



FACTORS INFLUENCING ADOPTION OF IMPROVED TOMATO SEED VARIETIES AMONG SMALL-SCALE TOMATO FARMERS IN SOUTH WEST ZONE OF NIGERIA

*Ogundeji, O. R. and Ogunwande, I. O.

Department of Agricultural and Resource Economics, Federal University of Technology Akure, Ondo State, Nigeria

*Corresponding Authors' Email: ogundejiare207403@futa.edu.ng GSM: +2348062238785

ABSTRACT

The study examine the factors influencing adoption of improve tomato varieties among small-scale farmers in Southwest Nigeria. Data were collected via structured questionnaires and analyzed using descriptive statistics, probit regression, and Likert scales. The findings revealed that 41.4% of the farmers were in their productive years with an average age of 45 years, predominantly male (70.0%), married (81.9%), with small households averaging five members. However, 87.5% had formal education and average of eight years of tomato farming experience. The farmers cultivate an average of 0.63 hectares, indicating small-scale operations. Furthermore, 85.6% of the farmers were not part of cooperatives. The result also shows that 80.0% and 65.0% of the farmers lack access to credit and extension services in the study area. Logic regression model reveal 68.39% probability of adoption of improve tomato seed varieties among farmers. Key factors significantly influencing adoption include age, gender, farming experience, education, access to extension services, market distance, input supply, and specific training. Major challenges include high input cost (73.8%), pests and diseases (55.6%), lack of credit (61.9%), marketing issues (28.8%) and unfavorable weather (18.1%). Therefore, recommendations from the study include strengthening extension services, raising awareness of cooperative membership benefits, and addressing farmers' priorities and needs.

Keywords: Adoption, Agriculture, Improved, Tomato and Varieties

INTRODUCTION

The agricultural industry is crucial for developing nations, providing employment and contributing significantly to foreign exchange and national income (Adinan, 2021). In Nigeria, agriculture is vital, linking rural and non-farm economies by generating employment and contributing to GDP and economic growth (Akande, 2012; Oyinbo and Rekwot, 2014). Tomatoes are a significant crop in Nigeria and Sub-Saharan Africa, primarily grown by small-scale farmers, with high consumption across the country (Tafida and Ayuba, 2020; Babalola *et al.*, 2010). In 2019 and 2020, Nigeria's tomato production was 3,798,939 tons and 3,693,722 tons, respectively (FAO, 2020). Despite this, output fails to meet demand due to resource constraints among smallholder farmers (Alabi *et al.*, 2023). Adopting high-quality seeds and modern agricultural inputs is crucial for improving productivity (Adinan, 2021). Increasing agricultural output requires diversifying production methods beyond traditional practices (Azumah *et al.*, 2019).

Adoption of new technologies depends on farmers' perceptions and involves a complex decision-making process (Rogers, 2003; Michelsen *et al.*, 2013). Many small-scale farmers lack access to essential knowledge and technology, hindering productivity (Syngenta, 2020). Adoption remains low among smallholder farmers in Southwest Nigeria (Awotide *et al.*, 2016). Low tomato yields, averaging 20-40 tons per hectare annually, are due to outdated seed varieties, pests, and poor soil fertility (Michael & Kolawole, 2020; Ugonna *et al.*, 2015). Improving tomato productivity requires institutional changes and widespread adoption of enhanced technologies



(Donkoh, 2016). However, benefits from new technologies will only be realized if inefficiencies in agricultural input use are addressed (Ogunniyi and Oladejo, 2011). Hence, there is a need for further investigation into the factors affecting farmers’ decision to adopt improved seed varieties among small-scale farmers in Southwest, Nigeria. The objectives of the study are to (i) describe the socioeconomic characteristics of the respondents; (ii) determine the factors affect to adoption of improved seed varieties and (iii) identify the constraints mitigating against tomato production among respondents in the study area.

