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Credit Use and Determinants of Economic Efficiency of Cocoa Seedlings Producing Entrepreneurs in South East Nigeria

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Abstract
This study examined credit use and the determinants of economic efficiency of cocoa seedlings-producing 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 comprising 60 formal credit users and 120 informal credit users 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 education, access to credits, extension contacts, cooperative membership, type of seed and farm size all showed positive signs and at different levels of significance. For the Fpenal Cresit Using entrepreneurs, household size, extension contacts, cooperative membership, type of seed and farm size all showed positive signs at different levels of significance respectively. For the Informal Credit Using entrepreneurs, age, education, household size, experience, the volume of credit, extension contacts, cooperative membership and farm size all showed positive signs at different levels of significance. The study recommends that efforts should be made by the government and other investors in agriculture to first consider the various factors identified by this study that influenced the economic efficiency of cocoa seedlings-producing entrepreneurs in South East Nigeria and to ensure the availability of hybrid seeds as hybrid varieties play an important role in increasing income of producing entrepreneurs and overcoming poverty.
Keywords: Cocoa, economic efficiency, credit, formal and informal, entrepreneurs, Seedlings producers, and South East Nigeria

IntroductionCocoa is one of the major cash crops that play a vital role in uplifting the country's economy, especially in providing employment, raw materials for industries and income to producing entrepreneurs (Erelu, 2019). Cocoa production has contributed immensely to the economic development of Nigeria and it is considered one of the major non-oil export crops. Cocoa is among the top agricultural export commodities in terms of foreign exchange. The Cocoa sub-sector employs a good number of people both directly and indirectly as farmers, seedlings producers, processors, licensed buying agents, marketers, and exporters. (Afolayan, 2020; Ejike and Chidiebere-Mark, 2019).Cocoa is one of the major sources of revenue for the governments of the cocoa-producing States and has contributed significantly to the Gross Domestic Product of the country. Additionally, cocoa is an important source of raw materials, as well as a source of revenue for the economy (Ejike and Chidiebere-Mark, 2019). Azunku (2021), reports that an estimate of about 30% of total cocoa produced in South-East Nigeria comes from Ebonyi State. The contribution of cocoa to these producing States (Ekiti, Ogun, Ondo, Osun, Oyo, Edo, Cross River, Delta, Akwa Ibom State, Imo, Abia, and Ebonyi, Kogi, Kwara, Adamawa and Taraba) is appreciably substantial, hereby boosting the economies of these States (Eze, 2018). Despite its contribution, cocoa growth witnessed a downward trend after the 1971 cropping season and kept on declining till date (Alao, Bamiri, and Kehinde, 2016). Akinagbe, (2015), and Olaiya (2016), in their studies, have ascribed this downward trend of cocoa production to a myriad of problems such as the dominance of smallholders in the cocoa production sector, constant use of farmlands, less emphasis on cocoa production, inadequate cocoa input subsidy programmes, poor agricultural credit financing and small cocoa farms.

Agricultural credit is necessary to enable the producing entrepreneurs to take advantage of new technologies in the form of machinery and pay for such items as improved varieties of seeds, fertilizers, pesticides, labour and other running cost (Nwaiwu, Iniovorua and Ogbonna, 2016). The credit facilities enable poor

producer entrepreneurs to employ higher resource and capacity utilization. It has been argued that inadequate level of agricultural credit facilities is a major factor preventing the adoption of innovative technologies, hence credit encourages the adoption of innovations leading to increased farm productivity and income, encourages the capital formation and improves efficiency (Toriola, Adewale, Lawal, and Aberu, 2022). Credit supply to processing entrepreneurs is perceived as a strategy for the transformation of the rural economy from poverty (Chima and Timothy, 2022). Producing entrepreneurs find it difficult to access formal credit because the financial institutions, which are supposed to provide formal financial credits, are controlled from headquarters located in the cities and, hence, cannot adequately cater for the needs of subsistence-producing entrepreneurs. Furthermore, the use of collateral, and the complicated procedures involved in securing credit coupled with the high interest rates charges, have restricted the access of farmers to funds in the formal credit sector (Friday *et al.,* 2016).

