

COMPARATIVE TECHNICAL EFFICIENCY OF INSURED AND UNINSURED COCOA FARM OPERATORS IN ONDO STATE, NIGERIA

Abraham Falola^{1*}, Ibrahim K. Banjoko² and Babatola O. Agboola¹

¹Department of Agricultural Economics and Farm Management, Faculty of Agriculture, University of Ilorin, P.M.B 1515, Ilorin, Kwara State, Nigeria

²Department of Agricultural Technology, Kwara State Polytechnic, P.M.B. 1375, Ilorin, Kwara State, Nigeria

Abstract: This study evaluates the technical efficiency of insured and uninsured cocoa farm operators in Ondo State, Nigeria. Study data were obtained from 60 insured and 60 uninsured farm operators. Descriptive statistics, stochastic frontier production function and t-test were used for the data analysis. The mean technical efficiency of the insured farm and uninsured farm operators was 76% and 70% respectively. Evidence from the t-test revealed that there was a significant difference between the technical efficiency of the insured and uninsured farm operators ($t\text{-cal.} = 2.513$; $p = 0.012$). The significant determinants for the output of the insured farm operators were farm size and the cost of pesticides while only the cost of pesticides was significant in determining output for the uninsured farm operators. The study therefore recommends policies aimed at promoting agricultural insurance among cocoa farmers, reducing the cost of pesticides, increasing farm size as well as encouraging young and well-educated individuals to insure their farming activities.

Key words: cocoa, technical efficiency, determinants, agricultural insurance.

Introduction

Cocoa is one of the major industrial tree crops that have largely dominated the export agriculture in West and Central Africa (Nyemeck Binam et al., 2008). The crop is not only important for macroeconomic balances but also for livelihoods of farm operators (Amos, 2007; Nyemeck Binam et al., 2008). This is also true about Nigeria, where the crop is its highest foreign exchange earner among all agricultural commodities and is the source of employment opportunities to a significant population of the country (Oseni, 2011; Falola et al., 2013).

In the 1960's, Nigeria accounted for about 15% of world cocoa production annually attaining a peak of about 304,800 tonnes and was the second largest

*Corresponding author: e-mail: falolaabraham@yahoo.com

producer of the crop in the world after Ghana (FAOSTAT, 2012). In recent years, however, Nigeria ranks fourth after Côte d'Ivoire, Indonesia and Ghana (FAOSTAT, 2012). Some of the reasons adduced for this were low yield, disease incidence, pest attack, vagaries of nature, inclement weather conditions and natural hazards (Obatolu et al., 2003; Oluyole and Sanusi, 2009; Falola et al., 2013). For these reasons, farmers are now taking agricultural insurance as a protective measure against unforeseen losses that could result from the effects of these challenges (Ada-Okungbowa and Abiola, 2011).

The technical efficiency of individual farmers is defined in terms of the ratio of observed output to the corresponding frontier output conditioned on the level of input used by the farmers (Muhammad-Lawal et al., 2009; Simonyan et al., 2012). Hence a production unit may be technically inefficient if it fails to produce maximum output from a given bundle of inputs and is therefore operating beneath its stochastic production frontier. Also, since scarcity of resources is a major factor that makes improvement in efficiency so important to any economic agent or society (Ambali, 2012), the need to use productive resources in a way that will minimize the gap between the actual and potential output of export crops, and cocoa in particular, is paramount to national development.

Formulating sound policies on improving productivity and efficiency within the agricultural sector particularly among cocoa producers through agricultural insurance requires a good knowledge of the current efficiency or inefficiency levels among the users and non-users of agricultural insurance as well as factors responsible for these levels. While many studies have focused on analysing technical efficiency of cocoa farmers in general (Amos, 2007; Nyemeck Binam et al., 2008; Kyei et al., 2011), none of them has attempted to make a comparative analysis of technical efficiency of insured and uninsured cocoa farm activities in particular. This is a research gap which this study was designed to fill. The outcome of the study is intended to guide in policy formulation and implementation on agricultural insurance. The specific objectives were to estimate the technical efficiency of insured and uninsured cocoa farm operators and to identify factors influencing their technical efficiency levels.

Material and Methods

The study area was Ondo State, Nigeria. The state is located in the south west geo-political zone of Nigeria and lies between longitudes 4°31' and 6°00' east of the Greenwich Meridian and latitudes 5°15' and 8°15' north of the Equator. The state is blessed with good climatic and ecological conditions suitable for agriculture and cocoa production in particular. The State accounts for about 50% of the Nigerian annual cocoa production (Ajayi et al., 2012; Falola et al., 2013).

