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TECHNICAL EFFICIENCY OF SMALL-SCALE COWPEA PRODUCTION IN BALI AND GASSOL LOCAL GOVERNMENT AREAS OF TARABA STATE

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ABSTRACT

The study examined the technical efficiency of small-scale cowpea production in Bali and Gassol Local Government Areas of Taraba State, Nigeria. The specific objectives were to; describe the socio-economic characteristics of cowpea farmers in the study area; estimate the technical efficiency of cowpea production and identify the underlying factors influencing technical inefficiency of the farmers. A multi-stage sampling procedure was adopted. Primary data were collected from the farmers through the use of a structured questionnaire. Descriptive statistics, Stochastic Frontier production function and Gross Margin were used for the analysis of the data. The mean age of the farmers to be 33years, the majority (97.2%) of the farmers had some form of education. The average household size was eight persons, while majority (62.94%) of the farmers were not members of a cooperative society. Majority (55.94%) of the farmers had farm size of two or less hectares. The parameters of the stochastic frontier production function revealed that farm size, seed, labour and agrochemical were statistically significant at 1 and 5% levels. The mean technical efficiency was 87%. Also, age, farm size, farming experience, educational level, cooperative association and extension contact were the socio-economic variables that influence technical efficiency of the farmers. However, gender, access to credit and household size were found to be the sources of technical inefficiency of the farmers. It was recommended that farmers should be encouraged to join cooperative society and extension services agents should intensify their efforts in training and mobilizing farmers for improved production of cowpea.

Keywords: Production, Technical efficiency and Determinants

INTRODUCTION

Cowpea is also one of the most important economic crops in the tropics for the fact that all of its parts are useful for human consumption and for the provision of livestock feed. The bacteria in the root nodules contribute to soil fertility through fixation of nitrogen in the soil and production of organic matter, making it a valuable crop for resource-poor farmers (small scale farmers) and well suited for inter-cropping with other crops (Tijani *et al.,* 2015).

Smallholder farmers are those farmers owning small-based plots of land on which they grow subsistence crops and one or two cash crops relying almost exclusively on family labour (Isah, 2017). By international standard, a farm that is less than 10 hectares is classified as small scale (Mgbenka and Mbah*,* 2016). More than 80 per cent of farmers in Nigeria are smallholder farmers (Salisu *et al.,* 2018). Agriculture is a major contributor to Nigeria's Gross Domestic Product (GDP) and small-scale farmers play a dominant role in this contribution. A small-scale farmer depends on his efficiency in the utilization of basic production resources available to him. The small-scale farmer is the main producer of 98 per cent of the food consumed in Nigeria with the exception of wheat (Mgbenkaand Mbah, 2016).The demand for cowpea in Nigeria has been soaring. Rising demand is partly as a result of increasing population growth, increased income levels, rapid urbanization and associated changes in family occupational structures. The production and socio-economic characteristics of the farmers, inconsistent government policies, the poor infrastructural base, all interact and affect the agricultural sector, resulting in low production, high price of food items, under-development and poverty. Most farmers in Nigeria, including cowpea farmers practice subsistence farming with low productivity. This is mostly associated with technical inefficiency resulting from the farmers' lack of access to appropriate production inputs and relevant information that could guide them to higher and efficient production (Kuzhkuzha *et al*., 2019).

With increasing population over the years the demand for cowpea had gone up but the production has not been increased significantly (Agwu, 2001) in (Azeez, *et al*., 2018). In essence, the supply side of cowpea production in Nigeria does not meet its demand due to some factors related to production processes, pest and diseases and economic factors (Ayodele *et al*., 2013). The smallholder farming systems have remained traditional and non-commercial oriented. Thus, the system is unable to sustain the ever-increasing population with food and energy demands. Therefore, an ever-increasing population pressure and environmental degradation followed by declining productivity and expansion of marginal agricultural lands necessitates farmers either to use modern technologies or need to use resources efficiently in order to optimize outputs. Because of the scarce resources that are on ground, recently it is getting importance to use these resources at the optimum level which can be determined by efficiency searches. Thus, increasing crop production and productivity among smallholder producers requires a good knowledge of the current efficiency/inefficiency level inherent in the study area as well as factors responsible for this level of efficiency/inefficiency. Hence, this study evaluated the technical efficiency of cowpea and also identified the factors affecting the inefficiency of cowpea farmers in the study area. The main objective of this study is to determine the technical efficiency of small-scale cowpea production in Bali and Gassol Local Government Areas of Taraba State, Nigeria. The specific objectives were to:

i. describe the socio-economic characteristics of cowpea producers in the study area;
ii. estimate the level of technical efficiencies of cowpea producers in the study area and
iii. determine the factors affecting the technical inefficiencies of cowpea producers in the study area

