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Evaluation of the Factors Affecting Technology Adoption Among Cassava Farmers in Ika North East Local Government Area, Delta State, Nigeria

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ABSTRACT

The factors affecting the technology adoption among cassava farmers in Ika North Local government Delta, State was examined. Specifically, the farmer's socio-economic characteristics, their sources of information on cassava production, the constraints to the adoption of innovations and the constraints to cassava production were examined. A two stage sampling procedure was used in the selection of 120 farmers while questionnaire and interview schedule was used for data collection. Descriptive statistics and regression were used in data analysis. The farmers were matured (mean age=40 years), mostly male (62.5%), married (70.8%), educated (90.0%) with a mean household size 8 members and cultivated a mean of 1.3 hectares with a farming experience of 12 years. The farmers belonged to farmer's associations (33.3%) and made an annual income of ₦215,404.17. The leading technologies adopted by the farmers were planting depth of 10-15cm (89.2%), intercropping with melon (88.4%), early planting between April-June (85.0%) and first weeding (manual weeding) (84.1%) The major serious constraints to the adoption of innovation among the farmers were attributes of the innovation (mean=3.68), poor extension contact (mean=3.62) while the leading serious constraints to cassava production were price fluctuation (mean=3.68) and poor extension contact (mean=3.62). Education (r=1.115; P<0.05), cooperative membership (r=1.116; p<0.05), income (r=1.211; p<0.05) and extension contact (r=1.220; P<0.05) had significant relationship with the adoption of innovation. It concluded that the adoption of innovation among the cassava farmers is constrained by several factors that are capable of affecting cassava production. Therefore, extension service providers should enhance their contact with the farmers.

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INTRODUCTION

Agriculture play an important role in Nigerian economy, especially for its role in the provision of food and employment, as well as it contribution to the gross domestic product (GDP). Agriculture contribute about 29% of the GDP (NBS, 2023). Among all the sub-sector of agriculture in Nigeria, crop production remains the leading with regards to contribution to the GDP. Crop sub-sector accounted 86.85% of the total contribution of agriculture to the nations GDP. One important way of improving the contribution of agriculture to national development is for farmers to be acquainted with improved farm practice of economically feasible crops (Onyemekonwu et al., 2019). In Nigeria, cassava remain one of such crop going by the role it plays in the fight against food security in Nigeria.

Cassava is widely grown in Nigeria and remains an important food crop in many parts Africa including Nigeria (Banmeke et al., 2021). This probably a reason for the continuous development of technologies and innovation with regards to cassava production. However, the adoption of these technologies and innovation by the farmers is of a great concern. Studies has shown poor adoption of innovation by famers (Onyemekonwu et al., 2021). This is probably a reason for poor output per hectare recorded by cassava farmers. Currently, there is the dearth of information on the factors affecting the adoption of innovation regarding cassava production. Previous studies on cassava production in the study area focused on factors influencing access to arable land, (Gbigbi, 2018), technical efficiency of cassava production (Eze and Nigho, 2014), gender role in cassava production (Ogisi, et al., 2013) and the literacy need of cassava farmers (Owabor, 2017). But none of these studies focused on the factors affecting the adoption of innovation by cassava farmers in the study area. It is therefore necessary to evaluated the factors affecting technology adoption among the cassava farmers in Ika North East Local Government Area, Delta Nigeria. The broad objective of the study is to evaluate the factors affecting technology adoption among cassava farmers in Ika North East Local Government Area (LGA), Delta State, Nigeria. The specific objectives are to profile the socio-economic characteristics of cassava farmers in the study area, describe the farmer's sources of information on cassava production, ascertain the improved cassava production technologies adopted by the farmers, ascertain the constraints to the adoption of innovations by the farmers and determine the factors affecting cassava production in the study area.

MATERIALS and METHODS

Ethical Statement

Ethical approval was obtained from the Departmental Ethics Committee of the Department of Agricultural Economics and Extension, Faculty of Agriculture, Dennis Osadebay University, Asaba, Nigeria (Approval No: DOU/FAG/DEES/EC/25/021).

Description of Study Area

The study was carried out in Ika North East LGA, Nigeria. The LGA is one of the twenty-five LGAs in Delta State. The LGA lies between Latitude 6.2287° or 6° 13′ 43″ North and Longitude 6.2896° or 6. 17′ 23″ East and occupy a land area of 463 km^2 (Mapcarta, 2025). The area falls within the tropical climate with an altitude of 135m (443fts) (DB-City, 2025). Farming is the predominant livelihood activity in the LGA with cassava, yam, maize, melon and oil palm being the major crops grown.