Primary and secondary data were used for the study. Primary data were obtained with structured questionnaire from the respondents while secondary data were obtained from NAIC, Ministry of Agriculture, Agricultural Development Programme (ADP) of the state, journals and grey literature. The population for the study was made up of cocoa farmers in the state. Three-stage sampling technique was used in selecting study respondents. The first stage involved purposive selection of six local government areas (LGAs) popular for cocoa production in the state – Idanre, Ondo-West, Ile-Oluji/Oke-Igbo, Odigbo, Akure South and Owo. Then, based on the list of all clients in the selected LGAs provided by the state's office of the Nigerian Agricultural Insurance Corporation (NAIC), 60 farmers, whose cocoa farms were insured, were purposively selected. Thereafter, 60 uninsured cocoa farm operators were randomly selected from the LGAs already selected for the participating farmers. Thus, the total sample was composed of 120 respondents.

The data collected were analyzed with descriptive statistics, stochastic frontier model and t-test. Descriptive statistics was used to analyze the socio-economic attributes of the respondents and to present the results of the findings. The stochastic frontier model was used to estimate the level of technical efficiency in cocoa production activities and to identify its determinants. The technical efficiency of an individual farmer is defined in terms of the ratio of observed output to the corresponding frontier output conditioned on the level of input used by the farmer (Ambali et al., 2012). Hence, the technical efficiency (TE) of the respondents was expressed as:

$$TE_i = Y_i/Y_i^* = f(X_i; \beta) \exp(V_i - \mu_i) / f(X_i; \beta) \exp V = \exp(-\mu_i) \quad (1)$$

where:

Y_i : The observed output;

Y_i^* : The frontier output;

TE: Ranges between 0 and 1.

The Cobb-Douglas functional form of the model was used because the functional form meets the requirement of being self-dual and has been applied in many empirical studies (Amos, 2007; Ambali et al., 2012; Balogun et al., 2012; Simonyan et al., 2012). The model is specified as:

$$\ln Y_i = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + V_i - \mu_i \quad (2)$$

where:

Y_i : Cocoa output from i-th farmer in kilogrammes;

X_1 : Cost of pesticides including fungicides and insecticides in naira;

X_2 : Fertilizer in kilogramme;

X_3 : Farm size in hectares;

X_4 : Labour in man-days;

V_i : Random variability in the production that cannot be influenced by the farmer. V_i s are assumed to be independent and identically distributed random errors having normal $N \sim (0, \delta v^2)$ distribution and being independent of μ_i .

μ_i : Deviation from maximum potential output attributed to technical inefficiency. The μ_i is assumed to be non-negative truncation of the half-normal distribution. $N \sim (\mu, \delta \mu^2)$.

β_0 : Intercept;

$\beta_1 - \beta_6$: Estimated production function parameters.

The technical inefficiency effects, μ_i is defined as:

$$\mu_i = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5 + \delta_6 Z_6 + \delta_7 Z_7 + \delta_8 Z_8 \quad (3)$$

where:

μ_i : Inefficiency effect;

Z_1 : Age of the farmer in years;

Z_2 : Educational level of farmer in years of successful academic pursuit;

Z_3 : Household size;

Z_4 : Farming experience in years;

Z_5 : Access to extension services, rated 1 if the farmer had access and 0 if otherwise;

Z_6 : Farm age of cocoa plantation in years;

Z_7 : Membership of cooperative, rated 1 if the farmer was a member and 0 if otherwise;

Z_8 : Shade index.

The δ_0 and δ_i coefficients are unknown parameters estimated along with the variance parameters δ^2 and γ . The δ^2 indicates the goodness of fit and the correctness of the distributional form assumed for the composite error term. The γ measures the total variation of output from the frontier which can be attributed to technical inefficiency. The estimates of all the parameters of the stochastic frontier production function and the inefficiency model were simultaneously obtained using the program FRONTIER version 4.1 (Coelli, 1996).

