# DETERMINANTS OF ADOPTION OF PRODUCTION TECHNOLOGIES AMONG POTATO FARMERS.

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**Abstract**
Potato is an important food security and cash crop for smallholder farmers in the study area. However, average yield is 6MT/ha; far below attainable yields of 25MT/ha; technology adoption becomes necessary to ameliorate the challenges of farm productivity. This study analyzed the determinants of adoption of potato production technologies in Bokkos, Plateau state, Nigeria. Multi-stage sampling procedure was used for this study. Primary data were analyzed using descriptive statistics, adoption index and Multinomial Logit regression analysis. The results revealed the mean age of the respondent was 41 years; 51% were male; majority (90%) are married; mean household size was 9; mean level of education was 12 years; mean farming experience was 11 years; mean farm size is 1.1ha; most (98%) had no access to extension contact; and average farm income was ₦197,500/ha. A variety of agricultural technologies have been disseminated in the area. In addition, the results revealed that most (59.2%) of the farmers have an adoption index of 0.1≥0.33; indicating low adoption of potato production technology among. Agricultural input subsidies, improved access and supply of agricultural technology, financial services, market linkages, extension services and tenure policy modifications are recommended.
**Keywords**: Adoption index, agricultural technology, determinants, potato production, yield

## 1.0 Introduction

Potato (*Solanum tuberosum* L.) is the fourth most important staple food crop in the world after rice, wheat (*Triticumae stricum*) and maize (*Zea mays*) (CIP, 2008). It was ranked first in the world's root and tuber crop production followed by sweet potato (*Ipomoeas batatas*). In terms of yield, potato is the third crop and first in root and tuber crops followed by sweet potatoes (CIP, 2008). Potato has the potential to relieve the pressure of food insecurity on the rural farmers since the crop has a short maturity period. It matures in about 60 to 90 days, giving it the advantage of being cultivated two to three times a year (Okunade and Ibrahim, 2011 & NRCRI, 2005). About 85% of Potato produced in Nigeria comes from Jos, Plateau state; which has near temperature climatic conditions that favor Potato production (NRCRI, 2005). Potato is grown for food as well as cash crop. It is a major source of income among the rural farmers during rainy and dry season in the producing area. Potato is a crop that provides reliable source of income, employment and feed to many populations in the developing countries (FAO, 2008). Potato is an important food security and cash crop for smallholder farmers. However, yields in SSA range from 6 to 10 MT/ha, far below attainable yields of 25–35 MT/ha and the 2010 global average of 17.4 MT/ha. Demand for potato is increasing, but the trend is to increase the area under production rather than tackle productivity constraints (yields). This is unsustainable. Although the solution is to increase productivity, major bottlenecks are limited access to quality seed of suitable varieties, poor agronomic and disease management which reduces yields, food availability, and famers' incomes. The health status of the seed defines the potential yield of the potato crop. Typically, farmers often use unmarketable ware potato for planting that is generally of low quality and sourced from their own fields or local markets. Kudi *et al*., (2010) maintain that the Irish potato gives the highest yield per unit area among roots and tuber crops in Nigeria and that it brings more income to farmers than other roots and tuber crops. Thus, a major challenge facing Potato production is poor awareness on the adoption of new and/or improved technologies. Other challenges faced by the Potato farmers are that most of the farmers have problem of marketing their farm produce, attributable to poor market linkages, inadequate storage facilities for their harvest and disease outbreaks.

