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Credit Use and Determinants of Economic Efficiency of Cocoa Seeds Processors in South East Nigeria

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Abstract
This study examined credit use and the determinants of economic efficiency of cocoa seed processing entrepreneurs in South East, Nigeria. A multi-stage random sampling technique was used in choosing the sample. Primary data collected from 180 seedlings-producing entrepreneurs were used for the study. Data collected were analyzed using descriptive statistics and the Maximum Likelihood Stochastic (MLS) regression model. Findings showed that the majority (66.77) percent of entrepreneurs use informal credit sources. Results from MLS showed that for the pooled sample, the coefficients of sex and cooperative membership each showed a positive significance. For the Formal Credit Users entrepreneurs, age, processing experience and quantity processed showed positive and significant. For the Informal Credit Users entrepreneurs, age and cooperative membership showed positive and significant. The study recommends that government and formal financial institutions should make formal credit available to entrepreneurs as cocoa processing requires some level of capital investment, thereby creating more employment opportunities for youths who want to invest in agriculture.
Keywords: Cocoa, seeds, processors, economic efficiency, credit, formal and informal, entrepreneurs, South East Nigeria

IntroductionCocoa belongs to the family *steruliacacea* and the genus "Theobroma". Cocoa as a cash crop was discovered in the 18th century, originated from the Upper Amazon basin and later spread to other tropical areas of South and Central America. Cocoa production in West Africa was first identified in Ghana in the year 1868 and the crop was eventually introduced in Nigeria in 1874 through Bonny River the present-day River State (Amos, 2017; Raufu, Kibirige and Singh, 2015). Cocoa is currently grown in Nigeria in the South Western States such as Ekiti, Ogun, Ondo, Osun, and Oyo; Some parts of South-South such as Benin in Edo State, Cross River State, Delta State, Akwa Ibom State; and some parts of South East such as Abia State, Imo State, and Ebonyi State (Afolayan, 2020; Azunku, 2021; Ejike and Chidiebere - Mark, 2019). Other cocoa-producing states are Kogi and Kwara States in North Central, and Adamawa and Taraba States in North East. The southwest region accounts for 70% of Nigeria's annual cocoa production, estimated at 250,000 to 280,000 tons. The southeast accounts for 25% of the national output (Ministry of Agriculture Ondo State, 2021). Abia State became a major player in Cocoa production as it is placed eighth, among the major Cocoa-producing States, in Nigeria and is characterized by cocoa entrepreneurs who major in cocoa tree production, seed processing, seedlings production and cocoa marketing (Ejike and Chidiebere-Mark, 2019). There is a need to increase cocoa productivity as part of the post-COVID economic recovery strategy in Nigeria as the production of cocoa has suffered a reduction in recent years owing to several factors such as low yield, inconsistency production patterns, disease incidence, pest attacks, use of simple tools, inadequate financing, and inconsistent policy in the agricultural sector by the past administration (Abayomi, 2022; Odegbade, Aina, Igelige, Hassan and Mshelia, 2021). Hence, some cocoa entrepreneurs obtain credit to finance the purchase of equipment and inputs as credit affects cocoa production (Abiola, 2019).

Credit is a prerequisite for the empowerment of entrepreneurs to increase productivity. Credit is the means of obtaining resources at a certain period with an obligation by the entrepreneur to pay back at a stated period by the terms and conditions of the credit obtained (Ben-Chendo, Oshaji and Iweanya2018; Agborlahor *et al.,* 2012). Agricultural credit given to agribusiness entrepreneurs plays an important role in making farming more productive and efficient. Empirical evidence has established a positive link between declining agricultural productivity and limited credit facilities. The problem is not the unavailability of credit, the problem is the inadequacy of credit and, the inability of

credit to circulate and be sufficient for producing entrepreneurs (Ben-Chendo *et al.,* 2018). Credit sources may be formal and informal. Formal credit sources are also called institutional sources such as the Bank of Agriculture, commercial banks, microfinance banks and government loans. Informal sources are also called non-institutional sources such as Professional and agricultural moneylenders, cooperative societies, traders and Commission agents, relatives and friends etc (John and Charlse, 2015; Ben-Chendo*et al.,* 2018). Among factors affecting producing entrepreneurs, the lack of insufficient funds and credit facilities seems to be the core issue as other matters are directly and indirectly linked to it (Friday *et al*., 2016). Credit facilitates the adoption of innovation which is fundamental to increased productivity and efficiency (John and Charles, 2015).