The t-test was used to determine whether there was any significant difference between levels of technical efficiency across groups of respondents. The formula as adapted from Koutsouyianis (2003) is given below:

$$T = \frac{\bar{X}_1 - \bar{X}_2}{S_{\bar{x}_1 - \bar{x}_2}} \quad (4)$$

where:

$\bar{X}_1$ = Mean of the technical efficiency of farmers whose farms were insured;

$\bar{X}_2$ = Mean of the technical efficiency of farmers whose farms were not insured;

$S_{\bar{x}_1 - \bar{x}_2}$ = Difference between the standard deviation of the technical efficiency of farmers whose farms were insured and those whose farms were not.

Results and Discussion

Socio-economic characteristics of the respondents

Table 1 shows the socio-economic profile of the respondents. The majority of them were of the male gender and made up about 90% and 98.3% of those whose farms were insured and those whose farms were not insured respectively. The majority of those whose farms were insured were within the age range of 21–50 years while only 50% of their counterparts were within this range. Also, the mean ages of those whose farms were insured and those whose farms were not insured were 42 years and 48.9 years respectively.

Table 1. Socio-economic profile of the respondents.

Variable	Category	Farmers whose farms were insured (N = 60)		Farmers whose farms were not insured (N = 60)	
		Frequency	Percentage	Frequency	Percentage
Sex	Male	54	90.0	59	98.3
	Female	6	10.0	1	1.7
Age (years)	21–30	10	16.7	4	6.7
	31–40	16	26.7	5	8.3
	41–50	19	31.7	21	35.0
	51–60	15	25.0	25	41.7
	> 60	-	-	5	8.3
Marital status	Single	5	8.3	2	3.3
	Married	43	71.7	46	76.7
	Widowed	12	20.0	9	15.0
	Divorced	0	0	3	5.0
Household size	1–5	13	21.7	13	21.7
	6–10	47	78.3	45	75.0
	≥10	0	0	2	3.3
Educational level of household head	Non formal	2	3.3	45	75.0
	Primary	14	23.3	13	21.7
	Secondary	38	63.3	2	3.3
	Tertiary	6	10.0	0	0
Farming experience (years)	≤10	27	45.0	21	35.0
	11–20	22	36.7	29	48.3
	21–30	10	16.7	9	15.0
	>30	1	1.7	1	1.7
Farm size (ha)	1–10	55	91.7	58	96.7
	11–20	3	5.0	1	1.7
	>20	2	3.3	1	1.7
Access to agricultural extension services	Have access	45	75.0	42	70.0
	No access	15	25.0	18	30.0
Membership of cooperative	Member	56	93.3	55	91.7
	Non-member	4	6.7	5	8.3

These results suggest that more of the policyholders were in their active/productive age than the non-policyholders. The majority of the both groups of farmers were married and they constituted 71.7% and 76.7% of the insured farm operators and uninsured farm operators respectively. About 78.3% of each group of the respondents had a household size of 6–10 persons.

As regards the educational attainment of the respondents, those whose farms were insured accounted for 96.7% while those whose farms were not insured were 25%. This suggests that formal education could account for the access to agricultural insurance facilities which the former group had.

About 55% and 65% of the policyholders and non-policyholders respectively have been in cocoa production for more than ten years. Further analysis showed that the mean years of farming experience of the policyholders and non-policyholders were 14.9 years and 15.3 years respectively. This suggests that cocoa production is an age-long venture to both groups of farmers.

The farm size of most of the respondents ranged from 1 to 10 ha. Further analysis revealed that the average farm size of those whose farms were insured was 7.5 ha while those with uninsured farms had average farm size of 4.2 ha. Those that had access to agricultural extension services among the farmers whose farms were insured accounted for 75% while those with uninsured farms were 70%. Those who were members of cooperatives among the farmers whose farms were insured and those whose farms were not members were 93.3% and 91.7% respectively.

Technical efficiency analysis

Table 2 shows the summary of technical efficiency of the respondents. Technical efficiency of the insured farm operators ranged from 0.13 to 0.99, with an average of 0.76. The technical efficiency of the uninsured farm operators ranged from 0.15 to 0.92, with an average of 0.70.

Table 2. Distribution of respondents by level of technical efficiency.

