



SOCIO-ECONOMIC FACTORS INFLUENCING ADOPTION OF TOMATO POSTHARVEST VALUE ADDITION TECHNOLOGIES (TPVTS) AMONG TIV FARMERS IN BENUE STATE, NIGERIA

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ABSTRACT

The study examined socio-economic factors influencing adoption of TPVTS among Tiv farmers in Benue State, Nigeria. A total sample size of 400 farmers were selected using cluster, purposive and random sampling techniques from six (6) Local Government Areas (LGA) who are the main producers of tomatoes in Benue State. Semi-structured Interview Schedule(SIS) and Focus Group Discussion (FGD) were used for data collection. The quantitative data were analyzed using descriptive statistics and regression analysis while qualitative data were analyzed through transcription of FGD responses. The result showed that TPVTS studied were available to Tiv farmers in Benue State. The results also showed that majority (59.8%) of the tomato farmers in the study area were female within the mean age of 41 years who were mainly married people (62.7%). Further result showed that majority (47.0%) of the respondents acquired only primary education. with mean household size and farm size of 10 people and 2 hectares respectively. The result further indicated that the farmers acquired annual mean income of ₦ 322,028 and average farming experience of 18 years. The study also revealed that farm size ($P= 0.032$), education ($p=0.048$), marital status ($P=0.018$) and age ($P= 0.007$) of the respondents significantly influenced adoption of TPVTS in the study area. The study therefore recommended among other things the improvement of rural farmer's level of formal education since it has positive influence on adoption in the study area. This will enhance farmers understanding of extension teachings and training on TPVTS since most farmers in the study area lack the basic educational background to acquire the technical knowhow to practice some tomato post-harvest value addition technologies available in their area.

Keywords: Adoption of Tomato, Post-harvest Technologies, Socioeconomic Factors

INTRODUCTION

Adoption is defined as the implementation of transferred knowledge about a technological innovation (Roger, 2003). He inferred that adoption occurs when a person has decided to make full use of a new technological innovation as the best way to address a need. It involves the integration of an innovation into farmers' normal farming activities over an extended period of time and is usually preceded by a period of 'trying' and some degree of adaptation (Loevinsohn and Diagne 2013). Adoption is a decision to make full use of an innovation as the best course of action available. Asiabaka *et al.* (2001) identified adoption conditions to include awareness of information, valid up-to-date information, technical assistance necessary to adopt the technology and applicability of the technology to their farming system. They also noted that adoption is not a perpetual behavior, this implies that an individual may decide to discontinue the use of an innovation for a variety of personal, institutional, and social economic reasons, one of which might be the obtainability of another practice that is better in satisfying farmers' needs.



There exist vast literatures on factors that determine agricultural technology adoption. According to Loevinsohn, and Diagne (2013), farmers' decisions about whether and how to adopt new technology are conditioned by the dynamic interaction between characteristics of the technology itself and the array of conditions and circumstances. Diffusion itself results from a series of individual decisions to begin using the new technology, decisions which are often the result of a comparison of the uncertain benefits of the new invention with the uncertain costs of adopting it. An understanding of the factors influencing this choice is essential both for economists studying the determinants of growth and for the generators and disseminators of such technologies (Hall and Khan, 2002). Traditionally, economic analysis of technology adoption has sought to explain adoption behaviour in relation to personal characteristics and endowments, imperfect information, risk, uncertainty, institutional constraints, input availability, and infrastructure (Uaiene *et al.*, 2009, Mwangi and Kariuki, 2015). A more recent strand of literature has included social networks and learning in the categories of factors determining adoption of technology. Some studies classify these factors into different categories. Akudugu *et al.* (2012) grouped the determinant of agricultural technology adoption into three categories namely; economic, social and institutional factors. Kebede as cited in Lavison (2013) broadly categorized the factors that influence adoption of technologies into socio-economic and physical categories, while Namara, *et al.* (2003) categorized the factors into, farmer characteristics, farm structure, institutional characteristics and managerial structure.

Although there are many categories for grouping determinants of technology adoption, there is no clear distinguishing feature between variables in each category. Categorization is done to suit the current technology being investigated, the location, and the researcher's preference, or even to suit client needs (Bonabana, 2002). For instance, the level of education of a farmer has been classified as a human capital by some researchers while others classify it as a household specific factor that influence adoption of agricultural innovation. This study therefore reviewed socio-economic factors influencing adoption of improved tomato postharvest value addition technologies among Tiv farmers in Benue State, Nigeria. The socio-economic factors considered in this research work are: tomato farmer's socio-economic attributes among Tiv people of Benue State which include sex, marital status, age, educational qualification, years of farming experience, farm size, occupation, annual income and household size. This would enable the researchers to examine the impact and contribution of each variable on the adoption of TPVTs in the study area. The specific objectives of the study include: to describe the socio-economic attributes of Tiv tomato farmers in Benue State; to access the available tomato postharvest value addition technologies among Tiv farmers of Benue State and to examine the influence of each socio-economic factor on adoption of tomato postharvest value addition technologies among Tiv farmers in Benue State.