Efficiency reflects the ability to obtain maximum output from a given set of inputs. It is the process of how best a producer utilizes the resources (inputs) to produce the desired products (outputs). It could also be defined as the attainment of production goals without waste (Chikezie, Benchendo, Ibeagwa, Oshaji, and Onuzulu, 2020; Aliyu and Shelleng, 2019). Economic efficiency requires producing entrepreneurs to use resources in ways to attain the highest possible output given available inputs by using the lowest cost or attaining a maximum revenue through resource combinations based on the relative input prices. An increase in Economic efficiency improves livelihood through food availability, opening markets for higher farm income and encouraging trade among value chain actors towards the growth and sustainable development of the economy (Dogba, 2020). The credit increases production efficiency, as it allows producing entrepreneurs the timely use of farm inputs and application of new and modern technology which ultimately increases output. Credit also influences productivity since credit-constrained producer entrepreneurs are more likely to use lower levels of input in production compared to those who are not (Sonny, Cao and Yaa, 2020).

Cocoa Pods are usually harvested by hand due to the lack of infrastructure. The early stages of cocoa processing and other cocoa derivatives are done in Nigeria; moreover, a bulk part of cocoa is sold abroad as beans (Anyanso, 2014). Afolayan (2020), noted factors militating against cocoa production in Nigeria to be climate change, ageing of plantations, soil nutrient degradation, internal and external price fluctuation, and excess exportation due to a shortage of cocoa processing factories in Nigeria. In Nigeria, about 80% of cocoa produced is exported as cocoa beans while 20% is processed into powder, butter, cake and liquor locally before being exported. This implies that Nigeria is yet to fully capitalize on cocoa production, as most of the beans are sold unprocessed. Studies such as Awotide, Kehinde and Akorede (2015), established a positive link between access to credit and technical efficiency of cocoa farmers. They noted that most cocoa farmers did not have access to formal credit implying negative consequences for agricultural productivity and household income. The maximum likelihood estimates of the inefficiency model showed that age, education, experience, membership association, marital status, household size and labour were all positive and significant to efficiency. Popoola *et al.* (2015), in their study on the technical efficiency of cocoa production in Southwest Nigeria, reported education to be positive and significantly associated with efficiency while age and farm location negatively affect technical efficiency. Other studies such as Mgbakor, Uzendu and Ndubisi (2014); and Ben-Chendo *et al.* (2018), reported that informal credit was the major source of credit for producing entrepreneurs.

Methodology

This study was conducted in South-east Nigeria. The South-east zone comprises five states: Abia, Anambra, Ebonyi, Enugu and Imo States. The states are within the Southeast rainforest zone of Nigeria. The area has a population of 21,955,334. Imo and Anambra are the most populous states of the zone and have a high concentration of economic activities. The zone is located on latitudes 5006'N to 6034'N of the Equator and longitudes 6038'E and 8008'E of the Greenwich (Prime) Meridian. The location of the zone within the tropical rainforest belt gives it the ecological essentials for the production of a wide range of tropical agricultural products such as cocoa, rice, yam, oil palm, maize, cassava and vegetables. The population of the study consisted of all cocoa seed processing entrepreneurs in Abia State, Imo State and Ebonyi State. Multi-stage and purposive sampling techniques were employed in the selection of cocoa seed processing entrepreneurs in the study. Firstly, three out of the five States in Southeast Nigeria were purposively selected. The selected States are Abia, Imo and Ebonyi State. These states were chosen based on their high-level activities on cocoa seed processing activities. Secondly, two agricultural zones per state were randomly selected based on their intensity on cocoa seed processing. Thirdly, two Local government areas were randomly selected from each of the agricultural zones. In the fourth stage, three communities were selected randomly from each Local Government Area giving a total of 36 communities. Finally, five entrepreneurs were randomly selected from the entire thirty-six (36) communities making a total of 180 respondents for this study. Primary data was used in this investigation. The data for this study was acquired by the administration of a questionnaire, observation and an oral interview. The researcher also aided respondents who were having trouble answering some of the questionnaire's questions, especially those they didn't understand. The researcher gave the respondents a maximum of 2 days to review the questionnaire and respond appropriately. The researcher and the two research assistants recruited for the study returned after the period to collect the questionnaire from the respondents. The instrument was validated before delivery, and item statements were checked to ensure that the respondents addressed the study objective, questions, and the appropriateness of the constructs

employed in the questionnaire. The study's data was analyzed using descriptive statistics and Maximum Likelihood Stochastic (MLS) regression.

Model Specification

The Maximum Likelihood Stochastic (MLS) regression model was used to analyse the determinants of economic efficiency of cocoa seed processing entrepreneurs according to credit use in South East Nigeria. Following Battese and Coelli (1995), the determinants of economic efficiency in the models above were simultaneously estimated with Exp(-μi) defined by:

$$\text{Exp}(-\mu i) = \alpha_0 + \alpha_1 z_1 + \alpha_2 z_2 + \alpha_3 z_3 + \alpha_4 z_4 + \alpha_5 z_5 + \alpha_6 z_6 + \alpha_7 z_7 \quad \text{.....1}$$

Where:

Exp(-μi) = Economic Efficiency of the ith cocoa seed processing entrepreneur,

Z_1 = age (years),

Z_2 = sex (1 = male, 0 = female),

Z_3 = Level of education (years),

Z_4 = household size (Number),

Z_5 = processing experience (years),

Z_6 = membership of farm association (1 = member, 0 = otherwise

Z_7 = quantity process per day (Kg),

δ_0 = intercept,

$Z_1 - Z_7$ = parameters to be estimated.

