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Effects of participation intensity on agricultural commercialization level among sweet potato farmers in Kwara and Osun States, Nigeria

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ABSTRACT

This study examined the effects of participation intensity on agricultural commercialization of sweet potatoes in Kwara and Osun States, Nigeria. Sweet potato is particularly a suitable food security crop as it produces a high yield in a short growing season even under low rainfall. A multistage sampling technique was used to select 485 sweet potato farmers. An interview guide was used to obtain primary data, which were analysed using descriptive and double hurdle Craggit regression models. The results revealed that majority of the respondents were male (86% and 87.6%) in both Kwara and Osun states, while the mean ages were 42 and 43 years, respectively. The results further showed that sweet potato intensity of participation in commercialization was significantly determined by gender, quantity consumed, and transaction cost of the crop in Kwara State ($p<0.1$, $p<0.01$, and $p<0.05$), respectively. However, for Osun state, it was significantly determined by age, gender, education, quantity consumed, and cooperative membership ($p<0.1$, $p<0.1$, $p<0.01$, $p<0.01$ and $p<0.01$), respectively. The study concluded that agricultural commercialization level of sweet potato was directly influenced by many factors in the study areas. It is therefore recommended that farmers should be assisted in lowering their transaction costs, particularly in terms of transportation costs. Cooperative membership performance should be enhanced positively for farmers through seminars, symposiums, and training.

Contribution/Originality: The study generates knowledge on how the nation can stimulate and enhance smallholder agricultural commercialisation, which will significantly reduce the extensive poverty status of the farmers by participating in the market to sell their agricultural crops and avoid the practice of middlemen.

1. INTRODUCTION

Sweet potato (Ipomoea batatas L. Lam) is a perennial plant belonging to the Convolvulaceae family (Eduardo, Ornella, Porcu, & Alicia, 2020). Sweet potato ranks as the fifth most important food crop in the tropics and the seventh in the world food production after wheat, rice, maize, potato, barley, and cassava (Bassey, Nwanko, & Harry, 2022). In the world production of sweet potatoes, Asia accounts for close to 76%, followed by the African continent (19.5%).

Among the top five producers are China, Nigeria, Uganda, Indonesia, and the United Republic of Tanzania. China is the highest producer, producing about 75.6 million tons, followed by Tanzania and Nigeria, which produced 3.57 and 2.73 million tons, respectively (Bassey et al., 2022). Sweet potatoes take important roles in the global food system, all of which have fundamental implications for meeting food requirements, reducing poverty, and increasing food security. It can potentially address issues including income generation, healthy food crops, nutritional deficit, poverty reduction, and food security in developing and less developed countries (Kang & Lee, 2021).

Most tropical countries consume sweet potatoes without much processing. It is either eaten boiled, roasted or fried. In countries like the United States, it is dehydrated into chips, canned, cooked and frozen, creamed, and used as pie fillings. It is also dried and ground into flour to make biscuits, bread, and other pastries. You can also pound sweet potato and yam together to create a delicious meal. Although sweet potato is a crop that is consumed in all parts of the country, its level of production still remains low. Climate change, the shrinkage of arable land, population growth, and the frequent occurrence of natural disasters have all contributed to this situation (Adewumi & Adebayo, 2008). In terms of nutritional value, adaptability to diverse environments, and yield potential, the potato is a preferred crop, especially in developing countries, where most undernourished households depend on potatoes as primary or secondary sources of food and nutrition.

Renkow, Hallstrom, and Karanja (2002) noted that food crop marketing is often inefficient, with market participation being linked to farmer inability to meet market standards, low volume of produce, wide dispersion of producers, presence of middlemen, and perceived low prices in formal markets (Jayne, Govereh, Mwanaumo, Nyoro, & Chapoto, 2002; Kherallah & Kirsten, 2002). Rosegrant, Cline, Li, Sulser, and Valmonte-Santos (2005) in their study also enlisted some difficulties such as gender, education level, lack of information, and ethnicity as barriers to market participation. Farmers find it difficult to dispose of their produce at attractive prices and places of their choice due to perceived weaknesses in the food crop marketing system. Smallholder farming and effective market participation can be a pathway to raising income in rural areas. Researchers examined the relationship between productivity and market participation using a double hurdle approach, but failed to capture the intensity of market participation in the second hurdle (Reyes, Donovan, Bernsten, & Maredia, 2012).