Procedure For Cassava Farmer's Selection

A two stage sampling procedure was adopted in the selection of the sampled farmers. The first stage involved the purposive selection of ten (10) communities, guided by the high intensity of cassava production in the communities. The second stage involved the random selection of twelve (12) farmers from the selected communities, given a total of 120 farmers that were used for the study. Data were collected with questionnaires and interview schedule. Descriptive statistics such as frequency, percentage, mean and standard deviation as well as Person correlation were used in data analysis.

Measurement of Variables

Sources of information on cassava production: Respondents were made to tick their sources of information on cassava production from a list of option provided to them.

Technology adoption by farmers: This was determined using by asking the farmers to indicate the technologies they adopt in their production. The frequencies and percentages of these responses were documented.

Constraints to the adoption innovations on cassava production and the constraints to cassava production: these constraints were ascertained using a five-point Likert scale as follows: very serious (coded 5), serious (coded 4), mildly serious (coded 3), not serious (coded 2) and not at all (coded 1). The level of seriousness was determined using a weighted mean score of 3.00 computed as follow (5+4+3+2+1)15÷5=3.00. Mean scores of ≥3.00 were categorized as serious while mean scores of <3.00 were categorized as not serious.

RESULTS and DISCUSSION

Socioeconomic Characteristics of Cassava Farmers

The socio-economic characteristics of the farmers is presented in Table 1. The study found that majority (56.7%) of the farmers' falls within 31 – 40 years, with a mean age of 40 years. This suggests that the farmers were young and in their active and

productive age. At this age, they can exert the physical power to agricultural production. Similar age was reported by Uchemba et al. (2021) who reported 44 years for the farmers studied. On the sex of the farmers, the result shows that more than half (62.5%) of the respondents were male, while 37.5% were female. This is an indication that cassava farming in the study area was dominated by male farmers. The dominance of male farmers was equally reported by Onyemekonwu et al. (2021) who reported 73.01% and 26.99% for male and female farmers, respectively. On the marital status, the result revealed that majority (70.8%) of the farmers were married. This suggests a sense of responsibility and emotional maturity among the farmers. Previous study by Omolehin et al. (2020) confirmed that cassava farmers were dominated by married persons with 68% of the farmers being married. Information on the farmer's educational status revealed that 90% of the farmers had formal education. This implies that the farmers were educated, indicating that the farmers could read and write, and potentially, understand information on agricultural innovation. This result is in agreement with Awoyemi et al. (2020). The result further revealed that more than half (60.0%) of the farmer had household size ranging from 6 – 10 people in with a mean household size per farming household of 8 people. This suggests that the farmers operate a large household size and by implication the farmers can utilize family labour in their production. This result corroborated with the findings of Onyemekonwu et al (2021). The result on farming experience revealed that many (55.0%) of the farmers had 11 – 15 years while the mean farming experience in the study was 12 years. This result suggests that the farmers have been in cassava production for over a decade. Interestingly, majority (60.0%) of the farmers had less than 1 ha farm size with a mean farm size of 1.36 hectares. Similar farm size was reported by Akpan et al. 2019. The result equally revealed that many (53.3%) of the farmers' had annual income ranging from ₦151,000 - 250,000, with the mean annual being ₦215,404.17. This level of income is low especially when compared with the increasing price of goods and services. This suggests that the farmers may not have enough fund to carter for the logistics involved in the adoption of innovation. In a similar study, Onyemekonwu et al. (2019) reported a poor income of 28, 640.90 naira for farmers in Delta State, Nigeria. On membership of cooperative, the result revealed that majority (66.7%) of the farmers belonged to cooperative societies and by implication, they might be able to raise fund to finance their production, as being a member of cooperative is an avenue for farmers to raise production fund.

