NIGERIAN AGRICULTURAL JOURNAL
ISSN: 0300-368X
Volume 49 Number 2, October 2018. Pp. 188-194
Available online at: http://www.ajol.info/index.php/naj

DIFFERENTIALS IN ADOPTION STAGES OF IMPROVED CASSAVA PRODUCTION TECHNOLOGIES AMONG SMALL-HOLDER FARMERS IN ANAMBRA STATE: A GENDER SITUATION ANALYSES

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ABSTRACT
This study was designed to estimate and compare the stages of adoption of cassava production technologies by gender. A multi-Stage random sampling technique was used in selecting the respondents. Primary data was collected from a sample of equal proportion of male (60) and female (60) farmers and analyzed by the use of descriptive statistics (mean, frequency and percentage), and Z-test. The socioeconomic results showed that the mean age of male farmers was 49 years while that of females was 48 years. About 38.33% of males attained primary while 43.33% of females attained secondary school. Male farmers had a mean farming experience of 20 years while female had mean farming experience of 23 years. The Z statistics showed a significant difference in the mean adoption stages between male and female farmers. The result showed that Female farmers had high level of trial and adoption while male farmers had higher level at evaluation stage. The result is an indication that male farmers were late adopters while female farmers were early adopters. Male farmers had high cost of inputs and lack of access to processing machines as the most constraints affecting the adoption of innovative technologies while poor road network, lack of access to processing machines and lack of extension agent visitation were the major constraints affecting the adoption of technological innovation by female farmers. The results call for policies that would aim at encouraging farmers to adopt innovative technologies introduced to them and access to extension for efficient dissemination of improved technologies.

Keywords: Stages, Adoption, Cassava technologies and Gender

Introduction

Nigeria is an agrarian country that has comparative resource advantage in the production of cassava: high population that could command the demand of its products, available man-power, and land suitable for its production. Cassava is an important staple food and cash crop in several tropical African countries especially Nigeria where it plays a principal role in the food economy (Agwu and Anyaeche, 2007). Governments in most of developing countries especially Nigeria pays much attention on the relevance of cassava (such as food security, and cash crop) as means of poverty alleviation (FAO, 2005). According to Onyemauwa, (2010) cassava has the potential to increase farm incomes, reduce rural and urban poverty and help close food insecurity gap. Obisesan (2012) noted that cassava is major source of economic empowerment for the largest number of households, in comparison with other staples, contributing positively to poverty alleviation (Obisesan, 2012). Reports have shown that a higher proportion of cassava farmers, in Nigeria get a higher income from the production of cassava than they get from most other major staples (Ezeibe, *et al.,* 2015).In cassava producing areas, food crops contribute about 40 percent of household cash income, industrial crops and non-farm activities about 25 percent each, while livestock contributes about 10 percent (Nweke, 1996). About 26 percent of cash income from all food crops in cassava growing households (91 percent of all households) was derived from the sale of cassava. It is clear that in cassava growing areas, where the most important source of cash income is food crops, cassava is the most important food crop generating cash income. Sanni *et, al*. (2005) observed that the potential of the crop is large because of its ability to offer the cheap source of food calories (a minimum of about 2400 calories per person per day) and the highest yield per unit area. The availability of cassava in a convenient food form, such as *gari,* played a major role in the increase in the per capita cassava consumption in Nigeria (FAO, 1995). The crop's

ability to provide a stable food base is a function of its flexibility in terms of planting and harvesting strategies and because of its relative tolerance to poor soil and pests/diseases problems (Government of Ghana, 1996). Currently, globally, the traditional use of cassava is changing from primarily human consumption to processed products such as starch, flour, and ethanol (PIND, 2011) and perhaps would industrialize Nigeria if fully adopted into food economy of the country.

Since 1980s, Nigeria has remained the global leader in cassava production with an annual production of 35 million metric tonnes (FAO, 2011). While Nigeria is regarded as the largest producer of cassava, her output per hectare remains one of the lowest in the world principally due to what would be attributed to poor technological adoption (Odebode 2008; Dada *et al.,* 2009; Ogundari 2010). Ayoade *et al*., (2012) noted that very low percentages use of some cassava production technologies is as a result of some constraints which include land tenure system and high costs of production inputs. In Nigeria access to land is restricted due to tenure problems; therefore the use of appropriate technologies without necessary expanding hectares under cultivation to increase output becomes a better economic option. Nigeria would meet her counterparts in other countries in terms of cassava output only through the use of appropriate technology and adoption of different technologies among the Nigerian farmers (Ayoade *et al*., 2012).