METHODOLOGY

The Study Area

The study was conducted in Bali and Gassol Local Government Areas. Bali and Gassol Local Government Areas are located in the central zone of Taraba State. The study area lies between Latitude 8º 29′00′′ North of the Equator and Longitude 8º 33′00′′East of the Greenwich Meridian (Taraba State Government, 2015).

The study area falls within the Tropical Savannah climate and the Sudan Savannah Vegetation belt of Nigeria with an estimated annual rainfall range of 500mm to 1000mm, (Adekola *et al.*, 2015). Farming is the key economic activity in the study area producing crops such as cowpea, millet, rice, onions etc. Other occupations in the study area include animal rearing, hunting, trading, fishing etc. The study area comprises several towns and villages such as Gunduma, Agungu, Samda, Yerima, Jafuma, Takai, Wurno, Gargala, Bali, Bakundi, Gangumi, Kaigama, Suntai, Maihula, Takalafiya, Pamanga, Maikarfi e.t.c. A number of languages such as Mumuye, Hausa, Fufulde and Jukun are spoken in the area while Islam and Christianity are the most practiced religions in the study area. The study area has land area of 14,694KM^2 with an estimated population of 453,684 people (NPC, 2006). The National Population Commission had projected an annual growth rate of 3.5% which brought the population figure to 675,989 people as at 2020.

Data collection

Primary data was used for this study. It was obtained using a structured questionnaire. Data collected include: the socio-economic characteristics of farmers such as age, sex, farm size, marital status, household size, educational level, farming experience, access to credit and membership of cooperative. Data on the inputs such as labour, fertilizer, seed, agro-chemical and farm size and outputs were also obtained.

Sampling procedure and sample size

Multi-stage sampling procedure was employed in the selection of the respondents. In the first stage, Bali and Gassol Local Government areas were purposively selected based on their predominance in cowpea production. In the second stage, five wards were purposively selected from the two (2) Local Government areas, each due to intensity in cowpea production to give a total of 10 wards. The respondents were randomly selected in each of the wards using Yamane, (1967) Formula to get a total of one hundred and forty-three respondents.

Taro Yamane Formula

$$n = \frac{N}{1 + N(r^2)}$$

RESULTS AND DISCUSSION

Socioeconomic Characteristics Cowpea Farmers

Result of the analysis presented in Table 1 shows that most of the respondents were within the range of 20-39 years of age, which constituted 74.12%. Also, 18.88% of the respondents were within the age bracket of 40-49 years, while 6.99% attained the age of 50 years and above. The mean age was 33 years which implies that majority (74.12%) of the respondents were in their active age (20-39), hence they can use their strength effectively to boost agricultural production. This result agrees with the findings of Joshua *et al.* (2019) on their study in of Mubi South Local Government Area of Adamawa State, recorded that the majority (82%) of the respondents were in their youthful age (20-49) and were active and very productive.

The result shows that majority (97.20%) had some form of formal education. This result reveals that the respondents are educated and are likely to be receptive to new and improved innovations that could lead to increase in output compare to those without formal education. This finding agrees with the result of Afuwai, (2016) in a study on Profitability and Efficiency of Cowpea Production in Giwa and Soba Local Government Areas of Kaduna State, Nigeria, who revealed that majority (85%) of the respondents had some form of formal education.

It was observed that the mean year for farming experience was 6. This implies that farmers in the study area have experience in cowpea production. This is in line with the findings of Salihu *et al.* (2018) who stated that majority (76.7%) of the respondents had at least, 6 years of experience on cowpea production therefore, they may likely understand some challenges faced by cowpea producers and some measures to address them (Zangoma, 2015).

Result also reveals that majority (76.92) of the respondents were male with only 23.08% being females. This implies that males participate more in cowpea production than females in the study area. This is so, as the area is typically society in which males are expected to head and care for their families, while women and children are subordinated to men. This result is in consonant with the findings of a study conducted by Saka *et al*. (2019) on Assessment of Varietal diversity and Production systems of cowpea in Southwest Nigeria, who revealed that cowpea production was dominated by male farmers. The high percentage of male gender may be attributed to the labour involved and the low percentage of women participating in cowpea farming may also be explained by socio-cultural factors affecting women (Joshua *et al.,* 2019).