Table 1. Socioeconomic characteristics of cassava farmers

Variables	Grups	Frequency (n = 120)	Percentage	Mean
Age:	≤ 20 years	5	4.2	
	21 - 30 years	4	3.3	
	31 - 40 years	68	56.7	40.0
	41 - 50 years	22	18.3	
	above 50 years	21	17.5	
Sex:	Female	45	37.5	
	Male	75	62.5	
Marital status:	Married	85	70.8	
	Single	20	16.7	
	Divorced	5	4.2	
	Widow/widower	10	8.3	
Level of education:	Primary	30	25.0	
	Secondary	58	48.3	
	Tertiary	20	16.7	
	No formal education	12	10.0	
Household size:	1 - 5 people	30	25.0	
	6 - 10 people	72	60.0	
	11 - 15 people	12	10.0	8.0
	Above 15 people	6	5.0	
Farming experience:	1 - 5 years	12	10.0	
	6 - 10 years	22	18.3	
	11 - 15 years	66	55.0	12.0
	Above 15 years	20	16.7	
Farm size:	Less than 1 ha	72	60.0	
	1 - 2 ha	29	24.2	1.36 ha
	3 - 4 ha	19	15.8	
Annual income (₦)	50,000 – 150,000	23	19.2	
	151,000 – 250,000	64	53.3	215,404.17
	251,000 – 350,000	25	20.8	
	351,000 – 450,000	8	6.7	
Source of fund:	Bank loans	4	3.3	
	Personal savings	76	63.3	
	Friends and relatives	22	18.3	
	Cooperative societies	18	15.0	
Cooperative membership:	Yes	40	33.3	
	No	80	66.7	

Farmers Source of Information on Cassava Production

The farmer's sources of information on cassava production (Table 2) show that a majority (96.0%) sourced information on cassava production from fellow farmers. Other sources of information available to the farmers included friends and relatives

(14.2%), extension agents (8.3%) and radio/television/newspaper and social media with 7.5% respectively (Figure 1). This result implies that the farmers depend more on fellow farmers for information on cassava production, suggesting that agricultural extension service providers in the area may not have being doing its best in the study area. This situation is likely to affect the adoption of innovation on cassava production and cassava production in general. This result is in line with Onyemekonwu et al. (2019) who reported that all the farmers in their study sourced their agricultural information from fellow farmers.

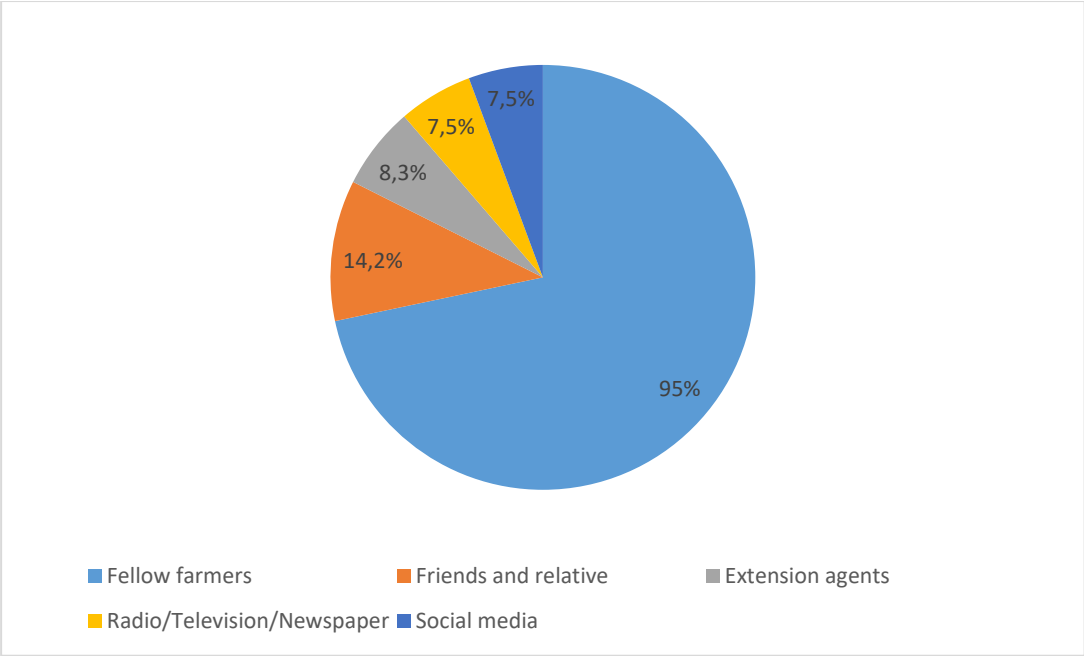

Figure 1. Farmers sources of information on cassava production

Technologies Adopted by Farmers

The improved cassava production technologies adopted by the farmers are presented in Table 2. The leading technologies adopted by the farmers were planting depth of 10-15cm (89.2%), intercropping with melon (88.4%), early planting between April-June (85.0%), first weeding (manual weeding) (84.1%) and application of Inorganic fertilizers (NPK 20:10:10 or NPK 15: 15:15) (82.5%). Other include subsequent chemical weed control (73.3%) and planting cassava cutting with length 25 cm (68.4%). The result suggests some level of adoption recommended technologies among cassava farmers in the study. The result agrees with Owigho et al. (2023) that intercropping with melon and planting with a depth of 10-15cm were the leading technologies adopted by the farmers.