Technology adoption by farmers becomes necessary to ameliorate the challenges of farm productivity. Some of these modern agricultural technologies include; (i) improved seed variety, (ii) agrochemical application, (iii) fertilizer application, (iv) irrigation farming, (v) plant protection measures, (vi) adjustments in planting dates (vii) seed rate, (viii) plant spacing, and (ix) improved agronomic practices. Disseminating these technologies to farmers is germane to increase the level of farm productivity (Mignouna *et al*., 2011). For a farmer to decide whether or not to adopt an innovation, there are other aspect and characteristics that come into play. They include educational level, access to credit services as well as access to extension services. Some of these factors have been shown to be significant in determining farmer's decision to adopt a technology. The way a farmer perceives a technology may influence adoption. The technology specific attributes have been shown in the past to significantly determine farmer's decision to adopt a technology (Idrisa *et al*, 2010). The actions taken by the farmer many times depends on their evolution of the outcomes depending on his/her personal perspectives. Since the role of any technological improvement in agriculture is to

improve production, adoption of improved potato technologies may be influenced largely by the farmer's perception (Idrisa *et al*., 2010). Farmers' lack of knowledge to select quality seed is compounded by limited access to varieties with robust traits (such as drought, heat, and disease tolerance and/or bio fortified with essential micronutrients, specifically iron and zinc), lack of knowledge of good agricultural practices, and minimal capacity to store. Although seed certification standards exist, most national policies do not recognize more practical quality standards, such as Quality Declared Planting Material (QDPM). This further limits access to quality seed. Policy advocacy for more practical quality standards is required at national levels. Strategic partnerships for going to scale, accompanied with strategic research to assess cost-effectiveness and gender inclusiveness constitute necessary next steps. However, despite all the efforts, there is dearth of information on the adoption of the disseminated agricultural technologies and factors hindering or promoting their adoption, particularly on potato production in the study area; therein lies the research gap. It is envisaged that this study would validate the significance of adoption of technologies in Potato production. The findings of this study are expected to provide a guide to assist farmers on areas to explore Potato production technologies for increased yields and economic benefits. It is expected that this study would provide a useful framework for assessing farmer's adoption behavior, thereby providing a feedback for extension and research institutes. Furthermore, the finding of this research would contribute to the existing literature, especially on agricultural technology adoption studies which would serve as a tool for consultation and subject of further research activities. Therefore, the broad objective of this study was to investigate the sustainability of potato production through technology intensification, while the specific objectives were to;

i. describe the socioeconomic characteristics of the respondents;
ii. identify agricultural technologies available in the study area;
iii. ascertain the level of adoption of agricultural technologies; and
iv. determine factors influencing adoption of potato technologies.

### 1.1 Statement of Hypotheses

$H_o$: There is no significant relationship between the socioeconomic characteristics of the respondents and their index of adoption of production technologies.

## 2.0 Methodology

### 2.1 Study Area

This study was conducted in Bokkos Local Government Area (LGA). The LGA has an area of 1.682km$^2$ with a population of 178,894 (projected population 2016). It lies between latitude 9$^o$N and 10$^o$S and longitude 8$^o$W and 9$^o$E. The LGA has eight (8) districts namely; Bokkos, Mushere, Tangur, Manguna, Butura, Sha, Daffo and Mbar (Anon, 2003). The area has a monthly average temperature range of 12$^0$C – 28$^o$C with an annual rainfall of 1500mm (Anon, 2003). The local government is largely rural and the people are mainly farmers engaged in marketing and production of agricultural commodities which include; Potato, cassava, sweet potato, yam, maize and rice. Livestock reared include; pigs, poultry, cattle, sheep and goat. The major ethnic groups are Ron, Mushere and Kulere (Anon, 2003).

### 2.2 Sampling Procedure

A multi-stage sampling technique was employed to select respondents for this study. In the first stage, four districts were purposively selected namely: Bokkos, Tangur, Butura, and Mbar. These four (4) districts were considered because they are the major producers of Potato in the LGA (NRCRI, 2005). The second stage involved the selection of two villages from each of the selected districts. These villages were selected due to the predominant population of potato farmers. The third stage involved the collection of a compiled list of potato farmers from a local Agricultural Extension Agent. The last stage involved the random selection of 5% of the total population from the compiled list to represent the sample size for the study.

### 2.3 Data Collection

Primary data were used in the study. The data were collected through the use of structured questionnaire administered to the respondents in study area.