However, Mignouna, Abdoulaye, Alene, Akinola, and Manyong (2015) opined that agricultural market participation has been conceived as the integration of subsistence farmers into the input and output markets of agricultural products with a view to increasing their income level and hence reducing poverty. Smallholder farmers' choice to intensify participation in agricultural markets is considered an essential determinant of household agricultural productivity, level of commercialisation, and kind of crop diversification practiced on-farm (Asfaw, Lipper, Dalton, & Audi, 2012; Lipper, Anderson, & Dalton, 2010; Lipper, Cavatassi, & Winters, 2006; Smale, 2006). Also, Salami, Kamara, and Brixiova (2010) emphasized that improved market participation is a key precondition for the transformation of the agriculture sector from subsistence to commercial production.

A study carried out by Obiadi, Nwankwo, Ezeokafor, and Ekwere (2020) and Emran, Krupnik, Aravindakshan, Kumar, and Pittelkow (2021) on the effect of institutional factors has no significant influence on market participation by the cooperative farmers but is significant relating to the laws governing the sale of agricultural products. This study examined the factors influencing the intensity of participation of sweet potato farmers in agricultural commercialization in Osun and Kwara states of Nigeria.

2. MATERIALS AND METHODS

Nigeria's Kwara and Osun States hosted the study. Multistage sampling technique was used in the selection of the respondents due to the population density of the study area and also for the selection of major producers of sweet potato. Firstly, two states were purposively selected; secondly, four Local Government Areas (LGAs) were selected purposively from each selected state that are major producers of sweet potato crops, making a total of eight LGAs. Thirdly, from each of the four LGAs per state, four sweet potato farming and processing villages were randomly

selected, making a total of 32 communities for the two states. Lastly, Krejcie and Morgan (1970) **s**ample Table 1 was used to select 248 farmers for each of the two selected states, respectively, based on their population size of 700, making a total of 486 farmers selected for this study.

Table 1. Table for sample size.

N	S	N	S	N	S
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	243	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note: N is population size, S is sample size.
Source: Krejcie and Morgan (1970).

Total number of respondents used was constructed using the following formula for calculating sample size.

$$s = X^2\, NP(1-P) \div d^2(N-1) + X^2P(1-P)$$

s = Required sample size.

X^2 = The table value of chi-square for 1 degree of freedom at the desired confidence level (3.841).

N = The population size. = 700.

P = The population proportion (assumed to be 0.50 since this would provide the maximum sample size).

d = The degree of accuracy expressed as a proportion (0.05).

Farmer's population: N was selected to be 700.

Sf = 3.841x700x0.50 (1-0.05)/ $(0.05)^2(700-1)$ +3.841x0.5(1-0.5).

Sf = 1344.35(0.5)/ (0.0025) (699) +1.9205(0.5).

Sf = 672.175/1.7475+0.96025.

Sf = 672.17/2.70775.

Sf = 248.24.

Sf = 248 Farmers Respondents per state.

2.1. Nature and Sources of Data

Primary data was used for this study, and data was obtained through the administration of a structured questionnaire to the respondents in selected study areas.