Table 2. A distribution of technology adoption by farmers

Improved production practices	Adopter		Non-adopter	
	Freq.	%	Freq.	%
Planting depth of 10-15cm	107	89.2	13	10.8
Intercropping (with melon)	100	88.4	20	16.6
Early planting (April -June)	102	85.0	18	15.0
First weeding (manual weeding)	111	84.1	9	7.5
Inorganic fertilizers (NPK 20:10:10 or NPK 15: 15:15)	99	82.5	21	17.5
Subsequent weeding (chemical control)	88	73.3	32	26.7
Cutting length of 25cm	82	68.4	38	31.6
Intercropping (with cowpea)	5	46.2	115	95.8
Planting with spacing of 1m X 1m	31	25.8	89	71.2
Late planting (August-October)	24	20.0	96	80.0
Fertilizer application (Organic fertilizer)	24	20	96	80
Disease control with the use of recommended farm chemicals	16	13.3	104	86.7

Constraints to the Technology Adoption

The result on the constraints to the adoption of innovation among the farmers is presented in Table 3. Using a mean benchmark of 3.00. The result revealed that the leading constraints included attributes of the innovation (mean=3.68), poor extension contact (mean=3.62), inadequate farm credit (mean=3.58), labour cost associated with the innovation (mean=3.48), gender sensitivity of innovations (mean=3.45) and illiteracy among farmers (mean=3.41), complexity of innovation (mean=3.33), improper orientation on the benefit of innovations (mean=3.05). Other constraints were high cost associated with the innovation (mean=3.02), untimely delivery of farm inputs (mean=3.01) and disease and pest infestation on improved varieties. This result suggests that the farmers were faced with diverse problems inhibiting the adoption of innovation among them. A possible implication of this result is that farmers may find it difficult to adopt innovation related to cassava production, if these constraints are not addressed. These findings are similar with challenges identified in the work of Bakut (2013) in factors influencing adoption of recommended cassava production practices by farmers in Bwari and Kuje Area Councils.

Table 3. A distribution of the constraints to the adoption of innovation among cassava farmers

Constraints	Mean	Std. Dev.	Decision
Attribute of technology	3.68	1.746	Serious
Poor extension contact	3.62	1.213	Serious
Inadequate farm credit	3.56	1.095	Serious
labour cost involved in adopting the innovation	3.48	1.078	Serious
Gender sensitiveness of the technologies	3.44	1.085	Serious
Illiteracy	3.41	1.156	Serious
Complexity of the innovation	3.33	1.181	Serious
Marketing problems	3.10	1.411	Serious
Improper orientation on the benefit of the innovation	3.05	1.527	Serious
High cost of innovation	3.02	1.378	Serious
Untimely delivery of farm inputs	3.01	1.425	Serious
Disease and pest infestation on improved varieties	3.00	1.470	Serious
The technology did not consider our indigenous knowledge on cassava production	2.85	1.417	Not serious
Inadequate land	2.53	1.141	Not serious
Technology conflicts with my traditional belief	2.40	1.155	Not serious
Grand mean	**3.16**	**1.300**	

Mean ≥ 3.00 = serious

Constraints to Cassava Production

The constraints to cassava production is presented in Table 4. Using a mean benchmark of ≥ 3.00, the result revealed that the serious constraints to cassava production in the study area were price fluctuation (mean=3.68), poor extension contact (mean=3.62), poor capital base of the farmers (mean=3.56), high cost of labor (mean=3.48), poor storage facilities (mean=3.44), poor awareness of source of loan (mean=3.41), poor rural infrastructure such as road network (mean=3.33), poor market network (mean=3.10), poor processing facilities (mean=3.06) and inadequate planting materials (mean=3.05). Other constraints include labour shortage (mean=3.02), high cost of transportation (mean=3.01) and high cost of farm inputs (mean=3.00). The result suggests that cassava production in the study area if faced with several constraints affecting its production. This result implies cassava production is threatened. Considering the role of cassava in combating food insecurity, there is the possibility of increased food insecurity if these constraints are not addressed. Previous studies by Ogisi et al. (2013) and Eze and Nigho (2014) highlighted similar constraints as constraints affecting cassava production in the study area.