Efficiency involves using existing resources in the best possible way to produce the highest level of output for the given technological constraints. The efficiency of production is highly important for output growth. (Chikezie, Benchendo, Ibeagwa, Oshaji, and Onuzulu, 2020; Aliyu and Shelleng, 2019). According to Nguyen (2023), economic efficiency reflects the strong relationship between the quantity of output attained and the quantity of costs incurred in producing the output. An enterprise is economically efficient in resource use when it operates on the economic efficiency frontier. On the other hand, the economically inefficient enterprise operates below the efficiency frontier. An increase in the output would increase entrepreneurs' income and reduce poverty in rural areas. According to Popoola *et al.* (2015), cocoa productivity levels can be enhanced by improving efficiency. The older the cocoa trees, the lower the efficiency. The increase in cocoa production in Nigeria has only been achieved by increasing the land area and not increasing yield and efficiency. Other factors that account for the decline in Nigeria's cocoa yield, are low production per hectare, neglect of extension services, lack of encouragement for youth participation, poor grading and quality-related issues (Cocoa Farmers Association of Nigeria, 2020). Camillus, Fuseini, Isaac, Justice and Dadson (2022), revealed that the adoption of hybrid cocoa seedlings by producing entrepreneurs will increase economic efficiency. Superior varieties play an important role in increasing the income of producing entrepreneurs and overcoming poverty in rural communities (Effendy, Pratama, Rauf, Antara Basir-Cyio, and Mahfudz, 2019).

This study promotes and improves cocoa seedling production and ensures increased returns to the farmers to sustain their living standards. A result from studies like this is of immense relevance to cocoa seedlings producers, government and other stakeholders in the agricultural industry. The result of this study is expected to stimulate far-reaching concerns and draw attention to the need to ensure appropriate credit to cocoa seedling producers as credit is an economically relevant strategy for improving economic efficiency. The result of the study acts as a reference to the government, cocoa-producing entrepreneurs, investors in agriculture, non-governmental organizations, research institutes, government agencies and other corporate bodies in their dealing with the economic efficiency of cocoa seedlings producers according to credit use in Southeast Nigeria.

Empirical studies on the determinants of economic efficiency. Effendy *et al*. (2019), studied on determinants of the efficiency of cocoa farms. The study revealed that seed type, extension services, access to credit, access to market women participation and gender were significant and positive. They noted that the type of seeds used by cocoa farmers had a significant and positive impact on the technical, allocative, and economic efficiencies of cocoa farms, resulting in higher productivity. Another important variable their study noted was the number of extension services that was significant implying that extension and training could increase the technical, allocative and economic efficiencies of cocoa farms because extension and training activities play a major role in disseminating technology among farmers. Extension and training have the potential to increase economic efficiency, resulting in higher productivity. Also, access to credit had a significant and positive impact on efficiencies. This means that access to credit could increase the technical, allocative, and economic efficiencies of cocoa farms as access to credit can enable farmers to obtain the required farming inputs. Ogunmefun (2020), in his study on the assessment of technical, allocative and economic efficiency of cocoa farmers in Ondo State Nigeria. The variables of the maximum likelihood estimates showed that the age of farmers, educational level and farmers association were positive and significant while extension contact, farming experience and household size were not statistically significant.

Methodology

This study was carried out in the southeast agroecological zone of Nigeria. The South-east zone comprises five states namely: 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 and this comprises Abia State 3,727347 people, Imo State 5,408,756, Anambra State 5,527,809 people, Enugu State 4,411,119 people while Ebonyi State 2,880,303 people (NPC, 2017). The zone is located at latitudes 5006'N to 6034'N of the Equator and longitudes 6038'E and 8008'E of the Greenwich (Prime) Meridian (Microsoft Corporation, 2009). It has a tropical humid climate with two distinct seasons per year namely, the rainy and dry seasons. (Onyeneke and Maduekwe, 2010). The population of the study consisted of all seedlings-producing 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 States 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 production 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 cocoa seedlings-producing 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 and an oral interview. The researcher also aided respondents who were having trouble answering some of the questionnaire's questions, particularly those that they didn't understand. A maximum of 2 days was given to each responder 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 they 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 seedlings-producing 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:

$$\text{Exp}(-\mu i) = \alpha_0 + \alpha_1 z_1 + \alpha_2 z_2 + \alpha_3 z_3 + \alpha_4 z_4 + \alpha_5 z_5 + \alpha_6 z_6 + \alpha_7 z_7 + \alpha_8 z_8 + \alpha_9 z_9 + \alpha_{10} z_{10} \ldots\ldots\ldots 1$$