The findings also indicated that 34.06% of the respondents were affiliated to one co-operative society or the other, while 62.94% were not member of any co-operative society. This implies farmers may lack access to credit and input supply as being member of associations enables farmers to benefit from financial institutions and also take advantage of economies of scale in the purchase of farm inputs. Farmers who belong to co-operative societies are better informed on resource use and farm planning which enables them to utilize resources more efficiently (Oseni *et al.,* 2015).

Furthermore, the result showed that 34.97% of the respondents had contact with extension agents, while 65.03 had no contact with extension agents. Lack of extension agents negates the theoretical role extension agencies supposed to play in technology diffusion and adoption (Tijjani, 2015) in (Bashir *et al.,* 2018). Contact with extension agents helps farmers to become better informed about farm management, planning and new technologies, hence, improving their efficiency in production (Oseni *et al.,* 2015).

The mean household size of the respondents was 8 persons per household. Although, large household size could sometimes be an asset to the farmers, often time, a farmers are faced with the challenges of providing social and welfare facilities such as feeding, education, shelter, clothing, health care etc. for such families (Oseni *et al.,* 2015).This finding is similar to that of Salihu *et al*. (2018) who reported that the mean household size was 11 persons implying that most of the sampled cowpea farmers had large family size that could support their farming activities.

The result revealed that 35.66% of the respondents had access to credit while 64.34% had no access to credit facilities. This implies that majority (64.34%) of the respondents had

no access to credit and might be using their personal savings to purchase inputs and finance their farm operations. This may reduce productivity as there is no or little capital available for the farmers to enhance production. Access to credit reduces inefficiency as it enables farmers to adopt high yielding varieties and make it possible for farmers to access information useful for increasing productivity (Oluwatosin, 2011).

Also, the finding shows that 55.94% of the respondents had farm sizes equal to or less than 2 hectares, while 44.06% of the respondents had farm sizes greater than 2 hectares. The small farm sizes may majorly be as a result of the fact that most of the respondents acquired their farm lands through inheritance. This means that the lands were fragmented and shared amongst family members after the death of their parents, thereby resulting to small farm land available for farming. This result is in conformity to the findings of (Adeola *et al.,* 2011) in a study on Productivity and Profitability Analysis of Cowpea Production in Kaduna State who stated that majority (95%) of the respondents had farm sizes below 5 hectares.

Technical Efficiency of Cowpea Farmers in the Study Area

The distribution of the technical efficiency of cowpea farmers in the study area on the analysis of the Stochastic Production Function is presented in Table 2. The technical efficiency of the respondents was found to be less than 1.00. This implies that cowpea farmers in the study area were producing below the maximum efficiency frontier. This agrees with finding of Abba, (2013) in a study on the Economic Analysis of Cowpea Production in Nigeria who revealed that farmers in the study area were operating below the frontier level as their mean efficiency was 0.6649. The technical efficiency level of the farmers in the study area varies between 0.30 (30%) and 0.96 (96%). The result also shows that the best cowpea farm in the study area has technical efficiency of 96% while the worst farm has technical efficiency of 30%. The mean technical efficiency was 0.87 which implies that on an average, cowpea farmers in the study area were able to obtain 87 % of potential output from a given mix of production inputs.

This means there is a room of increasing technical efficiency of cowpea production in the study area by 13 %. This result is in consonance with the findings of Omonoma *et al.* (2010) in their study on farmers' resource use and technical efficiency in cowpea production in Ogun state South-west, Nigeria who revealed that farmers' average technical efficiency was 87% in the study area suggesting an appreciable use of inputs in productivity. However, this result is not consistent with that of Kuzhkuzha *et al.* (2019) in a study on Economic Efficiency and its determinants: A case study of cowpea production in the Western Agricultural zone of Nassarawa State, Nigeria who reported that the mean technical efficiency of cowpea farmers in the study area was only o.31 (31%). Result in Table 4.2 also revealed that 2.1 % of the respondents had technical efficiency of less than or equal to 69 % while majority (97.9) of the respondents had technical efficiency of 70 % and above.