MATERIALS AND METHODS

The Study Area

The study was carried out in Southwest, Nigeria. The region lies between latitudes 4⁰ and 9⁰N and longitudes 30⁰ and 7⁰E with a total land area of 77,818km² and a total population of 28,767,752 (Oni and Odekunle 2019). The region’s temperature ranges between 21⁰C and 34⁰C while the annual rainfall ranges between 150mm and 3000mm and the temperature ranged between 15⁰C and 30⁰C. The region enjoys tropical climate with two distinct seasons, the rainy season (April-October)and the dry season (November - March). The vegetation in Southwest Nigeria is made up of freshwater swamp and mangrove forest at the belt, the lowland forest stretches inland to Ogun and part of Ondo State while the secondary forest is towards the northern boundary where Derived and Southern Savannah exists (Ojo and Baiyegunhi, 2008). The region is comprised of six states: Ekiti, Lagos, Ogun, Ondo, Osun and Oyo.

Sampling Techniques

A multistage sampling procedure was used for this study. The first stage involved a purposive selection of two states (Oyo State and Ondo State) out of the six states in Southwest region, Nigeria, due to the high tomato production. The second stage involved a random selection of four (4) Local Governments from each State respectively. In the third stage, a snowball sampling technique was used in selecting ten (10) adopters and ten (10) non-adopters of improved tomato seed varieties, making a total of twenty (20) tomato farmers from each Local Government of Oyo and Ondo State respectively. A total sample size of one hundred and sixty (160) respondents was used for this study comprising of eighty (80) adopters and eighty (80) non-adopters of improved tomato seeds varieties.

Table 1: Sampling Frame and Sample Size Selection

S/N	State	LGA	Adopters	Non-adopters	Sample size
1	Oyo	Ibarapa East	10	10	20
		Iseyin	10	10	20
		Oriire	10	10	20
		Ogo-oluwa	10	10	20
2	Ondo	Akure South	10	10	20
		Akure North	10	10	20
		Owo	10	10	20
		Ose			
Total			80	80	160

Source: Field Survey, 2024

N.B: Equal number of respondents were used for adopters and non-adopters in each LGA because of non-prevalence of cultivators of high yield varieties of tomato and ease of comparison.



Analytical Techniques

Descriptive Statistics

Descriptive Statistics was used in analyzing and describing the socio-economic characteristics of the respondents as stated specifically in objective one (i), determine the factors affecting decision to adopt improved seed varieties as stated in objective two (ii), and to identify the constraints facing tomato producers as specifically stated in objective three (iii). Descriptive statistics consist of frequency counts, percentages, mean among others.

Logic Regression Model

Logic Regression Model was used to determine the factors affecting farmers' decision to adopt improved tomato seed varieties as stated specifically in objective two (ii). When the dependent variable has two outcomes, this model is applied. Suppose response variable *Y* is *binary*, it can have only two possible outcomes which could be denoted as 1 and 0, where 1 symbolizes farmers who adopted improved seed varieties (adopters) and 0 depicts farmers who did not adopt improved seed varieties (non-adopters). The logic regression model was specified as:

$$\Pr(Y = 1|X) = \Phi(X'\beta) \quad \dots(1)$$

$$Y^* = X'\beta + \varepsilon \quad \dots(2)$$

Where,

Pr = Probability

Φ = Cumulative Distribution Function (CDF) of the standard normal distribution

β = Logistics coefficient of independent variable

ε = error term

$$Y = \mathbf{1}_{\{Y^* > 0\}} = \begin{cases} 1 & \text{if } Y^* > 0 \text{ i. e. } -\varepsilon < X'\beta \\ 0 & \text{otherwise,} \end{cases} \quad \dots (3)$$

Hence, the maximum likelihood estimator is given as

$$\ln \mathcal{L}(\beta) = \sum_{i=1}^n (y_i \ln \Phi(x'_i \beta) + (1 - y_i) \ln (1 - \Phi(x'_i \beta))) \quad \dots(4)$$

Where,

X₁ = Age (in years)

X₂ = Gender (Male = 1, Female = 2)

X₃ = Marital Status (1=Single, 2=Married, 3=Separated, 4=Divorced, 5=Widowed)

X₄ = Household size (number of family members)

