International Journal of Economics, Commerce and Management
United Kingdom ISSN 2348 0386 Vol. IX, Issue 10, Oct 2021

http://ijecm.co.uk/

AGRICULTURAL PRODUCTIVITY AND EDUCATION IN CAMEROON

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Abstract

The objective of this study is to investigate the relationship between the farmer's education level and their productivity in Cameroon. In order to achieve this goal, the researcher adopted the logistic regression model. Agricultural productivity was used as dependent variable, while sociodemographic and socio-economic characteristics were used as independent variables. The researcher used a random sample of 900 farmers in the Mbam et Kim division, (one of the divisions in the Center region of Cameroon). The study outcomes indicate that the farmers' education has a positive impact on their productivity. In addition, the educated farmers' productivity further increases when they are supported by some expertise. Some variables such as the farmer experience, his family size, his sex, the type of seed used as well as the rainfall frequency also appeared to be relevant factors determining the farmers' productivity. From these results, the researchers recommended the farmer literacy training, farmers mentoring by experts, gender promotion, availability of improved seeds, and a weather forecast that will help understanding the behavior of rainfall; in order to boost the famers' productivity.

Keywords: Literacy, Agricultural productivity, Education, Cameroon

INTRODUCTION

For the past decade, there have been an abundant development of literature on the relationship between productivity and education. Some authors have provided evidences supporting that there is a positive and significant relationship between an individual's education and their productivity (Canals et al. 2016; Oumbe et al. 2019; Habtamu, 2019; Luh, 2017; Ninh, 2021; Paltasingh, K.R et al. 2018). Among these researchers Arshad et al. (2015) shows that a high level of education plays a positive role in improving the productivity of an individual in Malaysia. In China, the study conducted by Fleisher et al. (2011) using data from 425 firms between 1998 and 2000 revealed that, there is a strong positive relationship between the average years of study and the individual productivity. In Africa, the study conducted by Aggrey et al. (2010) in Kenya, Tanzania and Burkina Faso, provide evidence that, the individual level of education is positively related to their productivity. As well, formal education, vocational and continuing training have proven to be the relevant factors affecting the productivity growth (Sala et al. 2013, Yakete-Wetonnoubena, 2019). Sala et al. (2013) also shows that one hour of vocational training improves the productivity rate by around 0.55 points in Europe over the period 1999 to 2005.

From the following development, it is obvious that education has a tremendous influence on productivity, it helps develop skills that make people more productive. According to the human capital theory, educated workers are better paid because they are more productive than those with less education, (Schultz 1961, Becker 1964). Schultz (1961) suggests that training and education are essential means to improve agricultural productivity and therefore agricultural income.

Indeed, the contemporary approach to education has been developed from the work of Schultz (1975), who founded the human capital theory. According to this theory, skills acquired in high school, university, technical education and vocational training improves the individual productivity as well as their income. Education, as an investment in human capital, is considered by that author as a growth factor, as it is supposed to support the labor productivity increase and to reduce income inequalities and poverty (Sundjo and Aziseh 2018). (Spence 1973) also claims that the human capital theory, which also deals with productivity, implies that education increases the individual productivity and hence induces a rise in market value of its labor". Consequently, much research has tested the impact of education on wages in order to evaluate its contribution to productivity. Mincer (1975) develops an econometric model that has become famous. Based on the theory of human capital designed by Becker (1964) according to which, economic agents, in order to decide whether or not to continue their studies, make a trade-off between the surplus wages that they will get from it, once they have entered the labor

market; the author concludes that the return to one additional year of study is conditioned in one hand by the proportionality between marginal productivity and the real wage, on the other hand by an imputation of the productivity related to one year study to the education system. Referring to the initial contributions of (Schultz 1961, Becker 1964, Mincer 1975), the fundamental assumption which constitutes the core of human capital theory is that education is an investment, for individuals and for the society as a whole; which increases the productivity of those who receive it and thereby induces their revenues increase. The first causality of this link comes from the fact that training, whether general or specific to a particular task, has (Becker 1964) a positive influence on individuals' productivity, by improving their skills and general knowledge and by directly providing them with qualifications, or an experience that is potentially applicable to the production process.