Results and Discussion

Categorize the Cocoa Seedlings Producing Entrepreneurs According to Credit Use

As shown in Table 1.1 below, the majority (66.77%) of the cocoa seeds processing entrepreneurs used informal credit while the remaining (33.33%) cocoa seeds processing entrepreneurs used formal credit. The result is in line with the findings of Awotide *et al*. (2015), in their studies on Access to Credit and Technical Efficiency of Farmers in SouthWest Nigeria revealed that farmers do not have access to credit from formal institutions which affects agricultural productivity and innovation. Ben-Chendo *et al*. (2018), in their studies on Determinates of Credit sources in Imo State, revealed that the majority (97.5%) of farmers used informal credit sources such as ESUSU, Cooperatives, family and friends while 2.5% of farmers used formal credit sources**.**

Determinants of Economic Efficiency of Cocoa Seedlings Producing Entrepreneurs

The Maximum Likelihood Stochastic (MLS) regression model was used to estimate the determinants of economic efficiency of cocoa seedling producers (pooled, Formal Credit User_ FCU and informal Credit Users_ ICU) are presented in Tables 1.2, 1.3 and 1.4 below. Generally, a negative sign on a parameter means that the variable decreases economic efficiency while a positive sign implies that the variable increases economic efficiency. The gamma and sigma were significant at one percent alpha level for Pooled credit users, FCU and ICU implying goodness of fit and correctness of the specified assumption of the composite error distribution according to Okoye and Onyenweaku (2007) and Kadurumba *et al*. (2009). The gamma value also indicates that 99.4% (pooled), 38.5 % (FCU) and 99.2% (ICU) of the variability in the economic efficiency of seedlings-producing entrepreneurs in the study area was accounted for by the factors included in the mode. For the pooled sample, the coefficients of sex and cooperative membership each showed positive signs at a 1% level of significance while age, education, household size and quantity of cocoa seeds processed showed negative signs at 1%, 5%, 5% and 1% levels of significance respectively. For the FCU entrepreneurs, age, processing experience and quantity processed showed positive signs each at a 5% level of significance while sex and household size showed negative signs at 1% and 10% levels of significance respectively. For the ICU entrepreneurs, age and cooperative membership showed positive signs at 1% and 5% levels of significance respectively while sex, education, household size and quantity of cocoa seeds processed showed negative signs at 1%, 5%, 1% and 10% levels of significance respectively.

The negative coefficient of age for the pooled sample implies that an increase in age would reduce economic efficiency. In contrast, an increase in the age of the processors will increase the EE of FCU and ICU processors. The negative relationship implies that holding other factors constant, a year increase in the age of cocoa seed processors will decrease their economic efficiency by corresponding units of coefficients. The reason is that as the processors increase in age, they get weaker to carry out daily manual operations and this would lead to additional cost of labour. This finding agrees with the work of Iheke and Onyendi (2017), on economic efficiency and food security status of rural farm households in the Abia state of Nigeria. Household size returned negative coefficients for all the categories, suggesting that larger families are less likely to be economically efficient when compared with households with fewer persons. This implies that holding other factors constant, an increase in the household size of the processors will decrease their economic efficiency by their respective coefficients. Large household sizes increase expenses on consumption expenditure which enhances the diversion of production credit. Thereby it reduces productivity and directly affects economic efficiency (Oladimejhi *et al*., 2021). The coefficient of processing experience was positive for FCU processors implying that experience enhances EE. Experienced processors are more likely to be economically efficient than their inexperienced counterparts. Experience is very important for the accumulation of good control of resources, and utilization of tools and labour that could boost their efficiency, since in agriculture, better availability of resources enhances the timely application of inputs (cocoa seeds) that increase the efficiency of the processor (Degefa 2017). The cooperative membership coefficient was positive for pooled and ICU processors, implying that members of groups are better positioned to be economically efficient than non-members. These

members of groups enjoy special privileges and benefits that play major roles in enhancing economic efficiency. Processors who belonged to cooperate, groups, were likely to have higher economic efficiency than their counterparts who did not belong to any group. Sanyang (2014) and Wakili & Isa (2015) reported a similar relationship between efficiency and group membership. Sanyang (2014) explained that entrepreneurs who belong to an organized group or an association usually have opportunities to access quick support from the government, NGOs, donors, and other stakeholders. These agencies enable prices and technologies information flow, subsidize inputs, offer financial and input credits to members, and organize product markets. Again, these groups offer agricultural training on the best production practices to their members and this improves their efficiency in the cost allocation of production and processing resources. Quantity processed was positive for FCU but negative for pooled and ICU processors. The positive coefficient implies that the larger the quantity of cocoa seeds processed, the higher the economic efficiency while the negative signs imply that the larger the quantity of cocoa seeds processed, the lower the economic efficiency. The latter does not seem to agree with a priori expectation. However, since c, compared with those who have access to formal credits which are usually larger in volume.