However, there has been gender differences in responding to different activities and technologies developed for cassava production by researchers. According to Kock and Krysher (2010), gender inequity is a "worldwide problem" and is an extremely significant debilitating factor in many countries of the world over economic development. A study by Thapa (2009) in Nepal and Malawi reported that given equal access of inputs, adoption would have no significant difference between male and female farmers. Based on the inequality in adoption between male and female farmers, the study investigated and compared the stages of adoption of improved cassava production technologies cassava production. The study further investigated the constraints militating against the adoption stages between male and female farmers.

Methodology

Study Area

This study was conducted in Anambra State, in South Eastern Nigeria, which comprises 21 Local Government Areas (LGAs). The State is divided into four Agricultural zones; Aguata, Anambra, Awka and Onitsha (ASADEP, 2003). Its population figure was estimated to be 4,055,048, (NPC, 2006) ; the State has two main ethnic groups; the Igbo with a population of about 3973947 (98%) and Igala with a population of about 811001 (2%) who live in the North western part of the State (ASADEP, 2003). The area lies within the 6º13' and 7º 9' North and longitudes 7º49' and 7º57' East (Nfor, 2006). It covers a land area of about 4,416sq km of the total land area of Nigeria: about 70% of this, is arable land, and less than 55 percent is under cultivation (NPC, 2006). The area lies mainly on plains under 200M above sea level (ASADEP, 2003). It has tropical rain forest vegetation, humid climate and a rainfall of between 152mm- 203mm. It experiences two seasons in a year; from late October to early May marks the dry season while from April to early October marks rainy season (Okorji *et al.,*2012). The State situates on flat land on the eastern plains of the River Niger and shares boundaries with Abia, Delta, Enugu, Imo and Kogi States. Farming is the predominant occupation of the rural inhabitants and the main crops in the State are roots, tubers, cereals and tree crops.

Sample Selection

A multi-stage sampling technique was used in choosing the samples. Anambra agricultural Zone was purposely selected for the study because of its close vicinity to National Root Crops Research Institute(sub-station) from where the technologies are being disseminated. Blocks, circles and cells were selected randomly from the Zone for the study. From the selected zone, three (3) extension blocks, two circles from each of the blocks and one cell from each of the circles were randomly selected for the study. A total of 20 respondents (that is 10 male and 10 female) were randomly selected from each of the cells. Hence, a total of 120cassava farmers were selected for the study. The farmers were selected from the list of 300 registered cassava farmers provided by Anambra Agricultural Zone, Anambra State.

Data Collection

Preliminary visits were carried out to Anambra agricultural Zone and study locations before the commencement of the actual data collection. The visit was an aid for the familiarization of the researchers with the study locations, village heads, resident agricultural extension agents, key informants and field guides. Data were collected using structured questionnaire and interview schedule. A rapid appraisal of questionnaire was undertaken by the extension agents and other enumerators and questions were raised. The questionnaire and interview schedule were pre-tested in Aguleri (because it is closer to the Zonal office) to standardize them and to give the enumerators and extension agent adequate orientation.

Data Analysis

Descriptive statistics such as mean, frequency, and percentages was used to estimate the socioeconomic characteristics the respondents. Likert scales on a 5-point likert type with a bench mark of 3 such that adoption (5), trial (4), evaluation (3), interest (2) and awareness (1) were used to estimate the adoption stages. Z-test analytical tool was used to compare the mean stages of adoption between male and female farmers. Constraints militating against the stages of adoption were achieved using likert scales on a 3-point likert type with a bench mark of 2 such that high (3), medium (2) and low (1).

The models are stated as follow:

likert scale model:

$$\overline{Xs} = \frac{\sum FN}{N_r}$$

Where

$\overline{Xs}$ = mean score

$\sum$ = summation sign

F = frequency

N = likert nominal value

Nr = number of respondents

Hence 5-point-likert was employed in the study such that, if Xs= 3 and above will imply adoption but less than 3 will imply no adoption.

$$Zcal = \frac{\overline{X_1} - \overline{X_2}}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

Result and Discussion

Socio-Economic Characteristics of the Respondents

The distribution of respondents according to socio-economic characteristics of the respondents is presented in Table 1

The results in Table1 show the socio-economic characteristics of the respondents. The results show that the mean age of male farmers was 49 years while that of female farmers was 48years. This implies that the farmers were within their active age therefore, they will adopt any technology or intervention that would gear towards improving their cassava production system. This is because new technology in agriculture requires physically able men and female. This finding is consistent with the findings of Rathmen, *et al.*, (2002). The table shows that majority of male farmers attained primary school education while majority of female farmers attained secondary school education. The implication is that female farmers are literate than their male counterparts, and would be better-off to cope with cassava production technologies introduced to them than the male. Education predisposes farmers to be innovative and puts them in a better position to cope with the challenges of the adoption of new technologies introduced to them (Adewuyi, *et al*., 2013).