Estimates of the Parameters of the Stochastic Frontier Production Function

Parameters of the Stochastic Frontier Model are presented in Table 3. The choice of the variables is made because these inputs are the conventional inputs used in cowpea production in the study area. The result of the analysis revealed that the coefficient of farm size (0.258) was positive and statistically significant at 5 % level of significance. This implies that a 1 % increase in farm size will lead to an increase of 0.258 % in output of cowpea *ceteris paribus*. This is inelastic elasticity because a 1 % increase in farm size leads to less than 1 % increase in output. This result is in consonance with the finding of Egbetokun and Ajijola, (2017) in a study on Technical Efficiency of Cowpea Production in Osun State, Nigeria, who reported that the coefficient of farm size (0.6593) was positive and significant at 1% level of significance implying that a 1% increase in farm size will result to increase in output of cowpea by 0.6593% in the study area. The study also conforms to that of Abba, (2013) in a study on Economic Analysis of Cowpea Production in Nigeria, who revealed that 1 % increase in farm size will result to an increase in output by 0.665 %.

The estimated coefficient for quantity of seed (0.235) was positive and significant at 5 % level of significance. This implies that a 1% increase in quantity of seed will lead to an increase in output of cowpea by 0.235%. Output tends to be low even when other inputs are in abundance but seed quantity and accurate seed rates are not used (Abdullahi, 2016).

This finding is in consonance with the findings of Oseni *et al.* (2015) in a study on Measurement of Technical Efficiency and its Determinants in Sampea 11 Variety of Cowpea Production in Niger State, Nigeria, who revealed that an increase of 1% in seed will result to an increase in output by 0.284%. The estimated coefficient for labour (0.814) was positive and significant at 1% level of significance. This implies that a 1% increase in labour will increase output by 0.814% *ceteris paribus*. This agrees with the findings of Afuwai, (2016), in a study on Profitability and Efficiency of Cowpea Production in Giwa and Soba Local Government Areas of Kaduna State, Nigeria, who reported that the coefficient of labour was positive and significant at 1% level of significance. This shows that labour is an important variable in cowpea production as human power plays a crucial role in virtually all farming activities. The result is also consistent to the findings of Opaluwa, *et al.* (2021) in a study on Food security and Technical Efficiency Levels of Small holder Cowpea Farmers in Bassa Local Government Area of Kogi State, Nigeria, who revealed that the estimated coefficient of labour (0.007) was positive and significant at 5% level of significance.

The coefficient for quantity of agro-chemicals (0.355) used was positive and significant at 1% level of significance. This means that there is a positive relationship between agro-chemicals and output of cowpea in the study area. That is the higher the agro-chemicals, the higher the output ceteris paribus. This agrees with the finding of Taru, *et al.* (2011) on a study on Technical Efficiency of Sole Cowpea Production in Adamawa State, Nigeria, who revealed that the coefficient for agro-chemical (0.65) was positive (0.65) and statistically significant at 1% level of significance which means an increase of 1% agro-chemical will result in an increase in cowpea output by 0.65%. However, the estimated coefficient for quantity of fertilizer (-0.191) was negative and not significant. This implies that fertilizer had a negative relationship with the output of cowpea in the study area. The insignificance of fertilizer may show that it does not have direct effect on the amount of cowpea output in the study area. This could be attributed to the fact cowpea plants contain bacteria in their root nodules that help in fixing nitrogen to the soil, thereby, increasing the soil nutrients.

The Elasticity of Production and Return to Scale

The result in Table 4 revealed that the elasticity of production and returns to scale of cowpea production in the study area. The estimated coefficients of the independent variables are the same as the elasticity of production. The elasticity of output for labour, among all the output elasticity, is the highest which shows that labour as an input has major influence on output of cowpea in the study area. The return to scale shows what will happen to output of cowpea if all the inputs are increased at the same time. The returns to scale calculated as the sum of the estimated output elasticity was 1.479. This suggests an increasing return to scale which is significantly different from unity. This implies that cowpea farmers in the study area were in stage 1 in the production curve. At this stage, any increase to the production inputs would lead to a more than proportionate increase in output of cowpea. It also implies that an increase in all inputs by 1% increases cowpea yield by 1.479 %. This is similar to the finding if Vitor *et al.* (2013) in a study on Estimation of Farm Level Technical Efficiency of Small Scale Cowpea Production in Northern Ghana who reported that the return to scale was 1.264 which indicated an increasing return to scale. It also conforms to the finding of Ajibefun *et al*. (2002) in a study on Determinant of Technical Efficiency in Smallholder Food Crop Farming: Application of Stochastic frontier Production Function who reported that the return to scale parameter was 1.17 which indicated an increasing returns to scale.

