature of the youth, they can easily align with modern agricultural practices that enhances efficiency.

2. The Ogun State government in her efforts to revamp the agricultural sector should collaborate with various cassava producing cooperatives in the State to attract foreign investors who have the capacity to mechanise the sub-sector. This would not only avail the farmers of the opportunity of learning new skills and international best practices, but would also boost revenue generation of the State.

3. Agricultural cooperatives should make training of members a topmost priority as to make them technically efficient. This is in view of the fact that when a farmer is not informed or trained there is little to nothing he or she can achieve.

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