X₅ = Years of education (in years)

X₆ = Farming experience (in years)

X₇ = Farm size (in hectares)

X₈ = Access to credit (1=Yes; 0 = No)

X₉ = Access to extension (1=Yes; 0 = No)

X₁₀ = Distance to market (kilometers)

RESULTS AND DISCUSSION

Socio-Economic Characteristics of Tomato Farmers

The socio-economic characteristics are presented in Table 2. The data shows that 41.4% of respondents were aged between 41 and 50 years, with a mean age of 45, indicating they are middle-aged and likely capable of the rigorous work required for tomato farming. This aligns with Adegboye *et al.* (2021), who found most tomato farmers were aged 41-60 years. Men comprised 70% of the farmers, reflecting the strenuous nature of the work and social norms regarding gender roles, consistent with Abimbola (2014). Most respondents (81.9%) were married, with an average



household size of five, suggesting that married individuals, seen as responsible, dominate agricultural production. This supports Adegboye *et al.* (2021) view that marriage brings responsibility to farmers. About 88% of respondents had formal education, enabling them to read and follow farming instructions, consistent with Ajagbe *et al.* (2014). Education is crucial for accessing and adopting innovations in tomato farming (Tafida and Ajuba, 2020). All respondents were small-scale farmers with less than 5 hectares of land and an average of 8 years of farming experience, indicating their extensive knowledge and profitability in farming. The majority (51.3%) relied on farming as their primary occupation, contradicting Adegboye *et al.* (2021), who found most had other primary occupations. Most farmers (85.6%) were not part of any cooperative society, 80% had no access to credit, and 65% were not visited by agricultural extension agents.

Table 2: Socio-Economic Characteristics of Tomato Farmers

Variables (n=160)	Frequency	Percentage	Mean
Age (in years)			45 years
≤ 30	20	12.5	
31 – 40	39	24.5	
41 – 50	66	41.4	
51 – 60	35	21.9	
Gender			
Male	112	70.0	
Female	48	30.0	
Marital Status			
Single	11	6.9	
Married	131	81.9	
Divorced	5	3.1	
Widowed	13	8.1	
Household Size			5 members
1 – 5	87	54.4	
6 – 10	71	44.4	
> 10	2	1.3	
Educational Level			
No Formal Education	20	12.5	
Formal Education	140	87.5	
Tomato Farming Experience			8 years
1 – 5	55	34.5	
6 – 10	79	49.6	
11 – 15	26	16.3	
Tomato Farm Size			0.63 hectare
≤ 5	160	100.0	
Primary Occupation			
Farming	82	51.3	
Others	78	48.7	
Cooperative Membership			
Member	23	14.4	
Non-member	137	85.6	
Access to Credit			
No	128	80.0	
Yes	32	20.0	
Access to Extension Services			
No	104	65.0	
Yes	56	35.0	

Source: Field Survey (2024)



Factors Affecting Decision to Adopt Improved Tomato Seed Varieties

Analysis in Table 3, based on the Logic regression model reveal 68.39% probability of adoption of improve tomato seed varieties among farmers. The factors that significantly influenced the adoption of improved tomato seeds includes years of education, access to extension services, and distance to market were significant at (p<0.01). Age, gender, farming experience, distance to input supply, and specific training on improved seed use were significant at (p<0.05), while tomato yield was significant at (p<0.1%).

The result revealed that years of education of the household head positively impacted adoption, with each additional schooling year increasing the likelihood of adoption of improved tomato by 0.39%. This suggests that literate farmers are more inclined to adopt improved seeds, consistent with Ahmed (2015). Access to extension services negatively influenced adoption, decreasing the likelihood by 30.07% due to low access in the study area. Similarly, increased distance to market decreased adoption likelihood of adoption of improved tomato varieties production by 10.29%, indicating that proximity to market sites encourages adoption. Additionally, age had a negative effect, with older farmers being 20.14% less likely to adopt improved seeds, possibly due to higher risk aversion and a decreased interest in long term investment in the farm while, younger farmers are typically less risk averse and are more willing to try new technologies. This contrasts with Ojo and Ogunyemi (2014) who reported that age had a positive influence on adoption decision of improved cassava production technology in Ekiti State