Level of efficiency	Farmers whose farms were insured					Farmers whose farms were not insured				
	Frequency	Percentage	Min.	Max.	Mean	Frequency	Percentage	Min.	Max.	Mean
0.11–0.20	3	5.0	0.13	0.15	0.14	2	3.3	0.15	0.20	0.18
0.21–0.30	2	3.3	0.22	0.25	0.24	3	5.0	0.24	0.30	0.26
0.31–0.40	2	3.3	0.34	0.34	0.34	2	3.3	0.36	0.39	0.38
0.41–0.50	1	1.7	0.49	0.49	0.49	4	6.7	0.46	0.50	0.48
0.51–0.60	3	5.0	0.57	0.59	0.58	6	10.0	0.52	0.54	0.52
0.61–0.70	6	10.0	0.61	0.69	0.66	8	13.3	0.62	0.67	0.63
0.71–0.80	9	15.0	0.71	0.79	0.76	8	13.3	0.72	0.76	0.73
0.81–0.90	13	21.7	0.82	0.90	0.81	12	20.0	0.82	0.90	0.84
>0.90	21	35.0	0.91	0.99	0.97	15	25.0	0.91	0.92	0.92
Sample	60	100	0.13	0.99	0.76	60	100	0.15	0.92	0.70

Source: Field survey, 2013.

The results of t-test on Table 3 show that there is a significant difference in the levels of technical efficiency of the two groups of farmers (t-cal. = 2.513; $p = 0.012$). This could be attributed to a tendency for protection against possible eventualities which the insured farm operators had in contrast to their counterparts. Notwithstanding, the mean values obtained indicate that if the efficiency of input usage by the policyholders and non-policyholders is increased by 24% and 30% respectively, the farmers will be operating on the production frontier.

Table 3. Technical efficiency comparison between insured and uninsured farm operators.

Source	Mean	Difference	t	Probability level
Farmers whose farms were insured	0.76	0.06	2.513**	0.012
Farmers whose farms were not insured	0.70			

**Significant at 5% ($p \leq 0.05$). Source: Field survey, 2013.

Estimated production function of the respondents

Table 4 shows the maximum likelihood estimates of the respondents. The estimated variance (σ^2) was statistically significant at 5% and 1% for the insured farm operators and uninsured farm operators respectively, indicating goodness of fit and correctness of the specified distribution assumption of the composite error terms. The gamma (γ) was estimated at 0.93 and 0.89 for the insured farm operators and uninsured farm operators respectively and was significant at 5% and 1% for the insured farm operators and uninsured farm operators respectively. This implied that 93% and 89% of the total variation in the farm output of the insured farm operators and uninsured farm operators farmers respectively were due to technical inefficiency. As revealed in Table 4, two variables (cost of pesticides and farm size) were significant in determining the output of the insured farm operators while only one variable (cost of pesticides) significantly influenced the output of the uninsured farm operators in the study area. The results further indicate that the cost of pesticides contributed negatively while farm size contributed positively to the output of the insured farm operators at 1% and 5% respectively. Also, the cost of pesticides negatively influenced output of the uninsured farm operators at 1%.

Determinants of technical efficiency

Table 4 further shows that age and educational level were the significant variables influencing technical efficiency of the insured farm operators while the significant variables influencing technical efficiency of the uninsured farm operators were educational level and membership of cooperatives. The coefficient

of age of the insured farm operators was significant at 5% and positively related to their technical inefficiency (or negatively related to technical efficiency). This implies that the older an insured farm operator is, the less the technical efficiency will be and vice versa.

Table 4. Maximum likelihood estimates of the stochastic production frontier function of the insured and uninsured farm operators.

Variable	Parameters	Farmers whose farms were insured	Farmers whose farms were not insured
Constant	β_0	5.5692(15.5936)***	5.4549(13.0401)***
Cost of pesticides	β_1	-0.1754(-4.4283)***	-0.1914(-3.7478)***
Fertilizer	β_2	0.0616(1.0664)	0.0279(0.2693)
Farm size	β_3	0.1422(2.0273)**	0.0310(0.2564)
Labour	β_4	0.0766(1.0641)	-0.0055(-0.0526)
<i>Inefficiency model</i>			
Constant	z_0	-3.7488(-1.4460)	-2.6735(-0.8900)
Age	z_1	1.1272(2.2489)**	0.6780(0.9889)
Educational level	z_2	-1.3791(-2.1383)**	-0.5231(-1.7941)*
Household size	z_3	1.0273(1.4768)	0.8565(1.5512)
Farming experience	z_4	-0.6675(-1.5528)	0.0894(0.3702)
Access to extension services	z_5	-0.1417(-0.4732)	-0.5342(-1.1312)
Farm age of plantation	z_6	0.2310(0.5659)	-0.1122(-0.2643)
Membership of cooperative	z_7	-2.2449(-1.3197)	-2.5744(-2.0439)**
Shade index	z_8	0.0855(1.2078)	0.0573(0.6399)
Sigma-squared	σ^2	0.3746(2.3738)**	0.2732(3.4910)***
Gamma	γ	0.9308(2.4248)**	0.8874(25.2200)***
LR		64.32	44.21

Notes: Figures in parenthesis are t-values; *, ** and *** represent significance at 10%, 5% and 1%, respectively. Source: Field survey, 2013.