According to the human capital theory, there is a double relationship between education-productivity and productivity-remuneration. This implies that education will transfer knowledge which will help increasing the technical productivity and efficiency of the individual and thereby, increases the worker remuneration. Lockheed et al. (1980), using data of some developing countries, show that four years of elementary education increases a farmers' productivity by 8.7% on average. According to Jamison and Lau (1982) education has a significant impact on farmers production. Speaking of productivity, the advantage of educated producers, Lockheed et al. (1980) study also established that, the impact of education on productivity is 9.5% in moderns in developed countries, but only 1.3% in poor areas.

Education is the main driver of human development and also plays an important role in agricultural development. Schultz (1975) further deepens this argument by emphasizing that the optimal allocation of resources becomes crucial when agriculture is undergoing rapid transformation, but this requirement does not hold for traditional agriculture. Therefore, the return on education will be high in contexts of imbalance, but low in the stable environment. It is easy to infer from this development that education plays an important role in agriculture, mostly in an environment where people adopt modern practices; though, Spence (1973) claims that, the hypothesis according to which the role assigned to education consists in increasing the individual's productivity is debatable.

The release of the Cameroonian National Institute of Statistics (INS) in 2018 indicates that, over 80% of the Cameroonian population is involved in agriculture. However, the agricultural productivity still remains low, the country is still not self-sufficient, as proved the import of many staple foods. Indeed, in 2019, the annual productivity of cocoa in Cameroon was about 830 kg per hectare in average, the productivity of coffee 570 Kg/Ha, that of banana was of 10,360 kg / ha and that palm oil was of 4,600 Liters/Ha.

On the other hand, with a farmer illiteracy rate of 28.7% in Nigeria (lower than what observed in Cameroon), the annual productivity of the corresponding crops was relatively high during the same period. Namely, the annual productivity of cocoa was 1250 kg/ha, that of coffee 800 kg/ha and that of banana of 12,100 kg/ Ha. From these observations, it is relevant to investigate the relationship between the farmers educational level and their productivity in Cameroon.

Thus, the objective of this research is to analyze the relationship between the farmers' literacy as measured by their education level and their productivity.

METHODOLOGY

Model specification

The objective of assessing the role of farmers' literacy on their productivity was achieved by using the logistic model. More precisely, the binary Logit model of Hosmer et al. (2000) was applied to investigate the impact of education on the famers' productivity in Cameroon. Like any linear regression, the logistic model aims at evaluating the relationships between the dependent variable and one or more independent variables (Gourieroux, Thomas 2000). Unlike simple linear regression, the logistic regression is used when the dependent variable is qualitative. The explanatory variables can be qualitative or quantitative.

In this study, the dependent variable (Y) is the farmers' productivity, measured in term of annual agricultural yield. This variable is binary with two options: 1 if the annual yield is high; 0 otherwise. Knowing that the farmers' productivity is explained by others factors than literacy, we controlled for several others variables; namely, the farmers sex (Sex), their age (Age), marital status (M. Stat), access to land (Ld), external labor (Lb), seed used (Sd), amount of fertilizer used (Fert), agricultural practice (AgPrac), rainfall (Rf), experience in agriculture (Exp) and access to agricultural supervision (Sup). Using these control variables were relevant in order to provide better insight on the ceteris paribus effect of education on the farmers' productivity.

Our model is specified as follow:

$$Y_{t=}\ \beta_0 + \beta_i\, X_t\ + \varepsilon_t \qquad (1)$$

$$X_t = (\ Educ, Sex, Age, Exp, M.Stat, Ld, Lb, Sd, Fert, Rf, AgPrac, Sup)$$

Where,

$\beta_0\ and\ \beta_i$ are the parameters to be estimated

These variables are better described in the table 1.