### 2.4 Analytical Techniques

Descriptive statistics (frequency distributions, percentages and means), Adoption index and Multinomial Logit regression were the analytical techniques adopted for this study.

### 2.5 Model specification

#### 2.5.1 Adoption Index

The level of adoption of potato production technology was measured using the adoption index. Adoption index were computed for individual farmer following Philip *et al*., (2000) whereby adoption index (Bi) is given by:

$B_i = \sum (R_i/R_T)$ …….. (1)

Where:

$B_i$ = adoption index of agricultural technology by $i_{th}$ farmer;

$R_i$ = number of potato production technology adopted by $i_{th}$ farmer; and

$R_T$ = Total number of potato production technology available to the $i_{th}$ farmer.

i = (1…….n)

For this study;

i. Adoption of ≤3 production technology indicates low level adoption;
ii. Adoption of 4-6 production technology indicates mid-level adoption, while
iii. Adoption of 7-9 production technology indicates high level adoption.

The modern agricultural technology available in the study area include; (i) improved seed variety, (ii) agrochemical application, (iii) fertilizer application, (iv) irrigation farming, (v) plant protection measures,

(vi) adjustments in planting dates (vii)seed rate, (viii) plant spacing, and (ix) improved agronomic practices.

**2.5.2 Multinomial Logit Regression Analysis**

Multinomial Logit regression analysis was used to analyze the factors that influence the index of adoption of potato production technology in the study area. In this regression analysis, the index of potato production technology adoption will be used as a dependent variable (Y) as applied in a study by Namwata *et al.* (2010) and the independent variables include; Age ($x_1$), Gender ($x_2$), Household size ($x_3$), Education ($x_4$), Farming experience, ($x_5$), Farm size ($x_6$), Farm income ($x_7$), Extension contact ($x_8$). The regression model is specified explicitly as follows:

$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + e_i$……. (2)

Variables for regression analysis:

**Table 1: Variables in the Regression Model**

| | |
|---|---|
| Dependent variable (y): | Index of adoption |
| Independent variables: | In years |
| Age ($x_1$) | Male=1, female =0 |
| Gender ($x_2$) | Number (population) |
| Household size ($x_3$) | In years |
| Education ($x_4$) | In years |
| Farming experience ($x_5$) | Hectares (Ha) |
| Farm size ($x_6$) | Naira (₦) |
| Farm income ($x_7$) | Yes=1, No=0 |
| Extension contact ($x_8$) | Error term |
| $e_i$ | |

## 3.0 Results and Discussion

### 3.1 Socioeconomic Characteristics of the Respondents

#### 3.1.1 Age of the Respondents

Table 2 revealed the mean age of the respondent was 41 years; most (71.4%) of the respondents were within the age bracket of 31-49 years. This implies that most of the farmers are still within their active and productive age and can participate adequately in farming activities. Young people are thought to be more receptive to modern ideas than their older counterparts; which therefore suggests an inverse relationship between age and technology adoption. This agrees with the findings of (lupilya, 2007); Onuwa *et al*. (2021) and Nwakor *et al*. (2008) who reported similar results on farmer's demography in agricultural technology adoption.

**Table 2: Distribution of Respondents based to their Age**

| Age of Respondents | Frequency | Percentage (%) |
|---|---|---|
| ≤ 30 | 13 | 13.3 |
| 31 – 49 | 70 | 71.4 |
| ≥50 | 15 | 15.3 |
| **Mean** | **41** | |

Source: Field Survey, 2018

#### 3.1.2 Gender of the Respondents

Table 3 revealed that 51% were male while 47% were female. This proportion indicates that there is large gender disparity among maize farmers hence a predominant population of male participants in this agricultural activity; implying a higher proportion of male to female ratio, thereby resulting to limited access of rural women to productive assets, e.g. land, etc. The low participation of females may also be due to sociocultural factors in the study area. This agrees with the findings of Kudi *et al*. (2010) who reported that the major constraints of women's full participation in agricultural activities and rural development was their limited access to productive assets.