METHODOLOGY

Study Area

This study was carried out among Tiv tomato farmers in Benue State, Nigeria. Agriculturally, Tiv area of Benue State comprise two agricultural zones which are Northern and Eastern agricultural zones. The population for the study consist of all the 398,500 tomato farmers in the six major tomato production Local Government areas (LGAs) in the two agricultural zones of Benue State (Benue State Ministry of Agriculture and Natural Resources, 2021). These LGAs are Tarkaa, Gboko, and Buruku from the Northern agricultural zone and Ushongo, Katsina - Ala as well as Konshisha from the eastern agricultural zone. Tiv people



were selected for the study base on the fact that they produce majority of tomatoes cultivated in Benue State.

Sampling Procedure and Sample Size

A sample size of 400 respondents for the study was determined using Taro Yamane sample size determination formula for known population while cluster, purposive and simple random sampling techniques was used for selection of respondents for the study. The six LGAs studied comprise of 10 extension blocks and 80 extension cells with a total number of 398,500 tomato farmers. Each of the selected block for the study has 8 extension cells out of which 4 extension cells were purposely selected for the study based on their level of tomato production to have a total number of 24 extension cells where structured interview schedules were held. 12 focus group discussion comprising of at least 7 leaders/executive members of tomato farmer's associations were held in each of the selected six (6) LGAs given a total number 84 discussants. This was necessary to validate responses from structured interview.

Data Analysis

Quantitative data collected were analyzed using simple percentages, frequencies, mean and a multiple regression model while qualitative data from the focus group discussions were analyzed through transcribing of responses of the discussants.

RESULTS AND DISCUSSION

Socio-economic Characteristics of the Respondents

The data presented in Table 1 revealed that majority (59.8%) of tomato farmers in Benue State were female while (40.2%) represent the male population. The larger number of female farmers may be attributed to the fact that tomatoes is commonly considered by many Tiv people to be a female crop hence it is mainly grown by female farmers in the study area. The result corroborated the findings of Odiaka *et al.* (2013) that showed more female (71.2%) participation in vegetable crop (including tomatoes) production in Benue. However, Akangbe *et al.* (2014) reported that tomato farming in Surulere Local Government Area of Oyo State were dominated by male.

The results in table 1 also revealed that greater proportion (37.8%) of the respondents were within the age of 31-43 years followed by those within the age of 44-56 years (30.5%) and 18-30 years (16.2%). The respondents that were above 70 years constituted 4.8%, while those within 57-69 accounted for 10.5%. The mean age of the respondents was 41 years. This implies that tomato farmers in the study area were adult in their active and middle years and hence will be physically disposed to farming activities and may have the willingness to adopt innovations in tomato production. This finding is in line with Kurannen - Joko and Dzahan (2018) who stated that majority of tomato farmers in Gboko Local Government Area of Benue State were still within their middle, active and productive ages and hence can engage efficiently in tomato production and accept new technologies.

Table 1 showed that the majority (62.7%) of the respondents were married, while 19.0% were single. The results also reveal that 17.5% and 1.5% of the respondents were widowed and divorced/Separated from their marriages respectively. The larger number of married people in tomato farming in the study area may be ascribed to the fact that they have more family responsibilities and are willing to engage in one economic activity or the other as well as in tomato production that will boost their agricultural output and income in order to cope with family needs and challenges unlike the singles who may have less responsibilities. This result is in line with the view of Terna, *et al.* (2016) and Kurannen - Joko and Dzahan (2018) who reported that married people account for majority of tomato farmer's population in Benue State.



Entries in Table 1 further revealed that greater proportion (40.0%) of tomato farmers had household size of 5-10 persons, while 32.8% of them had a household size of 11-16 persons. The remaining 13.8% and 9.5% of the respondents had a household size of less 5 persons and 17-22 people and above respectively. The mean household size was 10 persons. The large household size could serve as source of family labour who may engage in farming activities like land clearing, planting, weeding, harvesting, and sorting of tomatoes to increase income of the farmers. Agada (2015) affirmed that large household size is an advantage for labour provision in agricultural production in Benue State. Similarly, Irohabe (2017) reported that large household sizes are important assets in working together to reduce poverty among farming families.