This is logical as older policyholders are likely to be less energetic and innovative to work and as such may not necessarily be technically efficient (Ajibefun and Aderinola, 2004; Muhammad-Lawal et al., 2009; Falola et al., 2013). Also, coefficients of educational level of both the insured farm operators and uninsured farm operators were significant at 5% and 10% respectively and negatively related to the technical inefficiency of the farmers. This indicates that the more educated the farmers were, the more technically efficient they were. This conforms to *a priori* expectation and is in line with previous findings (Amos, 2007; Kyei et al., 2011). Table 2 also shows that the coefficient of membership of

cooperative was significant at 5% and negatively related to technical inefficiency (hence, positively influenced the technical efficiency) of the uninsured farm operators. However, this variable was not significant in the case of the insured farm operators. This could likely result from the fact that joining cooperative societies by the non-policyholders could be a means of providing cushion effects to them in case of any form of loss, since this group could not have the benefits inherent in agricultural insurance which their counterparts had. This might explain why membership of cooperative positively influenced the technical efficiency of the uninsured farm operators.

Conclusion

This study has established that insured cocoa farms were more technically efficient than their counterpart, uninsured farms. However, both groups of respondents did not attain their maximum technical efficiency. As such, there is room for improvement in their level of technical efficiency in cocoa production. The coefficients of age and educational level were significant in determining the technical efficiency of insurance takers, whereas educational level and membership of cooperatives were the factors that were significant to the technical efficiency of the farmers whose farms were not insured.

Therefore, there is the need for government and agricultural development organizations to sensitize cocoa farmers to the relevance of agricultural insurance to farm productivity. Besides, policies that will reduce the cost of pesticides incurred by farmers should be put in place. Also, measures that will encourage the young and well-educated individuals to take agricultural insurance should be implemented and/or overhauled.

References

- Ada-Okungbowa, C.I., Abiola, M.O. (2011): Expenditure profiles of insured and un-insured farm operators in Edo and Delta States, Nigeria. In: Erhabor, P.O., Ada-Okungbowa, C.I., Emokaro, C.O., Abiola, M.O. (Eds.), *From farm to table: Wither Nigeria*, Proceedings of the 12th Annual Conference of the Nigerian Association of Agricultural Economists, pp. 567-572.
- Ajayi, I.R., Afolabi, O.M., Fayose, R.S., Sunday, A.G. (2012): Modeling temperature as a constraining factor for cocoa yield in Ondo State. *American International Journal of Contemporary Research* 2(7):172-178.
- Ajibefun, I.A., Aderinola, E.A. (2004): Determinants of technical efficiency and policy implication in traditional agricultural production: An empirical study of Nigerian food crop farmers. Final report presented at bi-annual research workshop of African Economic Research Consortium Nairobi, Kenya.
- Ambali, O.I., Adegbite, D.A., Ayinde, I.A., Oyeyinka, R.A. (2012): Comparative analysis of technical efficiency of beneficiary and non-beneficiary food crop farmers of Bank of Agriculture in Ogun State, Nigeria. *ARPN Journal of Agricultural and Biological Science* 7(12):1038-1047.