Table 1: Variables Description

Variable	Variable Description	Variable's characteristics
Prod	Production in Kg/Hectare	0 = 730 Kg/Ha and 1= ≥730Kg/Ha
Sex	Farmer's sex	1 = Male and 0 = Female
Age	Farmer's age	1=less than 25 years; 2= [25 – 50] and 3 = more than 50 years
Educ	Farmer's literacy	0 = illiterate; 1 = Primary; 2 = secondary
Lab	Labor (define as able body family members)	1 = less than 4 persons; 2 =]4 – 8] persons; 3 =]8 - 12] persons; 4 = more than 12 persons
M.Stat	Matrimonial statute	1 = single; 2 = Married; 3 = Widow; 4 = Divorced
F.Me	Family members per households	1=]1-10] and 2=]10-20[
Ld	Land accessibility	1= Yes and 0 = No
AgrPrac	Agricultural practice	1=manual; 2=husbandry; 3=others
Rf	Annual rainfall	1=fair enough; 2= enough; 3=not enough
Fert	Quantity of fertilizers used in Kg	1=less than 10Kg; 2=]10 – 20] Kg; 3=]20 – 30] Kg; 4= more than 30 Kg
Sd	Type of seeds	0=non-improved; 1=improved
Exp	Years of experience	1=less than 4 years; 2=]4 – 6] years; 3 =] 6 – 8] years; 4 = more than 8 years
Sup	Farmer's supervision	1= having a mentorship support; 2= not having a mentorship support

Data Collection and Analysis

The research has been performed in the Mbam et Kim division, one of the divisions of the Center region of Cameroon. The choice of that division was motivated by the fact that, it is a place of so many strategic crops that makes the main exports and staple foods of the country. These are cocoa, coffee, banana, palm oil, cassava, maize groundnut and much more. We did a random sample across 900 farmers, using a structured questionnaire. To overcome the problems of bias, we used the triangularization method. The data was subjected to descriptive and inferential statistics. The data were analyzed using the SPSS software.

ANALYSIS AND RESULTS

Descriptive Statistics

The outcomes of the descriptive statistics indicate that the farmers' productivity in Cameroon remains low in our area of research. Precisely, the results show that 71.5% of farmers have low agricultural productivity against 28.5% of farmers who have relatively high

agricultural productivity. Furthermore, 58% of farmers have no education level, 26% of farmers have primary level and 16% have attained secondary or university. In addition, farmers who benefited from agricultural supervision represent 22% of our sample against 78% who did not. Analysis of the relationship between educational level and farmers productivity in Cameroon is performed by using four main crops, chosen with reference to their ranking on the country exports: cocoa, coffee, banana and palm oil. The indicator selected from the literature to capture agricultural productivity is agricultural annual yield measured in Kg/Ha for the three first products, and liters per hectare for the fourth.

Table 2: Farmers' productivity as function of literacy and mentorship

		Productivity in Kg/ hectare			
Education level	Having mentorship	Cocoa	Coffee	Banana	Palm oil
Illiterates	No	340	214	5000	<3000
	Yes	560	362	7800	4640
primary	No	730	460	9200	5300
	Yes	910	610	11600	6230
Secondary & university	No	1060	795	13500	7100
	Yes	1360	960	>15000	8400

Table 2 describes how the farmers' productivity in Cameroon varies according to the farmers literacy. Illiterate farmers have a very low productivity compared to farmers who have attained primary, secondary school or university. In Cameroon, productivity increases with the farmer's literacy. In addition, educated and uneducated farmers who have benefited from mentorship also have a higher level of productivity than their peers.