The results in Table 1 further revealed that greater proportion (47.0%) of tomato farmers had acquired primary education. This was followed by respondents who completed secondary education 31.0% while those who attained tertiary institution were 9.5%. The remaining 13.3% comprises the respondents who had no formal education were 14.0%. This implies that by average majority of the farmers acquired formal education. The larger number of tomato farmers who had access to formal education is worthwhile because education helps to create a favourable mental attitude within people for the acceptance of new practices. Adesoji and Adebayo (2008) observed that the more educated a farmer is, the more the chances that the farmer will adopt innovations than the uneducated ones. In the same vain, Mignouna *et al.* (2011) and Lavison (2013) reported that education level of a farmer increases his ability to obtain; process and use information relevant to adoption of a new technology. This is because formal education provides them with the ability to read and write, handle and interpret messages relating to their farm operations in the instruction manuals on input and machinery uses, and also enable them to appreciate extension services (Odoro Aboagye and Acquaye 2014)

The entries in able 1 revealed that the majority 51.8% of tomato farmers in the study area acquired farming experience of between the age bracket of 11-20 years, followed by 23.3% with farming experience of between 21-30 years and 16.5% had years of farming experience between 1-10 years. The result also shows that 8.8% of the respondents acquired between 31-40 years while only 0.75% of the tomato farmers acquired above 40 years of farming experience with a mean farming experience of 18 years.

Table 1 showed that the majority (42.2%) of the respondents had estimated annual total income of between ₦201000-300000 annually, followed by 29.9%, 18.3 % and 13.0% of the respondents who realized above ₦301000, between ₦101000-200000 and less than or equal ₦100,000 respectively per annum. The average annual income was ₦233,028 this implies that the majority of the farmers had low total annual income which may be inadequate to meet basic family needs like feeding, housing and payment of children school fees let alone purchasing of farm inputs and adopting new technologies particularly when they are cost ineffective. According to Diiro (2013), farm income is expected to provide farmers with liquid capital for purchasing productivity enhancing inputs such as improved seeds and fertilizers. When this income is low farmers are likely to deploy them to their other pressing need. The result also indicated that majority of the respondents were living on less than one dollar per day which is below poverty line.

Further results in Table 1 showed that the majority (61;0%) of the respondents cultivated between 1-2 hectares of tomatoes followed by 21.5 %, 11.5 %, 9.6% and 1.3 % who cultivated between 3-4 hectare, less than 1 hectare and 5-6 hectares respectively. The mean farm size for tomato production was 2 hectares. This implies that the respondents grew tomatoes in small scale and hence may not be willing to take risk adopting an innovation.



According to Lavison (2013) and Uaiene *et al.* (2009) stated that farmers with large farm size are likely to adopt a new technology as they can afford to devote part of their farm resources to try new technology unlike those with less farm size and financial resources. Anderson and Fedder (2004) also found that the adoption of technologies by farmers is affected by socio-economic factors, institutional and intervening factors which included age of the potential adopters, sex, education level, farming experience, farm size and labour availability

Table 1: Socio-economic Characteristics of the Respondents

Variables	Frequency (n=400)	Percentage	Mean
Sex			
Female	239	59.8	
Male	161	40.2	
Age			
18 – 30 years	66	16.2	
31 – 43	151	37.8	
44 – 56	122	30.5	41
57 – 69	42	10.5	
Above 70 years	19	4.8	
Marital status			
Single	76	19.0	
Married	248	62.0	
Widowed	70	17.5	
Divorced/ separated	6	1.5	
Household size			
<5people	55	13.8	10
5 – 10 people	176	44.0	
11 – 16 people	131	32.8	
17 – 22 people and above	38	9.5	
Educational qualification			
No formal education	56	14.0	
Primary school	188	47.0	
Secondary school	124	31.0	
Tertiary institution	32	8.0	
Years of farming experience in tomato			
1 -10 years	66	16.5	
11 – 20 years	207	49.7	
21 – 30 years	89	23.4	18
31 – 40 years	35	8.2	
Above 40 years	3	0.9	
Annual household income (₦)			
< ₦ 100000	52	13.0	
101000 – 200000	73	18.3	
201000 – 300000	169	42.2	233,028
Above ₦ 301000	106	26.5	
Size of tomato farm			
< 1hectare	39	9.8	
1 – 2 hectares	224	56.0	
3 – 4 hectares	86	21.5	2 h
5 – 6 hectares	46	11.5	
7 – 8 hectares	5	1.3	