2.2. Cragg's Alternative to the Tobit Model

Again, while useful, the major drawback of the Tobit model is that the choice of $y > 0$ and the value of y, given that $y > 0$, is determined by the same vector of parameters (β from above). For example, this imposes that the direction (sign) of a given determinant's marginal effect will be the same on both the probability that $y > 0$ and the expectation of y, conditional or otherwise. As an alternative, Cragg proposed the following, which integrates the probit model to determine the probability of $y > 0$ and the truncated normal model for given positive values of y,

$$f(w, y \mid x1, x2) = \{1 - \Phi(x1\gamma)\}1(w = 0) \_ \Phi(x1\gamma)(2\pi) - 12\sigma - 1exp\_ - (y - x2\beta)2/2\sigma 2 \ /\Phi(x2\beta/\sigma) \_1(w = 1) \quad (1)$$

Where w is a binary indicator equal to 1 if y is positive and 0 otherwise.

The probability of $y > 0$ and the value of y are now determined by different mechanisms (the vectors γ and β, respectively), and there is no restriction on the elements of $x1$ and $x2$, which implies that each decision may be determined by a different vector of explanatory variables altogether. Fitting Cragg's alternative requires the additional assumption of conditional independence for the latent variable's distribution, or $D(y* \mid w, x) = D(y* \mid x)$ From Cragg's model, we can obtain the same probabilities and expected values as with Tobit by using an updated functional form. The probabilities regarding whether y is positive are:

$$P(yi = 0 \mid \boldsymbol{x}1i) = 1 - \Phi(\boldsymbol{x}1i\boldsymbol{\gamma}) \ (1) \ P(yi > 0 \mid \boldsymbol{x}1i) = \Phi(\boldsymbol{x}1i\boldsymbol{\gamma}) \quad (2)$$

The expected value of y, conditional on

$$y > 0 \ is \ E(yi \mid yi > 0, \boldsymbol{x}2i) = \boldsymbol{x}2i\boldsymbol{\beta} + \sigma \times \lambda(\boldsymbol{x}2i\boldsymbol{\beta}/\sigma) \quad (3)$$

Where $\lambda(c)$ is the inverse Mills ratio (IMR) $\lambda(c) = \varphi(c)/\Phi(c)$ where φ is the standard normal probability distribution function. Finally, the "unconditional" expected value of y is

$$E(yi \mid \boldsymbol{x}1i, \boldsymbol{x}2i) = \Phi(\boldsymbol{x}1i\boldsymbol{\gamma}) \{\boldsymbol{x}2i\boldsymbol{\beta} + \sigma \times \lambda(\boldsymbol{x}2i\boldsymbol{\beta}/\sigma)\} \quad (4)$$

For a given observation, the partial effect of an independent variable, xj, around the probability that

$$y > 0 \ is \ \partial P(y > 0 \mid \boldsymbol{x}1) \ \partial xj = \gamma j \varphi(\boldsymbol{x}1\boldsymbol{\gamma}) \quad (5)$$

Where γj is the element of $\boldsymbol{\gamma}$ representing the coefficient on xj. The partial effect of an independent xj on the expected value of y, given $y > 0$, is

$$\partial E(yi \mid yi > 0, \boldsymbol{x}2i) \partial xj = \beta j \ [1 \ \lambda(\boldsymbol{x}2\boldsymbol{\beta}/\sigma) \{\boldsymbol{x}2\boldsymbol{\beta}/\sigma + \lambda(\boldsymbol{x}2\boldsymbol{\beta}/\sigma)\}] \quad (6)$$

Where βj is the element of β representing the coefficient on xj. The partial effect of an independent xj on the "unconditional" expected value of y is somewhat trickier because it depends on whether xj is an element of $\boldsymbol{x}1$, $\boldsymbol{x}2$, or both. First, if xj is an element of both vectors, the partial effect is

$$\partial E(y \mid \boldsymbol{x}1, \boldsymbol{x}2) \ \partial xj = \gamma j \varphi(\boldsymbol{x}1\boldsymbol{\gamma}) \times \{\boldsymbol{x}2\boldsymbol{\beta} + \sigma \times \lambda(\boldsymbol{x}2\boldsymbol{\beta}/\sigma)\} + \Phi(\boldsymbol{x}1\boldsymbol{\gamma}) \times \beta j \ [1 - \lambda(\boldsymbol{x}2\boldsymbol{\beta}/\sigma) \{\boldsymbol{x}2\boldsymbol{\beta}/\sigma + \lambda(\boldsymbol{x}2\boldsymbol{\beta}/\sigma)\}] \ if \ xj \ \_ \boldsymbol{x}1, \ \boldsymbol{x}2 \quad (7)$$