Where:

Exp(-μi) = Economic Efficiency of the ith cocoa seedlings producing entrepreneur,

Z_1 = age (years),

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

Z_3 = Level of education (years),

Z_4 = household Size (No),

Z_5 = level of experience (years),

Z_6 = Access to credit (1= yes, 0 = No)

Z_7 = Access to extension agent (Number visits per production cycle),

Z_8 = membership of farm association (1 = member, 0 = otherwise),

Z_9 = Type of seed (1 = hybrid, 0 = local),

Z_{10} = Farm size (hectare),

Z_{11} = Dummy (Formal Credit Use =1, Informal Credit Users =2)

δ0 = intercept,

Z_1 - Z_{11} = parameters to be estimated.

Results and Discussion

Categorize the Cocoa Seedlings Producing Entrepreneurs According to Credit Use

As shown in Table 1 below, the majority (66.77%) of the cocoa seedlings-producing entrepreneurs (accounting for about 120 entrepreneurs) used informal credit while the remaining (33.33%) cocoa seedlings-producing entrepreneurs (accounting for about 60 entrepreneurs) used formal credit. The result is in line with the findings of John and Charles (2015), in their studies on Determinates of Credit Sources at Anambra State. They noted that the majority (87.77%) of credit users used informal credit sources while (12.23%) of credit users used formal credit sources. This could be a result of a lack of collateral and a delay in loan approval/ disbursement from the formal credit sources. Also, Mgbakor *et al*. (2014), reported that entrepreneurs use informal credit sources because of easy accessibility, minimal formalities attached to accessing the credit, little demand or no demand for collateral securities and timely disbursement of the loans.

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 2, 3 and 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 FCU and ICU and five percent alpha level for Pooled credit users 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 91.9% (pooled), 95 % (FCU) and 90.1% (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 model. For the pooled sample, the coefficients of education, access to credits, extension contacts, cooperative membership, type of seed and farm size all showed positive signs at 1%, 1%, 10%, 5%, 5% and 5% levels of significance respectively. For the FCU entrepreneurs, household size, extension contacts, cooperative membership, type of seed and farm size all showed positive signs at 1%, 1%, 5%, 5% and 5% levels of significance respectively. For the ICU entrepreneurs, age, education, household size, experience, volume of credit, extension contacts, cooperative membership and farm size all showed positive signs at 1%, 5%, 1%, 5%, 5%, 10%, 10% and 1% levels of significance respectively while type of seed was negatively signed at 10% level of significance. The positive coefficient of age for ICU entrepreneurs implies that older producers are more economically efficient than younger cocoa seed producers. There is documented evidence that age

plays a crucial role in determining the EE of entrepreneurs. However, this role could be dual-directional. Education was positively signed for pooled and ICU producers implying that with an additional qualification or more years spent in school, EE would increase. That is, educated producers are more economically efficient. Ahmed *et al*. (2015), Mutoko *et al*. (2015), and Okoye *et al*. (2016) reported that education had a positive influence on the aforementioned efficiency. Ahmed *et al*. (2015) explained that educated farmers have an improved ability to interpret and utilize information about markets. Also, Nyagaka *et al*. (2010), and Kibirige, (2014) explained that entrepreneurs with more formal education are likely to adopt new technologies such as fertilizers and improved planting materials better than the less formally educated farmers, which improves their productivity. Such influence was also reported by Akpan *et al*. (2013), Mburu *et al*. (2014), Mutoko *et al*. (2015), and Thabethe & Mungatana (2014). Thabethe & Mungatana (2014) explained that entrepreneurs with formal education can acquire, analyze and comprehend important information about input mix and better production practices, which increases their ability to make timely decisions during production.