Male farmers had an average household size of 5 persons while female farmers had 4. The implication is that male farmers have more persons under their care than the female farmers. This indicates that male farmers would have more labour availability in their household than the female farmers since family size is one of the determinants of family labour or labour force in a society. The report from (FAO, 2011) showed that female headed households had less labour available for farm work than male- headed households because they typically had fewer working age adult members but more dependents. From the findings, male farmers had mean farming experience of 20 years while female farmers had 23 years. This implies that female farmers had more cassava farming experience than their male counterparts in the area and therefore would tend to adopt innovations on cassava than men. The mean farm size for male farmers was 1.8 ha while female farmers had 1.2 ha. The results show that arable land was more available to male farmers than their female counterparts. This could be that male farmers had access to farm land than female farmers due to culture. This is consistent with FAO, (2010) who stated that globally women scarcely own land due to norms and custom. The results further show that famers were more of small farm holders since they had farm size less than 5 ha. This is consistent with Onyebinama, (2004) who stated that farmers with less than 5 ha of farm land are small holder farmers.

Distribution of Stages of Adoption of Improved Cassava Production Technologies by Gender

The results in Table 2 show the stages of adoption of improved cassava production technologies understudied in the study area. Improved varieties are under evaluation by male and female farmers and are an indication that farmers in the area still stick tenaciously to the predominant local varieties. The result is an indication that farmers have not been convinced about the improved varieties introduced to them. This is inconformity with Majharul, (2012) who noted thatPeople by nature will resist change unless they can be convinced that they can directly benefit from the change. The result showed that planting space of 0.8m X 1m has been adopted by female farmers while still under trial by male farmers. This is because the planting spacing perhaps economizes land and provide good root and stem yield unlike 1m X 1m which could require large area of land. Female farmers adopted the use of manure in enriching soil fertility. The result is an indication that male and female farmers reason in different direction in terms of

adoption and it confirmed with Rogers (1969) who noted that person's attitude toward a technology is determined by his or her salient beliefs about consequences of performing the technology and an evaluation of the outcome of that technology. The use of fertilizer and tractor has not been adopted by the farmers and this could be attributed to high cost of the inputs for farming. High cost of fertilizers and farm tools were agreed with Obinne (1994) and Umeh and Chukwu (2015) as constraints to technology adoption, especially among low income farmers. Furthermore, female farmers adopting the use of herbicides for weed control is an indication that the use of herbicides reduces the labour costs of weeding. The results generally indicate that female farmers are adopting the introduced improved cassava production technologies in the area faster than male farmers and therefore female farmers are early adopters. On the other hands, the results is an indication that male farmers are newly developing interest on cassava production and this would be attributed to the fact that male farmers have been planting yam as their main crop.

Comparative Analysis of the Stages of Adoption of Improved Cassava Production Technologies by Gender

The results in Table 3 show the Z-test result on the comparative analysis of the level of adoption of improved cassava production technologies.

The mean value for the male farmers was 32.8167 while that of the female was 47.5902 and the Z-test value was -22.736. This shows that there was significant difference in the stages of adoption of the improved cassava production technologies between the male and female. This is in conformity with (Doss and Morris, 2001) who stated that significant difference exists between male and female adoption rate. The negative sign of the result is an indication that female farmers have high level of significant difference in adoption stages than their male counterparts. This result is an indication that female farmers adopt technologies faster than their male counterparts.

Constraints Militating Against Improved Cassava Production Technologies Adoption By Gender

The results in Table 3 show the distribution of respondents according to constraints militating against adoption of improved cassava production technologies.