Table 3: Factors Affecting Decision to Adopt Improved Tomato Seed Varieties

Variable	Coefficient	Standard Error	Marginal effect	P>Z
Age	- 0.2162	0.0932	- 0.2014**	0.048
Gender	- 0.6725	0.2288	0.0563**	0.027
Marital Status	1.0261	0.5285	0.0860	0.251
Household Size	- 0.2668	0.1822	- 0.0224	0.116
Years of Education	2.0463	1.1305	0.0039***	0.005
Farming Experience	- 0.3903	0.2366	- 0.0327**	0.077
Farm Size	0.7361	0.8577	0.0617	0.377
Access to Credit	- 1.0928	0.8780	- 0.0916	0.189
Access to Extension Service	- 3.5891	1.5333	- 0.3007***	0.004
Distance from Farm to Market	- 1.2280	0.5532	- 0.1029***	0.008
Distance to Input Supply	- 1.4213	0.6654	- 0.1191**	0.011
Farm Income	2.60e-06	5.350e-06	2.18e-07	0.626
Tomato Yield	4.37e-06	1.36e-06	3.66e-07*	0.000
Specific Training on ITSV Use	1.0865	0.3460	0.0910**	0.032
constant	8.4984	3.7526		
LR Chi ² (14) = 66.22				
Prob > Chi ² = 0.0000				
Pseudo R ² = 0.6839				
Log likelihood = - 15.301655				

(*), (**), and (***) expresses 10%, 5%, and 1% significance level respectively

Source: Field Survey (2024)

Furthermore, gender was significant, with male-headed households more likely to adopt improved seeds, likely due to better access to training and information, aligning with the findings of Mangisoni *et al.* (2019). Farming experience positively influenced adoption, increasing the likelihood of adopting improved tomato varieties by 3.27% per additional year of experience, contrary to Alemayehu (2020). Increased distance to input supply sites decreased adoption likelihood of adopting improved tomato seeds by 11.91% as farmers with improved seed supply



sites in their immediate environment were more likely to adopt improved seeds than those living in areas far from the supply site. Finally, tomato yield was also found to be positively significant in determining the adoption decision at 10% significance level. This implies that an increase in the yield of improved tomato seeds will increase the likelihood or probability of adoption by farmers, indicating that the superior yield of improved seeds is a critical factor for adoption, similar to the findings of Dugue *et al.* (2015).

Constraint of Tomato Production

Constraints are any issues that can reduce a tomato farmer's output. The result shows that 73.8% of farmers reported high cost of inputs (improved seeds, fertilizers, and herbicides). This aligns with Alabi *et al.*, (2023), who found that high input costs hinder productivity. The second major issue, cited by 61.9% of farmers, is pest and disease problems due to insufficient access to necessary chemicals. Additionally, 55.6% of farmers reported that lack of credit facilities is a significant constraint, as it limits their ability to expand production due to high interest rates, short repayment periods, and collateral requirements.

Table 4: Constraints of Tomato Farmers

Constraints	Frequency	Percentage	Ranking
High cost of inputs	118	73.8	1st
Unfavourable weather condition	29	18.1	5th
Lack of credit facilities	89	55.6	3rd
High incidence of pest & diseases	99	61.9	2nd
Marketing problem	46	28.8	4th
Insufficient/scarcity of labour	17	10.0	6th

Source: Field Survey (2024)

CONCLUSION AND RECOMMENDATIONS

In conclusion, the adoption of improved seed varieties among small-scale farmers is essential for enhancing productivity and sustainability. Transitioning from traditional farming methods to improved seed varieties can significantly boost yields, improve resilience to pests and diseases, and increase overall farm profitability. Encouraging this shift through education, access to credit facilities, and support from agricultural extension services is crucial for achieving long-term agricultural development and food security. Therefore, recommendations from the study include strengthening extension services, raising awareness of cooperative membership benefits, and addressing farmers' priorities and needs.

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