Adoption of Improved Cassava Production and Processing Technologies in Oshimili North Local Government Area of Delta State, Nigeria

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ABSTRACT

This study examined the adoption of cassava production and processing technologies in Oshimili North Local Government Area (LGA) of Delta State, Nigeria. A sample size of 90 respondents were used for the study. Data were collected through the use of structured interview schedule. Descriptive statistics such as frequency count, mean scores and percentage count were used to summarise data, while the sigma method for calculating adoption scores was used in determining respondents' level of adoption of technologies. Results of the study revealed that respondents were aware of most of the cassava production and processing technologies. Respondents adopted more of the technologies that are associated with enhancing cassava yield such as improved varieties, planting time, fertilizer application, and use of herbicides and pesticides to control weeds and pests infestations respectively. There was low adoption of most of the processing and storage technologies such as mechanized drying equipment, cassava chips slicing machine, and storage in trenches and sawdust. This low adoption was attributed to complexity and high cost associated with the utilization of these technologies. Important constraints to adoption of technologies include: inadequate fund, high cost of technologies, inadequate land space, high cost of technologies, and diseases and pests infestations. Based on these findings, the study recommends that a special micro – credit scheme should be established by government to enhance the financial capacity of the farmers to utilize technologies. Also, government should sponsor research on simple low- input technologies that cassava farmers and processors can conveniently use in terms of cost and complexity.

***Key words**: Adoption; Cassava; Production technologies; Processing technologies; Constraints;*

Cassava is one of the most important food crops in Africa. It derives its importance from the fact that it's starchy, thickened, tuberous roots are a valuable source of cheap calories. Cassava leaves which are about 7-12 percent protein are also used as a vegetable in traditional soups and stew. Cassava accounts for between 40-50 percent of all calories consumed in Southern and Central Nigeria. Cassava is important not only as food but even more as a major source of income for rural households (*Ajieh and Uzokwe, 2007*).

Cassava is mostly grown as a subsistence crop on small farms, usually intercropped with vegetables and other legumes. Cassava production in Nigeria has been increasing at a rate of 3 per cent every year. The realization of the potentials of cassava for contributing to the attainment of self-sufficiency in food production, informed the decision of the government of Nigeria to initiate a Cassava Transformation Programme. This programme seeks to create a new generation of cassava farmers oriented towards commercial production and processing of cassava. This is with a view to turn cassava sector in Nigeria into a major player in local and international starch, sweeteners, ethanol, high quality cassava flour (HQCF), and dried chips industries. This laudable objective of the cassava transformation programme in Nigeria cannot be achieved without the uptake of cassava production and processing technologies by farmers.

The following recommended cassava production and processing technologies have been developed and disseminated over the years in Nigeria:

(i) Improved cassava varieties that are low in HCN levels and resistant to various viral, bacterial and fungal diseases. Examples include: TMS 30572, TMS 4 (2)1425, TMS 50395, TMS 63397, TMS 91934 and NR 8082.

(ii) Plastic mulch for nursary.

(iii) *Plant population density:* 10,000 plants/ha.

(iv) *Fertilizer dose/schedule:* NPK:15:15:15.

(v) *Intercropping:* intercrop cassava with maize or cowpea

(vi) *Spacing:* 0.9m $\times$ 0.9m or 1m $\times$ 1m.

(vii) *Planting time:* cassava can be planted alone from April to October but July gives best yield in rainforest zones. When planted with maize, it should be done in early March or April. If intercropped with cowpea, planting should be done in July or August.

(viii) *Weed control:* Early weeding at least twice 30 days after planting.

(ix) *Herbicides:* Apply flumeturon or diuron at 2.0 mg/ha before weeds emerge.

(x) *Pesticides:* Use aldrin, carbofuran or nuvacron.

(xi) Mechanized cassava grater.

(xii) Mechanized garri frying-equipment.

(xiii) Drying and milling equipment.