The results in Table 3 show that high cost of inputs and lack of access to processing machine were considered the main constraints that militate against the adoption stages of improved cassava production technologies by male farmers. Alternatively, poor road network, lack of access to processing machine and lack of extension agent visitation were the main constraints militating against the adoption stages of improved cassava production technologies by female farmers. The results were in conformity with Nsoanya, (2011) and Ezeibe, *et al*., (2015) who noted that high cost of inputs, lack of improved planting materials, and lack of processing machines were the most serious constraints among cassava producers. The results further, imply that, though male and female farmers face some challenges that hinder their level of adoption, female farmers face more challenges. This agrees with Ezeibe, *et al.,* (2015) who noted that farmers (male and female) are faced with constraints that hindered their productivities but female farmers had more constraints than male.

Conclusion

This study was designed to estimate and compare the stages of adoption of improved cassava production technologies by male and female farmers. The findings call for policy recommendation that would initiate project or programme that would enhance farmers (especially female farmers) to adoption of improved cassava production technologies. There should be an implementation of effective and affordable mechanization in cassava farming to ensure higher profitability. This would motivate farmers (male and female) to adopt the improved cassava production technologies. Training and retraining of farmers would go a long way in helping farmers to be acquainted with the use of inputs (herbicides and fertilizer), agronomic practices, the value addition and the benefits associate with improved cassava production technologies. There is need to employ more extension agents and to also strengthen the Monitoring and Evaluation Unit of the Agricultural Development Programme in order to ensure full adoption of the technologies by male and female farmers in Nigeria. There is need for government initiate new or strengthen the existing tractor hiring service programme in order to ensure the use of tractor for land preparation.

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Table1: Distribution of respondents according to socio-economic characteristics:

	Male		Female	
Age (Years)	Frequency	Percentage	Frequency	Percentage
18-35	9	15.00	6	10.00
36-53	28	46.67	30	50.00
54-71	23	38.33	18	30.00
72-89	0	0	6	10.00
Mean	49		48	
Educational Status				
Primary School	23	38.33	20	33.33
Secondary School	22	36.67	26	43.33
Tertiary	10	16.67	8	13.33
None	5	8.33	6	10.00
Household Size				
1-5	35	58.33	38	63.33
6-10	25	41.67	22	36.67
Mean	5		4	
Farming Exp (yrs)				
1-10	15	25.00	7	11.67
11-20	28	46.67	20	33.33
21-30	12	20.00	18	30.00
31-40	4	6.00	14	23.33
41-50	1	1.67	1	1.67
Mean	20		23	
Farm Size (ha)				
0.1-2.0	42	70.00	55	91.67
2.1-4.0	15	25.00	5	8.30
4.1-5.0	3	5.00	0	0
Mean	1.8		1.2	

Source: Field Survey, 2015

Table2: Estimated Stages of Adoption of Improved Cassava Production Technologies (ICPT) By Gender

	Male		**Female**	
ICPT	**Mean Score**	**Stages of Adoption**	**Mean Score**	**Stages of Adoption**
Improved varieties	4.02	Evaluation	3.49	Evaluation
1m X 1m Planting Spacing	3.42	Evaluation	4.45	Trial
0.8m X 1m Planting Spacing	4.02	Trial	5.00	Adoption
0.5m X 1m Planting Spacing	2.90	Interest	4.83	Trial
Use of Fertilizer	3.35	Evaluation	4.20	Trial
Manure	3.37	Evaluation	5.00	Adoption
Use of Herbicides	4.08	Trial	5.00	Adoption
Use of Tractor For Land Preparation	3.12	Evaluation	4.03	Trial
Cassava Intercrop	3.43	Evaluation	4.16	Trial

Source: Survey 2015

Table 3: Estimated Z test For Adoption Stages Comparison between Gender

Gender	Observation	Mean	Standard/deviation	Z- Value	P- Value
Male	60	32.8167	2.9544	-22.736	0.0001
Female	60	47.5902	4.0922		

Source: Survey 2015

Table 3: Major Constraints Militating Against Adoption of Improved Cassava Production Technologies by Gender

Constraints Facing Farmers	**Mean Score (Male)**	**Ranking**	**Mean Score (Female)**	**Ranking**
Insufficiency Of Planting Material	2.2	Medium	2.4	Medium
Lack Of Agric. Information	2.1	Medium	2.2	Medium
High Cost Of Inputs	2.5	High	2.3	Medium
Poor Road Network	2.2	Medium	2.6	High
Lack Of Access To Processing Machine	2.9	High	2.5	High
Lack Of Extension Agents Visitation	2.2	Medium	2.7	High

Source: Field Survey 2015