Household size was positive for FCU and ICU producers suggesting that larger households tend to be more economically efficient. This is true especially when the household members provide labour for the farm operations, thereby reducing the funds that could have been channelled into hiring labour. These saved funds could then be used for other productive activities. In all, the cost of production per unit output is reduced, thereby improving EE. The possible reason for this result might be that a larger household size guarantees the availability of family labour for farm operations to be accomplished in time (Alemu *et al*., 2022). At the time of peak seasons, there is a shortage of labour and hence households with large family sizes would deploy more labour to undertake the necessary farming activities like ploughing, weeding and harvesting on time than their counterparts and hence they are efficient in maize production. This might be because farmers with large family sizes had better capacity for optimal allocation of resources. This suggests that larger households may utilize family labour and reduce the costs incurred in hiring labour. This result was consistent with the findings of Sisay - Debebe (2016); and Awol - Ahmed (2016). A positive influence was also reported by Ayinde *et al*. (2015). Ayinde *et al*. (2015) and Ahmed *et al*. (2015) explained that many entrepreneurs depend on household labour to increase production due to its availability, inexpensiveness, and ease of timely allocation in different farm activities thereby increasing their economic efficiency.

Entrepreneurship experience was positive for the ICU sample. As entrepreneurs add to their years of experience, their EE is being enhanced. This follows from the fact that entrepreneurs draw from their wealth of experience before making certain decisions such as purchasing inputs, resource allocation and general farm management. Oumarou and Huiqiu (2016), explained that farmers who have planted a certain crop for a long time can predict accurately when to plant, the appropriate cropping materials, and the types and amounts of inputs to use in production. He noted that experienced farmers understand wetland soil and water conservation practices better than their inexperienced counterparts do and consequently maize production may be done throughout the year. This increases their productivity compared to their inexperienced counterparts. Credit access was positive for the pooled and ICU cocoa seed producers. Credit availability shifts the cash constraint outwards and enables farmers to make timely purchases of those inputs that they cannot provide from their sources. In other words, credit utilisation permits a household to enhance efficiency by removing money constraints which may affect their ability to apply inputs, implements and farm management decisions on time. A significant positive influence was reported by Karani-Gichimu *et al*. (2015), Ng'ombe & Kalinda (2015), and Wakili and Isa (2015). Ng'ombe & Kalinda (2015) explained that a properly used credit enhanced a more diversified farming system, which steadies and possibly improves productivity due to increased affordability of yield-improving resources. Also, Karani-Gichimu *et al*. (2015) explained that entrepreneurs who borrow credit feel that they must work hard to produce maximum output to repay the debts and still make profits.

Extension contacts were positive across all groups. This might be due to the reason that the information obtained from extension workers had the power to increase the awareness and know-how of farmers towards technologies and efficient utilization of the existing resources to decrease their inefficiency and wastage of resource use. As the extension workers frequently visit and follow up with farmers, farmers may obtain important and influential information to decrease their economic inefficiency. This finding was in line with Jude *et al*. (2011); Mustefa (2014) and Wollie *et al*. (2018). Cooperative membership was positive across all groups. Group membership has been found by other studies to positively influence both TE and EE (Sibiko, 2012; Mburu *et al*. 2014; Sanyang, 2014). Cocoa seed farmers who belong to farmer groups or associations can access input credits, agricultural training, and linkage to product markets among others. This improves their productivity due to the proper and efficient allocation of resources (Sanyang, 2014).

The type of seed used was positive for the pooled and FCU entrepreneurs while it was negative for ICU entrepreneurs. This discrepancy could arise from the cost associated with purchasing improved seedlings. Formal credit-using entrepreneurs may have more funds at their disposal which would enable them to purchase these special seedlings, unlike the ICU who may not have as much funds as their counterparts. Ahmed *et al*. (2015) and Haile (2015) also found credit access to be a positive determinant of EE. Sibiko (2012) explained that farmers who borrow money for agricultural

production afford yield-improving inputs such as improved seeds and fertilizers, and labour-saving inputs such as herbicides. This increases their yield while reducing some production costs, which translates to increased productivity, profitability and economic efficiency. Farm size was positive across the categories. This could probably be because farmers with larger areas of cultivated land can use compatible technologies that could increase the efficiency of the farmer. On the other hand, the smaller-sized farms are populated heavily by young and inexperienced people and therefore, they are expected to have lower average efficiency levels than large and more experienced farmers. Moreover, farmers who have large farm sizes would have an opportunity to use and allocate the maximum available resources efficiently because they do not have land size limitations. Additionally, farmers with large farm sizes may also have easier access to new improved agricultural technologies introduced into the area. Generally, large farm-size owners are more efficient as compared to small land-size owners (Alemu *et al*., 2022).