- Amos, T.T. (2007): An analysis of productivity and technical efficiency of smallholder cocoa farmers in Nigeria. *Journal of Social Sciences* 15(2):127-133.
- Balogun, O.L., Adeoye, A., Yusuf, S.A., Akinlade, R.J., Carim-Sanni, A. (2012): Production efficiency of farmers under national Fadama II project in Oyo state, Nigeria. *International Journal of Agricultural Management and Development* 2(1):11-24.
- Coelli, T.J. (1996): A guide to Frontier version 4.1c: A computer program for stochastic Frontier production and cost function estimation. Department of Econometrics, University of New England, Armidale, Australia.
- Falola, A., Ayinde, O.E., Agboola, B.O. (2013): Willingness to take agricultural insurance by cocoa farmers in Nigeria. *International Journal of Food and Agricultural Economics* 1(1):97-107.
- FAOSTAT (2012): Food and agricultural commodities production by countries. <http://faostat.fao.org/site/339/default.aspx>.
- Koutsogiannis, A. (2003): *Theory of econometrics*, 2nd edition. Palgrave, New York, USA.
- Kyei, L., Foli, G., Ankoh, J. (2011): Analysis of factors affecting the technical efficiency of cocoa farmers in the Offinso district - Ashanti region, Ghana. *American Journal of Social and Management Sciences* 2(2):208-216.
- Muhammad-Lawal, A., Omotesho, O.A., Falola, A. (2009): Technical efficiency of youth participation in agriculture: A case study of the youth-in-agriculture programme in Ondo State, Southwestern Nigeria. *Nigerian Journal of Agriculture, Food and Environment* 5(1):20-26.
- Nyemeck Binam, J., Gockowski, J., Nkamleu, G.B. (2008): Technical efficiency and productivity potential of cocoa farmers in West African countries. The Sustainable Tree Crop Program (STCP) Working Paper Series 7. International Institute of Tropical Agriculture, Yaounde, Cameroon.
- Obatolu, C.R., Fashina, A.B., Olaiya, A.O. (2003): Effects of climatic changes on cocoa production in Nigeria. *Proceeding of African Crop Science Conference* 5:957-959.
- Oluyole, K.A., Sanusi, R.A. (2009): Socioeconomic variables and cocoa production in Cross River State, Nigeria. *Journal of Human Ecology* 25(1):5-8.
- Oseni, J.O. (2011). Value chain analysis of of cocoa in Ondo State, Nigeria. In: Erhabor, P.O., Ada-Okungbowa, C.I., Emokaro, C.O., Abiola, M.O. (Eds.), *From farm to table: Wither Nigeria*, Proceedings of the 12th Annual Conference of the Nigerian Association of Agricultural Economists, pp. 232-236.
- Simonyan, J.B., Olukosi, J.O., Omolehin, R.A., Atala, T.K.A. (2012): Productivity and technical efficiency among beneficiary farmers of Second National Fadama Project in Kaduna State, Nigeria. *American Journal of Experimental Agriculture* 2(1):102-110.

Received: March 19, 2014

Accepted: May 30, 2014

UPOREDNA TEHNIČKA EFIKASNOST OSIGURANIH I NEOSIGURANIH
FARMERA KOJI SE BAVE PROIZVODNJOM KAKAOA
U DRŽAVI ONDO U NIGERIJU

Abraham Falola^{1*}, Ibrahim K. Banjoko² i Babatola O. Agboola¹

¹Odsek za agroekonomiju i farm menadžment, Poljoprivredni fakultet,
Univerzitet u Ilorinu, P.M.B 1515, Ilorin, država Kvara, Nigerija

²Odsek za poljoprivrednu tehnologiju, Politehnička škola države Kvara,
P.M.B. 1375, Ilorin, država Kvara, Nigerija

R e z i m e

Ovaj rad se bavi procenom tehničke efikasnosti osiguranih i neosiguranih farmera koji se bave proizvodnjom kakaoa u državi Ondo u Nigeriji. Podaci za rad su dobijeni od 60 osiguranih i 60 neosiguranih farmera. Za analizu podataka su korišćeni deskriptivna statistika, stohastička granična proizvodna funkcija i t-test. Srednja tehnička efikasnost osiguranih i neosiguranih farmera je bila 76% odnosno 70%. Rezultati t-testa su pokazali da postoji značajna razlika između tehničke efikasnosti osiguranih i neosiguranih farmera ($t\text{-cal.} = 2,513$; $p = 0,012$). Determinante koje su bile značajne za produktivnost osiguranih farmera su veličina gazdinstva i cena pesticida, dok je u određivanju produktivnosti za neosigurane farmere bila značajna samo cena pesticida. U radu se, stoga, preporučuju politike koje imaju za cilj promovisanje poljoprivrednog osiguranja među proizvođačima kakaoa, smanjenje cene pesticida, povećanje veličine gazdinstva, kao i ohrabrivanje mladih i obrazovanih pojedinaca da osiguraju svoje poljoprivredne aktivnosti.

Ključne reči: kakao, tehnička efikasnost, determinante, poljoprivredno osiguranje.

Primljeno: 19. marta 2014.

Odobreno: 30. maja 2014.

* Autor za kontakt: e-mail: falolaabraham@yahoo.com