(xiv) Cassava chips and flour slicing machine.

The overall objective of this study was to examine the adoption of improved cassava production and processing technologies by farmers in Oshimili North local government area of Delta State, Nigeria. The specific objectives of the study were to:

(i) Ascertain the socio-economic characteristics of cassava farmer

(ii) Determine respondents' level of awareness of cassava production and processing technologies

(iii) Assess the respondents' level of adoption of cassava production and processing technologies

(iv) Identify constraints to the adoption of cassava production and processing technologies

METHODLOGY

Cassava farmers in Oshimili North Local Government Area (LGA) of Delta State, Nigeria formed the population from which the sample for the study was drawn. The area is notable for cassava production and processing. Eight extension cells in the LGA were used for the study. They include: Ibusa, Okpanam, Ugbolu, Akwukwu, Illah, Achalla, Ebu and Atuma. Fifteen cassava farmers in contact with extension were randomly selected from each of the eight cells using the list of farmers provided by the extension agents in charge of the cells. This gave a total of 120 farmers that served as respondents of the study. Structured interview schedule was used for data collection. Content validation of the research instrument was carried out. The instrument was pilot tested before administration to test for reliability.

To ascertain respondents' awareness of cassava production and processing technologies, a list of technologies used in cassava production was developed after a review of literature and respondents were requested to indicate the technologies they are aware of. The percentage awareness for each technology was then computed. For the purpose of this study, respondents' level of awareness was categorized as follows: (a) Low awareness (for awareness level of between 0-39 per cent, (b) Average awareness (for awareness level of between 40-69 per cents; and (c) High awareness (for awareness level of between 70-100%).

Adoption of cassava production and processing technologies was determined by requesting the respondents to indicate the technologies they have adopted. The percentage of adopters for each technology was computed into adoption scores using the sigma method. The method employs the principle of standardization in which the percentage of adopters is converted into adoption score by using a value known as sigma distance which is usually read from the statistical table of normal deviates. Usually a constant 2 is added to the value read from the table and multiplied by the same constant to increase the magnitude of the table value. For instance, if the percentage of farmers who adopted a particular agricultural technology is 35, the adoption score is calculated as follows: 100 - 35/2 = 82.5. Using the table of normal deviates, 82 in the vertical row under column 5 gives 0.935, and a constant 2 is added to this value and the result is multiplied by the same constant. This is given as follows: (0.935 + 2) 2 = 5.8. Since the sigma method of scoring assigns weights in reverse relation on a 10 point scale, the actual adoption score will be 10 – 5.87 which is 4.13 (*Agbamu, 2006*). For the purpose of this study, adoption scores between 5.00 and 10 were regarded as high while adoption scores of below 5.00 were considered to be low.

Constraints to adoption were determined by requesting respondents to rate the importance of possible constraints to their adoption of cassava production and processing technologies. A 4-point Likert type scale of: “not important” = 1; “barely important” = 2; “important” = 3; and “very important” = 4; was used to summarize their responses. The mean of the response values which is 2.50 was then used as the cut-off point. Thus, constraints with mean score of 2.50 and above were considered important while those with mean score below 2.50 are unimportant constraints.

RESULTS AND DISCUSSION

Socio-economic characteristics of respondents: Table 1 reveal that 65 per cent of the respondents are males while 35 per cent are females. This indicates that the males are more involved in cassava production than the females. Majority of the respondents (81%) were within the age range of 21 and 50 years while the mean age of the respondents were found to be 42 years. This implies that most of the cassava farmers are still in their productive age.

Majority of the respondents (94%) had one form of formal education or the other ranging from primary to post secondary education. Formal education has been found to be positively associated with technology adoption. The mean farm size of respondents was 2.3 hectares with 81 per cent of the respondents having farms ranging between 0.5 to 3.5 hectares. This indicates that majority of them operate as small scale farmers. Respondents’ mean farming experience was 10.2 years. Majority of the respondents (88%) had farming experience of between 1 and 15 years. This is an indication that most of the farmers had sufficient experience regarding the production and processing of cassava.