Source: Field Survey, 2023



Distribution of Respondents According to their level of Awareness of the Availability of Improved Tomato Post-harvest Value Addition Technologies in the Study Area. It is worthy to note here that only 288 out of the 400 sampled targeted farmers were aware of available TPVTs in the Study Area. This is why n in table2 is 288. The results in Table 2 reveal that the majority (99.7 %) of tomato farmers who were aware of the available improved tomato postharvest value addition technologies in their localities agreed that sun drying of tomatoes in to chips was the most available TPVTs in their area. This followed by grind and frozen with 96.6% of availability which ranked second as indicated by tomato farmers. While pureed and sealed with oil in Jars ranked third with availability score of 87.8%. The study also revealed that boiled and seal technology ranked fourth with available score of 86.1% as indicated by the tomato farmers while 80.9% of the farmers ticked fresh refrigerated as the fifth TPVTs available in the study area. Table 2 further shows that peeled tomato preserves was ranked 6 position with 73.6% availability in the study area with process in to Juice having 66,39% (7th), pulping and pickling had 62.8% (8th), cold water bath was ranked 9th with 37.5% availability and process in to Jam had the least level of availability score of 30,29% in the study area as shown in table 5.

The result of the study suggests that some TPVTs were more available and well known to the farmers in the study area than other TPVTs. The variation in availability of TPVTs may be attributed to the fact that some of the improve tomato post-harvest value addition technologies were developed from what the farmers were already familiar with than those TPVTs which could be entirely new to the farmers. It could also be that some of the available improved tomato post-harvest value addition technologies were more popular to farmers due to their simplicity, ease of use as well as farmer's perception of their usefulness. A focus group discussion with the tomato farmers in the study area also indicated that tomato postharvest value addition technologies studied were available to the farmers at varying degrees:

A 41- years- old female discussant from Tsekucha cell in Gboko block stated that: "We do not have all the TPVTs in our area but we practice majority of them in this village particularly sundried into chips and boil and seal (FGD, 2023)". Another 39-years-old discussant from Buruku township cell, Buruku block enlisted some of the TPVTs available in their area to include: "Sundried into chips, grind and frozen, pureed and sealed with oil in jars, pealed tomato preserve, boil and seal as the most common TPVTs available in their area (FGD. 2023). Similarly, a 41-years-old female farmers at Tarhembra cell in Tarkaa block named some of the TPVTs commonly available in their area as: Sun dried into chips, rind and frozen, pureed and sealed with oil in jars pealed tomato preserve, boil and seal as well as fresh frozen (FGD, 2023)"

Table 2: Distribution of Respondents According to their Level of Awareness of the Availability of Improved Tomato Post-harvest Value Addition Technologies in the Study Area

Variables	Frequency (n=288)	Percentages	Ranks
Cold water bath	108	37.5	9 th
Sundried into chips	287	99.7	1 st
Peeled tomato preserves	212	73.6	6 th
Fresh refrigerated	233	80.9	5 th
Pureed and sealed with oil in jars	253	87.8	3 rd
Boiled and sealed	248	86.1	4 th
Pulping and pickling	181	62.8	8 th
Grind and frozen	279	96.9	2 nd
Process in to jam	87	30.2	10 th
Process in to juice	191	66.3	7 th

Source: Field Survey, 2023

Socio-economic Factors Influencing the Adoption of Improved TPVTs among Tiv People of Benue State

Table 3 shows the result of a multiple regression analysis on socio-economic factors influencing adoption of improved tomato postharvest value addition technologies among Tiv people of Benue State. The result shows that coefficient of regression (R^2) was 0.075 and the adjusted R^2 had a value of 0.040. This implies that the independent variables were able to explain the dependent variables by about 7.5% which suggests that 7.5% of the variations observed were attributed to the combined influence of all the independent variables included in the regression model while the error term accounted for the remaining 92.5% which are variables that were not included in the model due to certain qualitative features. In addition, small value of $R^2=7.5\%$ point to the fact that the combined influence of all the independent variables (Socio-economic characteristics of the respondents) upon adoption of TPVTs is negligible.

Moreover, Table 3 also reveals that out of ten variables regressed, only four variables (farm size, education, marital status and age of the respondents) significantly influenced adoption of improved tomato postharvest value addition technologies among Tiv People of Benue State. Table 4 further reveals that tomato farm size had a significant ($t=2.161$, $P=0.032$) positive influence on adoption of TPVTs. This indicates that the larger the farm size, the more the likely hood of adopting TPVTs to reduce tomato postharvest loses among farmers in the study area. Naturally, farmers with larger farm size will produce more crops than those with small farm size and hence have more income and higher likely hood of adopting a new technology. Lavison, (2013) stated that farmers with large farm size are likely to adopt a new technology to increase farm output than those with less farm size. Mignouna *et al.* (2011) also reported a positive relationship between farm size, adoption of agricultural technology and farm output. Farmers with large farm size are likely to adopt a new technology and have better output as they have more income than poor farmers.