Determinants of Technical Inefficiency of the Respondents

Since the dependent variable of the inefficiency model is technical inefficiency, the sign of the coefficients of the independent variables has

important implications as the positive sign indicates a negative effect on technical efficiency, whereas negative sign signifies a positive effect on technical efficiency.

The result for the inefficiency model is shown in Table 5. The negative coefficient of age shows that technical efficiency increases with age. This suggest that older cowpea farmers were more technically efficient than their younger counterpart. This may be due to the fact that aged farmers have higher farming experience than the younger ones and their years of experience enable them to know how to use farm resources efficiently to get higher output. It is believed that experience increases with age and resource endowment, leading to an increased efficiency. This finding agrees with that of Oseni *et al.* (2015) in a study on Measurement of Technical Efficiency and its Determinants in Sampea 11 Variety of Cowpea Production in Niger State, Nigeria, who reported that the estimated coefficient of age was negative. On the contrary, Umar *et al.* (2018) in their study on Econometric Analysis of Technical Efficiency in Kano State, Nigeria, stated that age of farming household heads have an inverse relationship with their technical efficiency. This suggested that as the farming household heads advance in age, they become technically inefficient. This may be due to their inability to assimilate or use new technology and farming techniques. The coefficient estimate of farm size was negative and statistically significant at 5% level of significance which implies that farm size affect efficiency positively. That is, technical efficiency increases with farm size. This may be because as farm size increases, output also increases *ceteris paribus* leading to greater efficiency.

The coefficient of farming experience was negative and statistically significant at 5% level of significance. The positive contribution of this variable to technical efficiency could be that farmers with more years of experience tend to be more efficient through 'learning by doing'. (Sofoluwe and Kareem, 2011) This agrees with the findings of Afuwai, (2016) in a study on Profitability and Efficiency of Cowpea Production in Giwa and Soba Local Government Areas of Kaduna State, Nigeria, who observed that farming experience was significant and increases technical efficiency. The negative sign on the coefficient of educational level indicates that an increase in the number of years of education decreases technical inefficiency of cowpea farmers in the study area. This means that the more educated a farmer is, the more the technical efficiency. This is because higher level of educational achievement may lead to better assessment of the importance and complexities of good farming decision, including efficient use of inputs. This relationship is weakly statistically significant at 10 % level of significance. This agrees with the findings of Moses, (2017) in a study on Technical Efficiency of Soya beans Production in Mubi North Local Government Area of Adamawa State, Nigeria revealed that the negatively estimated coefficient for education was -0.763 for soya beans production and was statistically significant at 10% level of significance which implies that respondents with greater years of schooling tend to be more efficient, because as schooling years increases, technical inefficiency tend to reduce. This finding is also supported by findings obtained by Battese and Coelli (1995) in their study on Model for Technical Inefficiency Effect in a Stochastic Frontier Production Function for Panel Data who found that educational level was statistically significant at 10% level of significance. The coefficient of membership of co-operatives was negative and significant at 1 % level of significance. This implies that co-operative societies contribute towards increase in the technical efficiency of the farmers in the study area. The estimated coefficient of extension contact was negative and statistically significant at 5% level of significance. This implies that farmers who have extension services tend to be more efficient in cowpea production than those without extension contact. This is in consonance with the findings of Oseni *et al*. (2015) in a study on Measurement of Technical Efficiency and its Determinants in Sampea 11 Variety of Cowpea Production in Niger State, Nigeria, who revealed that increase in extension contact has a positive influence on technical efficiency of cowpea production. This could be because extension services, if properly implemented, increase the efficiency of farmers as farmers obtain knowledge on new innovations that will improve their productivity.

CONCLUSION

This study estimates stochastic frontier production for cowpea farmers in Bali and Gassol Local Government Areas of Taraba State, Nigeria. The mean technical efficiency was 0.87, suggesting that farmer's output can be improved by 13% through improved resource allocation. This analysis shows that age, farm size, farming experience, educational level, cooperative membership and extension contact are the major contributing factors to the efficient production of cowpea in the study area. Other variables such as farm size, seed (kg), labour (naira) and agro chemicals (litres) were found to exact positive effect on the production of cowpea.