Now, if xj solely determines the only determines the probability of $y > 0$, then $\beta j = 0$, canceling the second term on the right-hand side of (7). On the other hand, if xj is only determining the value of y, given that $y > 0$, then $\gamma j = 0$, and the first right-hand side term in (7) is canceled. In either of the latter cases, the marginal effect will still be a function of parameters and explanatory variables in both tiers of the regression.

3. RESULTS AND DISCUSSION

3.1. Socio Economic Characteristics of Agricultural Sweet Potato Farmers

3.1.1. Gender of Sweet Potato Farmers

The results in Table 2 show the gender distribution of the respondents. It was revealed that majority of the sweet potato farmers were males in Kwara and Osun states, 86.4% and 87.6%, respectively. Similarly, the pooled result

revealed that majority of the sweet potato farmers in the study areas were males 87.0%, while only 13.0% were females. The findings indicate most of the respondents from both states were males since agricultural activities are rigorous, which require adequate strength, implying that men have more strength to meet the vigorous task of agricultural activities and thereby engage themselves beyond providing for their households. In line with the present study, Bello, Baiyegunhi, Danso-Abbeam, and Ogundeji (2021) reported a disparity between men and women with a gender performance gap of about 11% in favour of men.

Table 2. Distribution of sweet potato farmers by gender.

Variable	Kwara farmers		Osun farmers		Pooled	
Gender	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Female	33	13.58	30	12.40	63	12.99
Male	210	86.42	212	87.60	422	87.01
Total	243	100.00	242	100	485	100.00

Source: Field survey 2022.

3.1.2. Education Level of Sweet Potato Farmers

Table 3 presents the education status of the respondents; 6.0% of the sweet potato farmers in Kwara state were non-literate, while other 94.0% were educated with at least a primary school certificate, compared to that of Osun state, where 48.0% were non-literate and 52.0% were educated with at least a primary school certificate. Thereafter, the pooled result revealed that 27.0% of the sweet potato farmers were non-literate, while other 73.0% were educated with at least a primary school certificate, though it was noticeably discovered that the sweet potato farmers in the study area had low educational status (about 55.4%), and this might cause a reduction in the adoption of commercialization practices.

Also, it was obviously revealed that the sweet potato farmers in Osun state have almost equal numbers of literates and illiterates compared to that in Kwara state. This implies that there is more likely to be variation in the level of adoption of new innovations, commercialization practices, and technologies, especially in sweet potato production, between the respondents in the two selected states since education is one of the major determinants of adoption of technologies. The present finding is in line with previous studies (Emran et al., 2021) and Nwaobiala (2014) which reiterated that educational level of farmers increases their ability to acquire technological advances and market information.

Table 3. Distribution of sweet potato farmers by level of education.

Level of education	Kwara farmers		Osun farmers		Pooled	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Non-formal	15	6.17	116	47.93	131	27.01
Primary	49	20.16	36	14.88	85	17.53
Secondary	155	63.79	56	23.14	211	43.51
Tertiary	24	9.88	34	14.05	58	11.96
Total	243	100.00	242	100.00	485	100.00

Source: Field survey 2022.