Conclusion

The efficiency of production is highly important for output. Cocoa productivity levels can be enhanced by improving efficiency and this can be attended by the adoption of hybrid cocoa seedlings by producing entrepreneurs. The result of the study has shown that for the pooled credit users, the coefficients of education, access to credits, extension contacts, cooperative membership, and type of seed and farm size all showed positive signs and were all significant. For the Formal Credit entrepreneurs, household size, extension contacts, cooperative membership, type of seed and farm size all showed positive signs were significance respectively. For the Informal credit entrepreneurs, age, education, household size, experience, volume of credit, extension contacts, cooperative membership and farm size all showed positive signs were significance respectively. Any policy aimed at dealing with credit use and economic efficiency of seedlings-producing entrepreneurs should prioritize factors such as education, access to credits, extension contacts, cooperative membership, type of seed and farm size, among others, which have a significant influence on the economic efficiency of cocoa seedlings producing entrepreneurs.

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Table 1: Categories of credit used by Cocoa Seedlings producing 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 entrepreneurs

Variable	Parameters	Coefficient	Std.error	t-ratio
Intercept	Z_0	0.000	1.000	0.000
Z_1	Z_1	0.000	0.000	-0.308
Z_2	Z_2	0.000	0.072	0.004
Z_3	Z_3	0.855	0.035	24.712***
Z_4	Z_4	-0.001	0.002	-0.336
Z_5	Z_5	0.001	0.005	0.285
Z_6	Z_6	0.107	0.005	21.166***
Z_7	Z_7	0.175	0.088	1.988**
Z_8	Z_8	0.158	0.055	2.845**
Z_9	Z_9	0.189	0.068	2.790**
Z_{10}	Z_{10}	0.190	0.080	2.387**
Z_{11}	Z_{11}	0.000	0.000	0.454
Sigma-squared	(σ^2)	0.043	0.006	7.867***
Gamma	(γ)	0.919	0.044	20.886***
Log-likelihood function		-26.955		
LR Test		7.148		

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 entrepreneurs**

Variable	Parameters	Coefficient	Std. error	t-ratio
Intercept	Z_0	-0.772	1.010	-0.765
Z_1	Z_1	0.000	1.111	0.000
Z_2	Z_2	-0.308	1.044	-0.295
Z_3	Z_3	0.004	1.065	0.004
Z_4	Z_4	24.712	1.115	22.156***
Z_5	Z_5	-0.336	1.041	-0.323
Z_6	Z_6	0.285	1.034	0.275
Z_7	Z_7	21.166	1.046	20.244***
Z_8	Z_8	1.988	1.004	1.981**
Z_9	Z_9	2.845	1.006	2.827**
Z_{10}	Z_{10}	2.790	1.005	2.775**
Z_{11})	Z_{11}	2.387	1.008	2.368**
Sigma-squared	(σ^2)	0.059	0.012	4.890***
Gamma	(γ)	0.950	0.114	8.333***
Log-likelihood function		-8.732		
LR Test		104.471		

Source: Field survey data, 2023
***and**aresignificantat1%and5%respectively**

Table 4: Maximum likelihood estimates of the determinants of economic efficiency of informal credit using entrepreneurs

Variable	Parameters	Coefficient	Std. error	t-ratio
Intercept	Z_0	1.044	0.002	522.070***
Z_1	Z_1	1.044	0.083	12.578***
Z_2	Z_2	1.042	0.993	1.049
Z_3	Z_3	1.043	0.441	2.366**
Z_4	Z_4	1.044	0.334	3.127***
Z_5	Z_5	1.047	0.446	2.348**
Z_6	Z_6	1.050	0.404	2.598**
Z_7	Z_7	1.040	0.606	1.717*
Z_8	Z_8	1.046	0.605	1.728*
Z_9	Z_9	-1.048	0.608	-1.724*
Z_{10}	Z_{10}	1.045	0.317	3.296***
Z_{11}	Z_{11}	1.046	0.070	14.948***
Sigma-squared	(σ^2)	1.043	0.004	258.778***
Gamma	(γ)	.904	0.050	18.080***
Log-likelihood function		162.402		
LR Test		10.114		

Source: Field survey data, 2023

***and**aresignificantat1%and5%respectively**