However, Parvan (2011) observed that farm size does not always have the same effect on adoption and yield; rather the effects of farm size vary depending on the type of technology being introduced, the institutional setting of the local community, market failure and quality of land used by the farmer among other factors.

The results in Table 3 also reveal that educational qualification of the farmers had a significant ($t=1.0695$; $p=0.048$) positive influence on adoption of improved tomato

postharvest value addition technologies. This implies that increase in years of acquiring formal education by farmers will tend to increase adoption of TPVTs. This is because formal education provides them with the ability to read and write, handle and interpret messages relating to their farm operations in the instruction manuals on how to use TPVTs. Thus, enables them to appreciate and adopt an innovation to reduce their tomato loses. This result is in conformity with Adesoji and Adebayo (2008) who observed that the more educated a farmer is, the more the chances that the farmer will adopt innovations than the uneducated ones. In the same vain, Mignouna *et al.* (2011) and Lavison (2013) reported that education level of a farmer increases his ability to obtain, process and use information relevant to adoption of a new technology.

The results in table 3 also indicated that marital status has positive significant (2.374; $P=0.018$) influence on the adoption of improved tomato post-harvest value addition technologies in the study area. The result implies that for very addition marriage among tomato farmers in the study area, adoption of improved tomato postharvest value addition technologies will increase by 2.374. As many people get married there is likely hood that adoption will increase.

The greater number of married people in tomato farming in the study area may not be unconnected to the fact that they have more family responsibilities and were willing to adopt innovations in an attempt to augment their farm output and income in order to cope with family needs and challenges unlike the singles who may have less responsibilities. This result is in line with the view of Kuranen-Joko and Dzahan (2018) who reported that married people accounts for majority of tomato farmer's population in Benue State in order to cope with numerous family responsibilities. The results in table 18 also indicated that age of the respondent has negative significant (- 2.719; $P= 0.007$) influence on the adoption of improved tomato post-harvest value addition technologies among Tiv farmers in Benue State. The result infers that as the farmers get older, there is likely hood that they may not be willing to adopt agricultural innovation hence the adoption of TPVTs will decrease among the respondents in the study area as they grow older

Table 3: Socio-economic factors that Influence the Adoption of Improved Tomato Post-harvest Value Addition Technologies among Tiv Farmers in Benue State.

Variables	B	Std. error	Beta	T	Sig.
Constant	1.016	0.2.2		5.029	0.000
Sex of respondents	0.32	0.052	0.038	-0.163	0.534
Age of respondents	-0.68	0.025	-0.163	-2.719	0.007*
Marital status	0.96	0.040	0.147	2.374	0.018*
Occupation of the respondents	-.045	0.040	0.068	-1.122	0.623
Household size	-.036	0.031	0.068	1.132	0.259
Educational qualification	0.022	0.031	0.045	0.695	0.048*
Years of farming experience	0.028	0.030	0.059	0.914	0.362
Annual household income	-0.013	0.290	-0.032	-0.467	0.641
Size of tomato farm	0.069	0.032	0.190	2.161	0.032*
Quantity of tomatoes produced	-0.048	0.027	-0.161	-1.798	0.073

$R^2=0.075$, Adjusted $R^2=0.041$ * = Significant at 5% Level of probability

Source: Field Survey, 2023



CONCLUSION AND RECOMMENDATION

The study evaluated the socio-economic factors influencing adoption of improved tomato postharvest value addition technologies of rural farmers among Tiv farmers in Benue State. The main finding of study revealed that out of ten socio-economic variables regressed, only four variables (farm size, education, marital status and age of the respondents constitute only about 7.5% of the variations observed in the dependent variable) significantly influenced adoption of improved tomato postharvest value addition technologies among Tiv people of Benue State. This implies that there may be other factors affecting adoption of ITPVs in the study area.

The study however, recommended among other things improvement of local famers access to formal education in the study area by upgrading adult primary school to secondary level by Benue State government. This will not only enhance farmers' understanding of skills necessary for adoption of ITPVs but will also augment their perception of future innovations in agriculture This is necessary because most farmers in the study area lack the basic educational background to acquire the technical knowhow to practice some tomato post-harvest value addition technologies available in their area.

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