**Table 3: Distribution of Respondents Based on their Gender**

| Gender | Frequency | Percentage (%) |
|---|---|---|
| Female | 47 | 48 |
| Male | 51 | 52 |

Source: Field Survey, 2018

#### 3.1.3 Marital Status of the Respondents

Table 4 revealed that majority (90%) of the respondent are married, while 10% are single; implying a predominance of married households in the study area. Thus, marital status can be a determinant of household size, which also serves as proxy to family labour required for carrying out farm activities. This corroborates with Voh *et al*., (2001) asserted that a married farmer is more likely to adopt improved agricultural technology, due to additional

responsibilities and hence the need to improve farm productivity and income.

**Table 4: Distribution of Respondents based on their Marital Status**

| Marital Status | Frequency | Percentage (%) |
|---|---|---|
| Single | 10 | 10 |
| Married | 88 | 90 |

Source: Field Survey, 2018

### 3.1.4 Household Size of the Respondents

Table 5 revealed that the mean household size of the respondents was 9; most (36.73%) had household size of between 6-10 people. This suggests adequate supply of family labour for farm activities; household size has a great role to play in family labour provision in the agriculture sector and it is an important determinant of adoption (sule*et al*., 2002).This finding is in line with Okoedo-Okojie and Onemolease (2009); Onuwa *et al*. (2021); Mignouna *et al*. (2011) and Bonabana-Wabbi (2002) who reported that large household size supplement labour supply used in carrying out farm and other household activities.

**Table 5: Distribution of Respondents Based on their Household Size**

| Household Size | Frequency | Percentage (%) |
|---|---|---|
| ≤5 | 27 | 27.55 |
| 6-10 | 36 | 36.73 |
| 11-30 | 35 | 35.72 |
| **Mean: 9** | | |

Source: Field Survey, 2018

### 3.1.5 Respondent's Level of Education

Table 6 revealed that the mean level of education of the respondents was 12 years; most (67.4%) of the respondents attained an educational level of between 7-12years (secondary) followed by ≤6years (primary) (17.3%) and ≥13years (tertiary) (16.3%); implying that majority of farmers were literate and farmers with some level of education have a higher likelihood to adopt new technology easily and use them effectively. Education according to Murtala *et al*., (2004) plays an important role in a farmer's adoption of improved technologies and decision making and also improve their ability in evaluating and managing risk that determine success of their farm enterprise. Similarly, Mignouna *et al*. (2011) noted that education would likely enhance the adoption of modern farm technologies. Ojukaiye (2001) posited that education is an important socio economic factor that influences a farmers' decision because of its influence on the farmers' awareness, perception, reception and the innovation that can bring about increase in production.

**Table 6: Distribution of Respondents Based on their Level of Education**

| Level of education | Frequency | Percentage (%) |
|---|---|---|
| ≤6 (primary) | 17 | 17.3 |
| 7 – 12 (secondary) | 66 | 67.4 |
| ≥13 (tertiary) | 16 | 16.3 |
| **Mean:12.9** | | |

Source: Field Survey, 2018

### 3.1.6 Farming Experience

Table 7 revealed that the mean farming experience of the respondents was 11 years; most (62.3%) of the respondents had 11-19 years farming experience, those with ≤10 years of farming experience were 20.4%, while 17.3% had ≥20 years of farming. The years of farming experience suggests that the farmers will be able to make sound decisions as regards resource allocation and general management of their farms. The study area is an agrarian community and hence most of the respondents had several years of farming experience and farmers with more years of farming experience will have more likelihood to be more efficient in farm production. These years of farming experience provides the respondents with adequate knowledge and information on agricultural practices and technology that can enhance farm productivity (Onuwa*et al*., 2021).