Conclusion

Agribusiness entrepreneurs are more efficient when there is an increase in output. Credit supply to cocoa processing entrepreneurs is perceived as a strategy for the transformation of the rural economy from poverty since credit-constrained entrepreneurs are more likely to use lower levels of input in production compared to those who are not constrained. The result of the study showed that for the pooled credit users, the coefficients of sex and cooperative membership were positive signs and significance. For the Formal Credit Users age, processing experience and quantity processed all showed positive signs were significant respectively. For the Informal credit entrepreneurs, age and cooperative membership all showed positive signs were significance respectively. Formal credit sources should make credit available to entrepreneurs as cocoa processing requires some capital investment and processors with limited funds may not be economically efficient.

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Table 1: Categories of credit used by Cocoa Seeds processing entrepreneurs

Credit Use	Frequency	%
Formal	60	33.33
Informal	120	66.77
Total	**180**	**100**

Source: Field Survey, 2022

Table 2: Pooled Maximum Likelihood estimates of the determinants of economic efficiency of the seed processors

Variable	Parameters	Coefficient	Standard-error	t-ratio
Intercept	a_0	0.390	0.523	0.746
Z_1 = Age (Years)	a_1	-0.025	0.008	-3.195***
Z_2 = Sex (Male = 1; female = 0)	a_2	0.422	0.085	4.972***
Z_3 = Education (Years)	a_3	-0.174	0.065	-2.694**
Z_4 = Household size	a_4	-0.005	0.002	-2.392**
Z_5 = processing experience (Years)	a_5	-0.002	0.008	-0.296
Z_6 = Membership of association (1 = member, 0 = otherwise),	a_6	0.913	0.236	3.869***
Z_7 = Quantity processed per day (kg)	a_7	0.000	0.000	-11.305***
Sigma-squared	(σ^2)	0.213	0.016	13.511***
Gamma	(γ)	0.994	0.195	5.110***
Log-likelihood function		-27.262		
LR Test		41.571		

Source: Field survey data, 2023. *** and ** are significant at 1% and 5% respectively

Table 3: Maximum Likelihood estimates of the determinants of economic efficiency of formal credit-using seed processors

Variable	Parameters	Coefficient	Standard-error	t-ratio
Intercept	a_0	-2.245	1.081	-2.077**
Z_1 = Age (Years)	a_1	0.032	0.016	1.979**
Z_2 = Sex (Male = 1; female = 0)	a_2	-0.401	0.108	-3.708***
Z_3 = Education (Years)	a_3	-0.028	0.070	-0.407
Z_4 = Household size	a_4	-0.013	0.007	-1.873*
Z_5 = processing experience (Years)	a_5	0.031	0.012	2.611**
Z_6 = Membership of association (1 = member, 0 = otherwise),	a_6	-0.024	0.156	-0.157
Z_7 = Quantity processed per day (kg)	a_7	0.000	0.000	2.011**
Sigma-squared	(σ^2)	0.049	0.014	3.378***
Gamma	(γ)	0.385	0.108	3.559***
Log-likelihood function		14.317		
LR Test		12.405		

Source: Field survey data, 2023. *** and ** are significant at 1% and 5% respectively

Table 4: Maximum likelihood estimates of the determinants of economic efficiency of informal credit using cocoa seed processors

Variable	Parameters	Coefficient	Standard-error	t-ratio
Intercept	a_0	-0.158	0.054	-2.900**
Z_1 = Age (Years)	a_1	0.698	0.125	5.578***
Z_2 = Sex (Male = 1; female = 0)	a_2	-0.781	0.243	-3.211***
Z_3 = Education (Years)	a_3	-0.941	0.369	-2.553**
Z_4 = Household size	a_4	-0.277	0.036	-7.767***
Z_5 = processing experience (Years)	a_5	-0.005	0.011	-0.434
Z_6 = Membership of association (1 = member, 0 = otherwise),	a_6	0.384	0.180	2.129**
Z_7 = Quantity processed per day (kg)	a_7	0.000	0.000	-1.884*
Sigma-squared	(σ^2)	0.291	0.045	6.415***
Gamma	(γ)	0.992	0.159	6.257***
Log-likelihood function		-3.082		
LR Test		51.194		

Source: Field survey data, 2023

***** and ** are significant at 1% and 5% respectively.**