Model Estimation Results

To assess the relationship between the farmers' productivity and their education level, while controlling for other variables; the researcher first performed the objective criterion test, the most commonly used of which is the Kolmogorov-Smirnov correlation test. Indeed, before computing the Pearson correlation coefficients, it is necessary to check whether some conditions are satisfied, namely the variable normality. To this end, the Kolmogorov-Smirnov test allowed us to prove that our variables were all within 0.1, or greater than the 5% p-value threshold, which implies that these variables are normally distributed.

Table 3: Estimation results

Variables	Coefficients	Std.dev	T-Statistics	Significance
Constant	3,408	0.412	8.27	0.000
Age	18.106***	0.607	29.82	0.000
Stam	0.492	0.992	0.49	0.430
M.Stat	5.081**	1.702	2.98	0.011
Educ	33.401***	1.907	17.51	0.000
Ld	3.091	1.624	1.903	0.116
Lb	0.602	0.172	3.5	0.015
Sd	27.125*	3.423	7.92	0.000
AgPr	13.086*	1.802	7.26	0.000
Rf	18.312*	1.809	10.12	0.000
Exp	1.972*	0.843	2.33	0.076
Fr	0.012	3.914	0.0003	0.983
Sex	11.512**	1.608	7.18	0.001
Sup	57.097***	0.928	61.52	0.000
sample size: 900; likelihood: 967.21; LR chi2 :487,02; R^2:0,801				
significance level: 1% ***, 5%** 10% *				

Table 3 of the model estimation results indicates that, the explanatory variables are globally significant with the exception of some variables such as marital status (M. Stat), access to land (Ld), external labor (Lb) and the quantity of fertilizer used (Fert).

Discussion of the results

The investigation of the relationship between farmers productivity and their literacy, and namely when focusing on the scales used to evaluate the productivity “high level of productivity" and "low level of production", we notice that these two modalities are not uniformly distributed according to the education level, which leads to the conclusion that the more educated the farmers are, the more their agricultural productivity improves. In other words, the level of agricultural productivity in Cameroon is also linked to the level of education of the farmers. This is confirmed by Karl Pearson’s Chi-square independence test at the 5% level. As well, the relationship between the farmers’ productivity and their literacy is quite strong, which is in accordance with the results of the work of Yakete-Wetonnoubena, (2019). Indeed, our main independent variable, education, positively and significantly affects the productivity of farmers in Cameroon at the 5%; this result is in line with the findings of Rumberger and Russell (1987)

according to which improving the farmers' education level makes them more productive. Hence, the more educated the farmer, the more efficient he becomes, since farmers with an average or high level of education, improve their productivity more than those with a lower level of education, (Gurgand 1993). This result also indicates that the farmers literacy also has a significant and positive effect on the physical production in Cameroon, which is consistent with the evidences provided by previous works, namely (Arshad et al. 2015, Sala et al. 2013, Schultz 1961). Increasing the farmers education level by one year in Cameroon would improve their productivity by over 33%.

These results corroborate the human capital theory, which suggests that, educated people are better paid because they are more productive than those with less education (Canals et al. 2016, Fleisher et al. 2011). Educated farmers allocate their resources optimally, the more educated the farmer, the more efficiently they will use the production factors (Aggrey et al. 2010, Schultz 1975). Thus, literate Cameroonian farmers make good use of inputs and better adapt to environmental changes affecting their area. But our findings are also in contradictions with some others researches, providing evidence that that education does not have a positive effect on farmers productivity and efficiency (Gurgand et al. 1993).