**Table 7: Distribution of Respondents based on the Years of Farming Experience**

| Years of experience | Frequency | Percentage (%) |
|---|---|---|

| | | |
|---|---|---|
| ≤10 | 20 | 20.4 |
| 11-19 | 61 | 62.3 |
| ≥20 | 17 | 17.3 |
| **Mean: 11.04** | | |

Source: Field Survey, 2018

### 3.1.7 Farm size of the respondents

Table 8revealed that the mean farming size of the respondents was 1.1ha; most (82%) of the respondents had farm size of ≤1ha, while those with ≥2ha had the lowest percentage of 16%. This suggests that majority of the farmers had small farm holdings which accounts for the predominance of subsistent level of maize production in the study area, which prevents them from enjoying economies of scale. Similarly, small farm size is an impediment to agricultural mechanization because using farm machineries like tractors will be difficult. The small farm holdings may be attributable to the prevailing land tenure practices in the study area which further fragments farmlands. Farmers with large farm size are likely to adopt new technology as they can afford to devote part of their land to try new technology unlike those with smallholdings (Uaiene *et al.*, 2009). Many studies have reported a positive relation between farm size and adoption of agricultural technology (Uaiene *et al*., 2009; lavison 2013; Mignouna *et al.*, 2011).

**Table 8: Distribution of respondents based on their farm size**

| Farm size | Frequency | Percentage (%) |
|---|---|---|
| ≤ 1ha | 82 | 84 |
| ≥2ha | 16 | 16 |
| **Mean: 1.10** | | |

Source: Field Survey, 2018

### 3.1.8 Access to Extension Contact by respondents.

Table 9 revealed that most (98%) of the respondents had no access to extension contact, while (2%) had access to extension contact. Contact with extension workers tends to increase farmers' likelihood of adopting agricultural technologies. Access to extension services has also been found to be a key aspect to technology adoption. Farmers are usually informed about the existence as well as the effective use and benefit of new technology through extension agent. Extension agents act as a link between the innovation (Researchers) of the technology and users of that technology. This help to reduce transaction cost incurred when passing the information on the new technology to a large heterogeneous population of farmer (Genius *et al.*, 2010).

**Table 9: Distribution of Respondents Based on their Access to Extension.**

| Access to Extension Contact | Frequency | Percentage (%) |
|---|---|---|
| No | 2 | 2 |
| Yes | 96 | 98 |

Source: Field Survey, 2018

### 3.1.9 Income of the Respondents

Table 10 revealed that revealed that the average income of the farm households ₦197,500/ha; most (88.8%) of the respondents earned an average farm income of ≤₦299,000; followed by₦300,000-₦499,999 (10.2%). This is indicative of a relatively low income level among farm households. When a farmer earns high income he tends to adopt more production technologies which bring about increased farm productivity, but if his income is low he will adopt only a few or none of the technologies introduced.

**Table 10: Distribution of the respondent based on their average farm income**

| Average Income (₦/ha) | Frequency | Percentage (%) |
|---|---|---|
| ≤ 299,999 | 87 | 88.8 |
| 300,000 – 499,999 | 10 | 10.2 |
| ≥ 500,000 | 1 | 1.0 |
| **Mean= ₦197,500** | | |

Source: Field Survey, 2018

### 3.2 Potato Production Technology Available to the Farmers

The result in Table 11 reveals that most (97.9%) of the farmers adopted improved seed technology, followed by plant spacing technology (96.9%), improved seed (95.9%), improved fertilizer application (94.8%), irrigation technology (92.8%) and improved agrochemical application (70.4%). This implies that

the farmers in the study area adopted a minimum of one potato production technology so as to improve their overall farm productivity. This result agrees with the findings studies carried out by Namwata *et al*., 2010 and Oladele and Kareem, 2003 on adoption of agricultural technology.