Respondents’ awareness of cassava production and processing technologies: Table 2 show the level of awareness of cassava production and processing technologies by respondents. Results reveal that out of the 17 technologies investigated by the study, respondents had high awareness in three technologies; average awareness in eight technologies and low awareness in six technologies. The awareness level of respondents regarding cassava production and processing as revealed by this study is encouraging. This may be as a result of the regular campaigns mounted by the agricultural extension agency charged with the dissemination of information on new production and processing techniques to farmers. According to *Ugbomeh (2005),* when farmers have frequent contact with extension, they become more aware of technologies promoted by extension and the rate of diffusion and adoption of these technologies is enhanced.

Table 1: Distribution of respondents according to their socio-economic characteristics (N=120)

Socio-economic characteristics	No.	%	Mean
Age (years)			
21 – 30	20	17	
31 – 40	25	21	42
41 – 50	52	43	
51 – 60	18	15	
61 – 70	5	4	
Sex			
Male	78	65	
Female	42	35	
Education Status			
No formal education	18	15	
Primary education	55	46	
Secondary education	40	33	
Post Secondary education	7	6	
Farm Size (ha)			
0.5 – 1.5	25	21	
1.6 – 2.5	48	40	
2.6 – 3.5	36	30	2.3
3.6 – 4.5	7	6	
4.6 – 5.5	4	4	
Farming experience (years)			
1 – 5	29	24	
6 – 10	35	29	
11 – 15	42	35	10.2
16 – 20	5	4	
21 – 25	6	5	
26 – 30	3	3	

Table further show that technologies in which respondents had more awareness include: improved varieties (72%); planting time (74%); intercropping (65%); fertilizer application (56%); pesticides (63%); herbicides (58%); mechanized cassava grater (78%); mechanized garri frying (57%); and mechanized drying equipment (69%). Among the technologies that respondents recorded low awareness include; plastic mulch (33%); plant spacing (35%); plant density/population (38%); storage in polyethylene bags (28%); storage in trenches (32%) and storage in saw dust (26%).

Respondents' adoption of cassava production and processing technologies: Table 3 reveals that out of the 17 technologies investigated by the study, respondents recorded high adoption in seven and low adoption in 10. Among the technologies with high adoption are: improved technologies (5.09); planting time (5.64); intercropping (5.34); fertilizer application (5.67); pesticides (5.04); herbicides (5.36); and mechanized cassava grater (5.09). These technologies are known to enhance yield and improve cassava processing. Among technologies in which respondents had low adoption are: plastic mulch, mechanized garri frying, cassava chips slicing machine, mechanized drying equipment, storage in polyethylene bags, storage in trenches and storage in saw dust. The low adoption of these technologies may be due to the complexity and cost associated with their utilization.

Constraints to the adoption of cassava production and processing technologies: Table 4 show the mean scores of constraints to the adoption of cassava production and processing technologies. Results reveal that seven of the eighteen possible constraints investigated by the study were considered important by the respondents. They include: inadequate fund ($\bar{X}$ = 3.60); high cost of technologies ($\bar{X}$ = 3.80); inadequate land space for farming ($\bar{X}$ = 3.40); high cost of inputs ($\bar{X}$ = 2.70); diseases infestation ($\bar{X}$ = 2.95); pest infestation ($\bar{X}$ = 3.20), and limited production resources ($\bar{X}$ = 3.40). These constraints are crucial to cassava production and processing. For instance, poor economic background of a farmer which in turn inadequate funds can hinder his/her utilization of technologies. Similarly, inadequate land space could influence adoption of recommended planting density. According to *Sulaiman and Sadamate (2000)*, farmers having higher land area were more willing to accept reforms and innovations. Reports of earlier studies on adoption of agricultural technologies shows that the cost of technology has greatly influenced its utilization by farmers. The low adoption of mechanized drying equipment; mechanized garri frying and cassava chips slicing machines as reported in this study could be as a result of high cost associated with their utilization.