3.1.3. Marital Status of Sweet Potato Farmers

The distribution of marital status in Table 4 shows that 64.6% and 47.5% of sweet potato farmers were married, 6.0% and 38.8% were single, 12.4% and 10.7% of the respondents were divorced/separated, while 16.8% and 2.9% of the sweet potato farmers were widows/widowers in Kwara and Osun States, respectively. For the pooled data, the result of marital status showed that 56.0% of the sweet potato farmers were married, 22.5% were single, 11.5% of the respondents were divorced/separated, while 9.9% of the sweet potato farmers were widows/widowers. This result

indicated that majority of the respondents in both states were married, probably because farming generally is labour-intensive so they need a partner that can help in providing cheap labour, especially through childbearing in the farming activities.

It must be mentioned that most farmers in the rural often depend on family labour supply in whole or with assistance of hired labour. Also, being married could be a measure of level and determination of a farmer's sense of belonging and responsibility, which helps them in contributing to commercialization of their products in the sense that if one is not available for participation, the other will be.

Table 4. Distribution of sweet potato farmers by marital status.

Marital status	Kwara farmers		Osun farmers		Pooled	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Divorced	39	12.35	26	10.74	56	11.55
Married	157	64.61	115	47.52	272	56.08
Singled	15	6.17	94	38.84	109	22.47
Widow/Widowed	41	16.87	7	2.89	48	9.90
Total	243	100.00	242	100.00	485	100.00

Source: Field survey 2022.

3.1.4. Household Size of Sweet Potato Farmers

Table 5 presents that household sizes having below 5 members have the highest representation for both Kwara and Osun states (62.0% and 66.0%), respectively, while those between 5 and 10 members had 37.5% and 29.7% while the remaining 0.41% and 4.13% had a household size greater than 10, respectively. For the pooled data, the household size result opined that household size having below 5 members has the highest representation of 64.0%, between 5 and 10 members had 36.3%, and households having between 5 and 10 members had 33.6%, while the remaining 2.3% had a household size greater than 10. The average household size of the respondents was approximately 4 members per household during the study, which implies that the number of household size is moderate and cause a reduction in the cost of hired labour. However, this study recorded low household size compared to that of Mahelet (2007) who found 6 persons in the households of their respondents.

Table 5. Distribution of sweet potato farmers by household size.

Household size	Kwara farmers		Osun farmers		Pooled	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
<5	151	62.14	160	66.12	311	64.12
5-10	91	37.45	72	29.75	163	33.61
>10	1	0.41	10	4.13	11	2.27
Total	243	100.00	242	100.00	485	100.00

Note: Mean ($\bar{X}$) =, 3.9383, 3.8388, Standard deviation= 1.847, 2.353, minimum= 1.0, maximum = 11, 13.0. Respectively.
Source: Field survey 2022.

3.1.5. Age of Sweet Potato Farmers

Table 6 displayed the age distribution of sweet potato farmers in Kwara and Osun States. The mean age of the farmers in Kwara and Osun States was approximately 46 years and 44 years, respectively, which fall in the same class range as the modal age, that is, between 36-45y years for Kwara and Osun States, respectively. For the pooled data, the mean age of the sweet potato farmers in the study areas was 45 years, which also falls within the same class range with the modal age which is between 36-45 as it was in both States. The average age of the respondents was 45%, which implies that the respondents were still within the productive age which will help boost sweet potato production, especially for commercial purposes. These results were in line with the findings of Bamigboye and Kuponiyi (2013) who revealed that majority (65.0%) of the respondents were within the age group of 40 and 59 years. Also, Zelda and Tamuno-Ina (2022) confirmed the average age of rice farmers in their research to be 41 years.

Table 6. Age distribution of sweet potato farmers.

Age	Kwara farmers			Osun farmers			Pooled		
	Frequency	%	Mean	Frequency	%	Mean	Frequency	%	Mean
<25 years	3	1.23	45.63	13	5.37	43.49	16	3.30	44.56
25-35 years	39	16.05		52	21.49		91	18.76	
36-45 years	89	36.63		71	29.34		160	32.99	
46-55 years	72	29.63		68	28.10		140	28.87	
>55 years	40	16.46		38	15.70		78	16.08	
Total	243	100.00	43.63	242	100.00	43.49	485	100.00	44.56

Source: Field survey 2022.