Recommendations

i. Land redistribution policy by the government that will increase the farm size of farmers since they are mainly small-scale farmers will boost cowpea production.
ii. Farmers in the study area need to form viable cooperative societies to enable them access improved inputs especially improved seed and agro-chemicals at subsidised costs.
iii. Government should therefore, engage extension agents who will help in the dissemination of new innovations and technologies to the farmers and also serve as information linkage between the farmers the research institutes and the government.
iv. Agricultural loan facilities should be made accessible to cowpea producers by financial institutions at a low interest rate to ensure timely and adequate utilization of agricultural inputs for improvement in farm production efficiency.
v. There is need for better training for the farmers the use of better farm inputs. Training of farmers can be intensified by increased extension services via demonstration farms within the vicinity of most farmers.

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Table 1: Socio-economic characteristics of the respondents

Variables	Frequency	Percentage (%)	Mean
Age (Years)			33
20– 29	52	36.36	
30 – 39	54	37.76	
40 – 49	27	18.88	
≥ 50	10	6.99	
Education			
No Education	4	2.80	14
Primary Education	6	4.20	
Secondary Education	38	26.57	
Tertiary Education	95	66.43	
Farming Experience (Years)			6
1-9	106	74.12	
10-18	31	21.68	
≥19	6	4.20	
Gender			
Male	110	76.92	
Female	33	23.08	
Membership of any Cooperative Society			
Member	53	37.06	
Not Member	90	62.94	
Extension Contact			
Contact	50	34.97	
No Contact	93	65.03	
Household Size			8
1-5	28	19.58	
6-10	81	56.64	
11-15	29	20.28	
≥16	5	3.50	
Access to Credit			
Yes	51	35.66	
No	92	64.34	
Farm Size (Hectare)			3
≤2	80	55.94	
>2	63	44.06	
Total	**143**	**100**	

Source: Field survey, 2021.

Table 2: Distribution of the respondents based on technical efficiency

Technical efficiency range	Frequency	Percentage (%)
0.30-0.39	1	0.7
0.40 - 0.49	0	0
0.50-0.59	1	0.7
0.60-0.69	1	0.7
0.70-0.79	16	11.2
0.80-0.89	54	37.8
0.90-0.99	70	48.9
Total	**143**	**100**
Minimum TE	**0.30**	
Maximum TE	**0.96**	
Mean TE	**0.87**	

Source: Computed from field survey data, 2021

Table 3: Estimates of the Stochastic Frontier Production function

Variables	Coefficient	Standard error	t-ratio
Constant (β_0)	0.258	0.180	1.433
Farm size (X_1)	0.266	0.118	2.254^{**}
Quantity of seed (X_2)	0.235	0.087	2.701^{**}
Labour ((X_3)	0.814	0.184	4.424^{***}
Quantity of fertilizer (X_4)	-0.191	0.367	-0.5204^{NS}
Quantity of Agro -chemical (X_5)	0.355	0.112	3.170^{***}
Variance parameters			
Sigma-squared	0.128		
Log likelihood	-0.528		
Number of observation	143		

Source: Computed from field survey data, 2021
*** and ** denote 1% and 5% level of significance respectively, while NS = not significant

Table 4: Elasticity of Production and Return to Scale

Variables	Elasticity of Production
Farm size	0.266
Seed	0.235
Labour	0.814
Fertilizer	-0.191
Agro-chemical	0.355
Returns to scale	**1.479**

Source: Computed from field survey data, 2021

Table 5: Determinants of Technical Inefficiency of the Respondents

Variables	Coefficient	Standard error	T-ratio
Constant	1.046	0.0621	16.843
Age	-0.011	0.001	-11.000^{***}
Gender	0.001	0.016	0.063^{NS}
Farm size	-0.013	0.006	-2.167^{**}
Farming experience	-0.007	0.003	-2.333^{**}
Educational level	-0.005	0.003	-1.667^{*}
Co-operatives membership	-0.023	0.007	-3.286^{***}
Access to credit	0.009	0.006	0.150^{NS}
Extension contact	-0.022	0.010	-2.200^{**}
Household size	0.004	0.003	1.333^{NS}

Source: Computed from field survey data, 2021
***P<0.01 ** P<0.05 *P<0.10, ^{NS} denotes not significant