**Table 11: Distribution based on Potato Production Technology Adopted by the Farmers**

| Technology | Frequency | Percentage (%) |
|---|---|---|
| Improved seed variety | 96 | 97.9 |
| Agrochemical application | 69 | 70.4 |
| Fertilizer application | 93 | 94.8 |
| Irrigation farming | 91 | 92.8 |
| Plant protection measures | 54 | 55.1 |
| Planting dates | 51 | 52 |
| Seed rate | 94 | 95.9 |
| Plant spacing | 95 | 96.9 |
| Agronomic practices | 48 | 48.9 |

Source: Field survey (2018)

### 3.3 Level of Adoption of Agricultural Technology

The result in Table 12 reveals that most (59.2%) of the farmers have an adoption index of 0.1≥0.33; indicating a low level adoption of potato production technology among respondents in the study area. This was followed by an adoption index of 0.44≥0.66 (30.6%) and 0.77≥1 (10.2%) representing mid-level and high level technology adoption respectively. Therefore, it is evident that several modern agricultural technologies for sustainable potato production are available in the area. However, the index of adoption of these technologies is not satisfactory. This trend is responsible for the existing low farm productivity for this crop in the area as observed in previous studies (Idrisa *et al*., 2012). It is well known that in sub-Saharan Africa (SSA) low farm productivity among smallholder farmers have been attributed to poor adoption of modern agricultural technologies. Therefore, identification of factors hindering adoption/uptake of improved agricultural technologies has been an important research agenda in most farming communities (Oladele and Kareem, 2003; Namwata *et al*., 2010; Adebiyi and Okunlola, 2010; Okoedo-Okejie and Onemolease, 2009; Ayinde *et al*., 2010).

**Table 12: Distribution based on Level of Adoption of Agricultural technology**

| Adoption index | Frequency | Percentage (%) |
|---|---|---|
| 0.11≥0.33 (low) | 58 | 59.2 |
| .44≥.66 (mid-level) | 30 | 30.6 |
| 0.77≥1 (high) | 10 | 10.2 |

Source: Field survey, 2018

### 3.4 Factors Influencing Adoption of Potato Production Technologies

The regression analysis presented in Table 13 was used to determine the factors influencing the adoption of potato production technology in the study area. The Likelihood ratio statistic (as indicated by $X^2$ statistic) is 0.007 and highly significant at 1% ($p<0.01$) probability level; suggesting that the model has a strong explanatory power. Also, the result of the regression model reveals that the pseudo coefficient of multiple determinations ($R^2$) was 0.7721 implying that 77% variation in the index of adoption is attributable to variables in the regression model. The remaining 23% not explained may be due to omitted variables and the stochastic error term.

**Age ($x_1$):** The age of farmers assumed a quadratic function which implies that farmers' rate of adoption is low at both the younger and older ages. The coefficient (-0.474) of age is negative but statistically significant at 5% level. At the younger age, farmers may not be able to adopt modern agricultural production technologies, especially capital intensive ones because of the fact that they might not have adequate resources to do so. At an older age, farmers' volume of economic activities declines, besides older farmers have accumulated years of experience in farming through experimentation and observations and may find it difficult to leave such experiences for new technologies. Farmers' advanced age reduces their interest in the new technology (Kudi *et al*, 2010; Namwata *et al*., 2010).

**Household size ($x_3$):** The coefficient of household size (0.811) was positive and statistically significant at 5% ($p<0.05$) probability level; suggesting that farmers household size serves as a proxy to family labour required for carrying out farm activities; hence facilitating the rate of adoption of agricultural technology or innovations that enhance farm productivity and efficiency.

**Education ($x_4$):** The coefficient of education was 0.714. The level of education was found to have a positive relationship with the probability of adoption and significant at 5% level. The implication is that farm households with well-educated members are

more likely to adopt modern agricultural production technologies than those without. This is consistent with the literature that education creates a favorable mental attitude for the acceptance of new practices especially of information-intensive and management-intensive practices (Kudi *et al*, 2010; Sule *et al*., 2002).

**Experience ($x_5$):** The coefficient of farming experience (0.358) was positive and statistically significant at 5% percent level, implying that it influenced the likelihood of adoption of technologies. These findings agree with a number of reports on adoption of improved agricultural technologies by small scale farmers (Okoedo-Okojie and Onemolease, 2009). Experience enriches the farmer's knowledge to all major aspects of production and agronomic practices.