3.2. Factors determining the Intensity of Participation in Agricultural Commercialization

However, the result of the intensity of participation in agricultural commercialization among the farmers without endogenous variables is thereby revealed in Table 7. The results of the first model, which measures participation of farmers in agricultural commercialization, reveal that transaction cost is a major determinant of farmers participation in agricultural commercialization among farmers in both Kwara and Osun States. Transaction costs negatively influence participation at a 10% level of significance. This is an indication that an increase in transaction cost will lower the probability of farmers participation in agricultural commercialization by 0.0015 and 0.0022 for Kwara and Osun States, respectively. This is in accordance with Food and Agriculture Organization of the United Nation (2019) which also posited that transaction cost factors such as quality of rural roads and ownership of communication assets have positive and significant effects on the probability of market participation.

In addition, quantity consumed by the sweet potato farmers significantly influences participation in agricultural commercialization among Osun farmers at (10%), and this relationship is negative. This is an indication that an increase in quantity consumed will lessen the probability of farmers participation in agricultural commercialization by 0.0012. This is in line with apriori expectation, as an increase in quantity consumed will discourage more farmers from participating in commercialization.

The second model examined the factors that influence the intensity of farmers' participation in agricultural commercialization. Out of the nine (9) variables considered, five of them were statistically significant at varying levels for both Kwara and Osun States. The gender of sweet potato farmers and quantity of the potato consumed at the household level positively and negatively affect farmers participation intensity, respectively, for both states at 10% and 1% significant levels. This is an indication that male farmers participate more intensively in agricultural commercialization than their female counterparts. The reason for this cannot be farfetched because of the tedious nature involved as well as the possession of land resources, which favour the male farmers. This is in accordance with the result of Bello et al. (2021) who found out that majority of the sweet potato farmers were male in Osun state and that males operate at an efficiency range lower than that of the females. On the other hand, increasing the quantity consumed at the household level will reduce the intensity of commercialization because the household will have less quantity to be made available for commercialized purposes, hence, a reduction in their level of participation.

Also, the result in Kwara State shows that transaction cost negatively affects the intensity of commercialization at a 5ç% level of significance. This shows that increasing the transaction cost will reduce participation intensity among the farmers due to the financial implications involved, which will reduce level of profit that can be made. This is in accordance with Food and Agriculture Organization of the United Nation (2019) which also posited that transaction cost factors such as quality of rural roads and ownership of communication assets have positive and significant effects on the probability of market participation.

It was also revealed that age and membership in cooperatives have negative and positive effects respectively, on commercialization intensity at the 10% and 1% levels of significance in Osun State. This is in consonance with apriori expectation, as membership in cooperative society will help increase a farmer's social network.

More so, education significantly influences the intensity of participation in commercialization at 1% level of significance and positively affects the intensity of participation in agricultural commercialization. This means that is an increase in the level of education will enhance the intensity of participation in agricultural commercialization of sweet potatoes by 0.0010. This negates the results of Oladiran, Ogunniyi, and Fanifosi (2020) where a farmer's years spent in school are negatively signed and are at 10% statistically significant. The result implies that as food crop farmers' years spent in school increase, the decision to participate in market increases. It is therefore implying that there are no limitations to access to information on networking, collaboration opportunities, and difficulties in adopting new technology and innovative practices that will boost productivity and enhance participation at the commercialization level.

Table 7. Factors determining the intensity of participation in agricultural commercialization.