Table 2: Distribution of respondents according to their awareness of cassava production and processing technologies (N= 120)

Cassava production and processing technologies	No.	%
Improved varieties	86	72***
Planting time	89	74***
Intercropping	78	65**
Fertilizer application	67	56**
Plant population/density	46	38*
Plant spacing	42	35*
Early weeding	53	44**
Plastic mulch	40	33*
Pesticides	76	63**
Herbicides	70	58**
Mechanized cassava grater	94	78***
Mechanized garri frying	68	57**
Cassava chips slicing machine	50	43**
Mechanized drying equipment	83	69**
Storage in polyethylene bags	34	28*
Storage in trenches	38	32*
Storage in saw dust	31	26*

*** = High awareness
** = Average awareness
* = Low awareness

Table 3: Distribution of respondents according to their adoption of cassava production and processing technologies (N = 120)

Cassava production and processing technologies	No.	%	Adoption score
Improved varieties	78	65	5.09**
Planting time	103	86	5.64**
Intercropping	89	74	5.34**
Fertilizer application	80	87	5.67**
Plant population/density	43	36	4.17*
Plant spacing	55	46	4.48*
Early weeding	46	38	4.64*
Plastic mulch	35	29	3.88
Pesticides	76	63	5.04**
Herbicides	90	75	5.36**
Mechanized cassava grater	73	65	5.09**
Mechanized garri frying	65	54	4.77*
Cassava chips slicing machine	38	32	4.01*
Mechanized drying equipment	43	36	4.17*
Storage in polyethylene bags	29	24	3.65*
Storage in trenches	36	30	3.93*
Storage in saw dust	34	28	3.84*

Multiple response recorded
** = High adoption
* = Low adoption

Table 4: Mean scores of constraints to adoption of cassava production and processing technologies (N = 120)

Constraints	MS	Rank
Inadequate funds	3.60*	II
Lack of farm credit	2.21	IX
High cost of technologies	3.80*	I
Inadequate land space for farming	3.42*	III
High cost of inputs	2.70*	VII
High disease infestation	2.95*	VI
High pest infestation	3.20*	V
Poor income for cassava production	1.82	XIII
Lack of ready market for sale of products	2.30	VIII
Inappropriate technologies	1.70	XV
Poor contact with extension	1.90	XII
Poor extension services	1.80	XIV
Limited production resources	3.40*	IV
Scarcity of labour	1.30	XVII
Higher wage of labour	2.20	X
Low yield	1.20	XVIII
Inadequate water supply	1.60	XVI
Inability to obtain inputs	1.92	XI

* = Important constraints
MS= Mean score

For instance, majority of the respondents who use mechanized cassava grater in the area claimed that they patronized the commercial operators at a fee since they could not afford to own theirs due to high cost.

CONCLUSION

This study examined the adoption of cassava production and processing technologies in Oshimili South LGA of Delta State, Nigeria. Results show that respondents were aware of most of the technologies in cassava production and processing. There was a more adoption of technologies that are associated with enhancing cassava yield such as improved varieties, fertilizer application, planting time, intercropping and use of pesticides and herbicides. There was low adoption of most of the processing and storage technologies such as mechanized garri frying equipment, cassava chips slicing machines, mechanized drying equipment, storage in trenches and sawdust. Important constraints to the adoption of cassava production and processing technologies include: inadequate fund, high cost of technologies, inadequate land space, high cost of inputs ,and diseases and pest infestation. In view of these findings, this study suggests that government should increase funding of research on simple low-cost input technologies that can be affordable by farmers. Also, a special micro- credit scheme should be established by the government for cassava farmers to enhance their capacity to utilize technologies.

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