The results of the model estimation further indicate that the influence of the control variables of the different types of crop growth is significant. The study confirms the existence of a positive relationship between gender and the farmers' productivity in Cameroon. Indeed, our study revealed that women farmers in Cameroon are more productive than men farmers in some type of crops, namely palm oil. This result supports the findings by (Sala et al. 2013). This result also supports the findings by Kane (2007), which reiterates the significant contribution of gender in the farmers' productivity. In fact, 55% of agricultural activity are predominantly female in palm oil sector in the Mbam et Kim division. Building technical capacity, and considering gender will therefore make it possible to increase women's productivity in the Mbam et Kim division. These recommendations apply to all the different farmers age categories; this is relevant as the data on the 2019 production indicates that, 60% of the production were carried out by adults, against 22% among the youngest and 18% among the oldest. Hence, support and advice efforts will not only allow adults to increase their production, but the young will need supervision to be more productive (Kane 2010). The family size also plays an important role in the farmers' productivity, the relationship between the two variables is significant. This implies that, the number of workers per farmer determines the agricultural output in the study area. Precisely, the results indicate that, one addition member in the farmer's family would make productivity to rise by 4.21%. Farmers with a high labor force have higher productivity, which corroborates the results established by Sen (1997), but do not support the empirical results from

the work by Alem et al. (2017). In addition, past experience in agriculture positively affects the farmers' productivity. The more experience the farmer, the more he produces, this result is in line with the finding by Gislain et al, (2018). Indeed, an additional one-year experience in agriculture would increase the farmer productivity by 1.97%, which is in line with the evidence provided by Bruinsma, (2017).

The regularity of rainfall is a relevant factor affecting farmers productivity as well; indeed, the results indicate that, an increase of rainfall by 1%, improves the farmers' productivity by over 18%. This result is consistent with the evidences provided by Kane (2010). The outcomes of the model estimation also indicate that there is positive and significant relationship between better agricultural practices and the farmers' productivity in Cameroon.

The more the farmer practice animal husbandry, the more he increases his productivity. Precisely, when the farmer shifts from to husbandry practices, he increases his agricultural productivity by 13% in Cameroon. This result confirms the findings by Gislain et al. (2018), according to which agricultural practice and productivity are positively related. Research result also revealed the existence of a positive and significant relationship between the type of seeds and the farmer productivity. Farmers using improved seeds obtain higher productivity than those using local or non- improved seeds. When the farmer switches from using non-improved seeds to improved seeds, his productivity increases by 27%, which is in line with the results of the work of Djamen and Ganou (2013).

The farmer mentorship by the experts also improves their productivity. When the Cameroonian farmers are supported by mentorship, their productivity increases by 57%. This result is consistent with the work of Jamison and Lau (1982). However, our empirical investigation suggests that, there is no evidence of the relationship between land and the farmers' productivity. This result can be explained by the fact that access to agricultural land is not yet binding in our study area. Hence, under this perspective, our results contradict the evidences by Gislain et al, (2018). which justifies the existence of a positive and significant relationship between access to land and the farmers' productivity. Likewise, the absence of a link between the use of fertilizers and the farmers' productivity could be explained by the under-usage of fertilizers on the crops.

CONCLUSION

Our study objective was to investigate the impact of farmers literacy on their productivity in Cameroon. Using the logistic model, and data sampled across 900 farmers of the Mbam et Kim division, in the Center Region of Cameroon, our research revealed that, the farmers literacy, as measured by their education level positively and significantly affects their

productivity. Farmers having a high level of education, use it to improve agricultural techniques, to optimally allocate resources, to accurately track the agricultural calendar, to better adapt to environmental changes and to make a wise mix of inputs that will boost their productivity. In addition, if the educated farmer benefits from agricultural supervision, his productivity further increases. Besides, certain variables such as the farmers experience, his family size, his sex, the type of seeds used and the regularity of rainfall are also relevant determinants of his productivity. Thus, from these findings, the researchers made some recommendations that might be useful for the country to improve its agricultural policy. These include: the farmer literacy training, farmers mentoring by experts, gender promotion, availability of improved seeds, and a weather forecast that will help understanding the behavior of rainfall; in order to boost the famers' productivity. While this article was focuses on the influence of literacy on farmer's productivity, a new trend in low incomes countries such as those in sub-Sahara Africa is a massive involvement in agriculture of younger generation with high literacy level and technology mastering, prompted both by high unemployment rate and the appealing prospect in the agribusiness. Investigate the involvement of that high literate generation in the agricultural productivity can be insightful.

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