Variables	Kwara farmers			Osun farmers			Pooled farmers		
Participation level	**Coeff.**	**Std. err.**	**P>/t/**	**Coeff.**	**Std. err.**	**P>/t/**	**Coeff.**	**Std. err.**	**P>/t/**
Age	-0.016	0.010	0.119	0.023	0 .017	0.171	-0.019**	0.009	0.039
Gender	-0.018	0.303	0.951	-4.434	89.366	0.960	0.088	0.268	0.742
Education	-0.039	0.028	0.157	-0 .001	0.027	0.959	-0.533**	0.021	0.013
Depend ratio	-0.626	0.643	0.330	-0.627	0.942	0.505	-0.638	0.566	0.259
Nearness	0.002	0.003	0.577	0.010	0.006	0.102	0.002	0.002	0.469
Farmsizeha	0.025	0.034	0.461	-0.034	0.057	0.551	0.021	0.041	0.604
Quantity consumed	0.001	0.000	0.165	-0.001*	0. 001	0.080	0.001	0.000	0.146
Transaction cost	-0.002*	0.001	0.086	-0.002*	0.001	0.084	0.002***	0.001	0.004
Cooperative membership	0.203	0.215	0.345	-0.002	0.351	0.498	0.151	0.198	0.446
_cons	3.733	1.221	0.002	7.980	89.396	0.929	0.509	0.918	0.579
Commercialization	Coeff.	Std. err.	P>/t/	Coeff.	Std. err.	P>/t/	Coeff.	Std. err.	P>/t/
Age	-0.002	0.000	0.390	-0.000*	0.000	0.058	-0.000	0.000	0.204
Gender	0.014*	0.008	0.091	0.010*	0.006	0.063	0.011**	0.005	0.033
Education	-0.001	0.001	0.312	0.001***	0.000	0.001	-0.001**	0.003	0.011
Dependent ratio	0.027	0.017	0.121	0.006	0.010	0.939	0.013	0.010	0.191
Nearness	-0.000	0.000	0.866	7.26e-06	0.000	0.848	1.92e-06	0.000	0.960
Farmsizeha	0.001	0.001	0.054	-0.001	0.001	0.430	0.001	0.001	0.215
Quantity consumed	-0.000***	8.76e-06	0.000	-0.000***	6.02e-06	0.000	-0.004***	5.46e-06	0.000
Transaction cost	-0.00**	0.000	0.046	-7.52e-06	0.000	0.510	-0.000	8.71e-06	0.222
Cooperative membership	0.003	0.005	0.549	0.012***	0.004	0.002	0.008**	0.004	0.019
_cons	0.986***	0.030	0.000	0.983***	0.018	0.004	0.962***	0.015	0.000
Sigma_con	0.038***	0.002	0.000	0.027***	0.001	0.000	0.035***	0.001	0.000
Number of obs. = 243				Number of obs. = 242			Number of obs. = 485		
Wald chi2 (9) = 12.79				Wald chi2 (9) = 8.29			Wald chi2 (9) = 22.14		
Prob> chi2 = 0.173				Prob> chi2 = 0.505			Prob> chi2 = 0.005		

Note: * p< 0.1; ** p< 0.5; *** p< 0.01.
Source: Field survey 2022.

4. CONCLUSIONS

It is concluded that the mean age of the respondents was between 42 and 45 years, which implies that they were more responsive and alert, strong, and at their active age. The results further showed that sweet potato intensity of participation in commercialization was significantly determined by gender, quantity consumed, and transaction cost of the crop in Kwara State ($p<0.1$, $p<0.01$, and $p<0.05$), respectively. However, for Osun state, it was significantly determined by age, gender, education, quantity consumed, and cooperative membership ($p<0.1$, $p<0.1$, $p<0.01$, $p<0.01$, and $p<0.01$), respectively. Whereas pooled farmers were significantly determined by gender, education, quantity consumed, and cooperative membership, which determined the intensity of participation in commercialization of sweet potatoes. This study therefore recommends that:

- Farmers should be assisted in lowering their transaction costs, particularly in terms of transportation costs, market stands, etc.
- Cooperative membership performance should be enhanced positively for farmers levels of commercialization, particularly in Osun farmers, through seminars, symposiums, and training.
- There should be more awareness of the importance of sweet potato value addition to generate more income and improve their standard of living.

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