Table 4. Constraints to cassava production

S/N	Extension Needs	Mean	Std. Dev.	Decision
16.	Price fluctuation	3.68	1.746	Serious
5.	Poor extension contact	3.62	1.213	Serious
13.	Poor capital base	3.56	1.095	Serious
8.	High cost of labour	3.48	1.078	Serious
15.	Poor storage facilities	3.44	1.085	Serious
1.	Poor awareness to sources loan	3.41	1.156	Serious
4.	Poor rural infrastructure such as roads network	3.33	1.181	Serious
3.	Poor market network	3.10	1.411	Serious
12.	Poor of improved processing facilities	3.06	1.324	Serious
11.	Inadequate planting materials	3.05	1.527	Serious
9.	Labour shortage	3.02	1.378	Serious
7.	High cost of transportation	3.01	1.425	Serious
2.	High cost of farm inputs	3.00	1.470	Serious
10.	Changes in climate resulting in flooding	2.85	1.417	Not serious
14.	Inadequate farmland	2.53	1.141	Not serious
6.	Unavailability of improve planting materials	2.40	1.155	Not serious
	Grand mean	**3.16**	**1.300**	

Relationship Between Farmer's Socio-Economic Characteristics and the Adoption of Innovation

Person correlation was used to test the relationship between the farmer's socio-economic characteristics and the adoption of innovation. The result revealed that education (r=1.115; P<0.05), cooperative membership (r=1.116; p<0.05), income (r=1.211; p<0.05) and extension contact (r=1.220; P<0.05) had significant relationship with the adoption of innovation. The result for education (r=1.116) was positive and significant, implying that the more educated farmers adopted innovations than the less educated farmers. This suggests that as the farmer's educational level increases, there is the likelihood for them to adopt innovations related to cassava production. The result agrees with Uchemba et al. (2021) who reported a significant relationship between education and the adoption of cassava technologies. The result on cooperative membership (r=1.116) was positive and significant, suggesting that farmers who belonged to association adopted more innovations compared to those who do not belong to associations. It is possible that the farmers who belonged to association had access finance to fund the innovation adoption. This agrees with Onyemekonwu et al. (2021) who reported that farmers who belonged to cooperatives were more positive towards the adoption of innovations. Similarly, the result for income (r=1.211) implying that farmers who earned more income adopted more innovations than the farmers who earned less income. This could be attributed to the fact that these farmers

who made more income had the available fund to finance innovations. The result agrees with Onyemekonwu et al (2019) who reported a significant relationship between farmer's income and the adoption of innovation. The result on extension contact was equally significant and positive, suggesting that farmers with extension contact adopted more innovation compared to the farmers who had no contact with extension agents. It is possible that theses farmers with extension contact had the innovations explained to them by the agents leading to higher adoption. The result disagrees with Uchemba et al. (2021) who found no significant relationship between extension contact and the adoption of innovation.

Table 4. Relationship between the farmer's socio-economic characteristics and the adoption of innovation

Characteristics	Coefficient (r)	Prob. Level	Decision
Sex	0.239	1.232	Not Significant
Age	0.422	2.225	Not Significant
Education	1.115	0.002	Significant
Farm size	0.255	1.661	Not Significant
Farming experience	1.211	0.243	Not Significant
Cooperative membership	1.116	0.001	Significant
Income	1.211	0.001	Significant
Extension contact	1.220	0.000	Significant

CONCLUSION

The study found that the farmers relied mostly of fellow farmer as source of information for cassava production. Furthermore, the adoption of innovation among the cassava farmers is constraints by several factors which are capable of affecting cassava production in the area. Accordingly, several factors including price fluctuation, poor extension contact and poor capital base affects cassava production in the study area. Also, farmer's socio economic characteristics such as sex, farm size, farming experience, cooperative membership, and income influenced the adoption of innovation among cassava farmers in the study area.

RECOMMENDATIONS

It was recommended that

i. Extension service providers in the study area should enhance their contact with the farmers, as this will help the farmers improve their knowledge of innovation and consequent adoption.

ii. Grant/or loan should be provided to the farmers by relevant agencies. The will assist the famers in the procurement of farm inputs relevant to innovations and by so doing, the adoption of innovations becomes easier for the farmers.

iii. Cassava famers in the areas should be encouraged to join cooperative societies, this could be an avenue for them to raise the needed fund required for the adoption of innovation.
iv. Exposing farmers to training is trainings associated with innovation should be a major focus of extension service providers in the study area since the study found a positive and significant relationship between education and the adoption of innovations.

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Conflict of interest:

The authors declare that there is no conflict of interest among them.

Author's contribution

ORC, conceptualization, design, formation of data gathering instrument and review of manuscript, EFA, data collection and review of related literatures, KJO, data analysis, ASE, data interpretation.

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