**Farm size ($x_6$):** The coefficient of farm size (0.657) was positive and statistically significant at 5% ($p<0.05$) probability level. Farm size was found to have a positive relationship with the probability of adoption of modern agricultural production technologies. This finding is consistent with the literature that large scale farmers are more inclined to adopting new technologies than small scale farmers. This presents a serious challenge to policy makers and implementers in promoting the adoption of modern agricultural production technologies in the study area. This is because majority of farm households in the study area operate on small scale with average farm sizes hardly exceeding two hectares.

**Farm income ($x_7$):** The coefficient of Farm income was 0.639. Farm income had a positive and significant effect on adoption of potato technologies at 5% ($p<0.05$) probability level. Increased income significantly influenced the likelihood of adoption of improved technologies. Similar findings have been reported in several studies. Higher income farmers may be less risk averse, have more access to information, have longer-term planning horizon, and have greater capacity to mobilize resources and hence increased likelihood of adopting new technologies.

**Extension contact ($x_8$):** The coefficient of extension contact was 0.792. Access to extension contact had a positive and significant effect on adoption of potato technologies at 5% ($p<0.05$) probability level. Farmers who had access to extension services were more likely to adopt the technologies than those without access to extension services. Accessing extension services lets potato farmers to gain knowledge and skills to undertake new technologies. This result is consonance with Okoedo-Okojie and Onemolease (2009) who posited that farmers who accessed extension services had higher levels of adoption of farm technologies compared to those who had not accessed the services.

**Table 13: Determinants of adoption of production technologies**

| Variable | Coefficient | Standard error | T-ratio |
|---|---|---|---|
| Constant | 0.797** | 0.272 | 2.93 |
| Age ($X_1$) | -0.474* | 0.18 | -2.633 |
| Gender ($X_2$) | $0.782^{n.s}$ | 0.61 | 1.281 |
| Household ($X_3$) | 0.811* | 0.307 | 2.64 |
| Education ($X_4$) | 0.714* | 0.284 | 2.514 |
| Experience ($X_5$) | 0.358* | 0.139 | 2.613 |
| Farm size ($X_6$) | 0.657* | 0.243 | 2.703 |
| Income ($X_7$) | 0.639* | 0.25 | 2.556 |
| Extension ($X_8$) | 0.792* | 0.296 | 2.675 |
| Prob $<X^2$ | 0.007** | | |
| Pseudo $R^2$ | 0.7721 | | |

Source: Field survey (2018);**= 1% ($p<0.01$) level;*= 5% ($p<0.05$) level, $^{n.s}$= not significant

## 4.0 Conclusion and Recommendations

This study analyzed the determinants of adoption of production technologies among potato farmers in Bokkos local Government Area of Plateau state, Nigeria. This study revealed a range of production technologies that have been disseminated in the area. The farmers in the study area adopted a minimum of one potato production technology. However, the level of adoption of some these technologies among the respondents were generally low as indicated by their adoption index. Also, there is a significant relationship between the socioeconomic characteristics of the farmers and their index of adoption of production technologies. Thus, this study revealed that the level of adoption of agricultural technology in the study area is relatively low; hence a great need to mitigate this trend exists. Based on these findings, the following recommendations are made for policy actions to improve the level of adoption of potato production technologies in the study area and promote sustainability of potato production through technology intensification;

i. Subsidization of improved seed varieties, equipment's well as other production inputs.
ii. Formulation of policies for improved input supply and access to production technologies should be encouraged.
iii. Improved access to financial services in the study area should be strengthened.
iv. Mechanization of agricultural activities to increase labour efficiency.

v. Modification of land tenure systems to mitigate excessive land fragmentation.
vi. Establishment of well-organized markets and linkages between suppliers and farmers.
vii. Formulations of policies to improve farmer's access to extension services.

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