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Social Capital and Adoption of Cassava Innovation among Rural Farmers in Abia State, Nigeria

Ifeanyı Moses KANU[1] 0000-0002-5766-193X

Department of Agricultural Economics, Michael Okpara University of Agriculture, Umudike, P.M.B. 7267, Umuahia, Abia State, NG

Chidinma Rosemary OKEZIE 0000-0003-0430-1954

Department of Agribusiness and Management, Michael Okpara University of Agriculture, Umudike, P.M.B. 7267, Umuahia, Abia State, NG

Simon Gift NNAH 0000-0002-8477-477X

Department of Agribusiness and Management, Michael Okpara University of Agriculture, Umudike, P.M.B. 7267, Umuahia, Abia State,NG

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Abstract

Innovation is the practical implementation of ideas, thoughts and methodologies that results in the introduction of new and better ways of offering goods and services; while social capital incorporates the collective relationships that help people to get along with each other and act more effectively individually and within a group. Amidst the various technical, institutional and socio-economic constraints to Cassava production in Nigeria, adoption of innovative approaches within the farmers groups' is expected to improve the gross margin and profitability of Cassava production amongst rural Cassava farmers. The study analyzed the effect of social capital on adoption of Cassava innovation among rural Cassava farmers in Abia state, Nigeria. Data for the study was analyzed with descriptive statics, logistic regression and correlation matrix. Results from the analysis shows that adoption of Cassava innovation increases as the rural farmers grew older. Evaluation from the socio capital indices shows that the higher the number of days the Cassava farmers belonging to their respective social institutions/groups' claimed to have worked for their social institutions/group, the more the farmers adopt improved Cassava cultivation and processing methodologies. Result from the logistic regression model shows that Age of the rural farmers, Education level, Density of Membership Index, Decision Making Index and Meeting attendance Index were the significant variables influencing adoption of Cassava innovation among the rural Cassava farmers in the study area. High cost of innovation technologies, difficulty in operation and instability in government policies were the major constraints to the adoption of improved Cassava innovation among the rural farmers in Abia State, Nigeria. It is recommended that policies be directed to the development and improvement of various social institutions/cooperative societies in Nigeria; that would enhance rural farmer's access to productive farm resources, especially information, credit and labour resource, so as to achieve her farming objectives.

Keywords: Social Capital, Cassava Adoption, Rural Households, Abia State Nigeria

1. Introduction

Social capital encompasses communal/collective relationships that help people to get along with each other and act more effectively in groups and as isolated individuals. It is the ability of people to secure benefits by virtue of their membership in various social groups or organizations. It embodies the collective actions that members of a group/organization take to achieve their desired objectives (Okezie et al., 2020). It facilitates mutually beneficial collective action.

[1] *Corresponding Author: ifym.skolarz@gmail.com*

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Cassava (Manihot esculenta crantz) production has been acknowledged to be constrained by a wide range of technical, institutional and socio-economic factors. Olurotimi et al., (2018) observed that these constraints included pests and diseases problems, agronomic and climate change challenges, poor road networks and shortage of planting materials/inputs. Other constraints are poor processing facilities and lack of institutionalized form of social capital or cooperative groups to pull resources and knowledge together for collective efficiency. Social capital allows access to innovation aimed at improving the efficiency of cassava production among rural farmers.

Innovation is the practical implementation of ideas, thoughts and methodologies that result in the introduction of new and better ways of offering goods and services. Amidst the various technical, institutional and socio-economic constraints to cassava production in Nigeria, adoption of innovative approaches is likely to improve the gross margin and profitability of cassava production among rural farmers. Yet, the rural farmers in Nigeria find it very difficult to adapt improved cassava innovative approaches (Olurotimi et al., 2018). Problems arising from policy and lack of organizational structure hinder the rural farmers' in adapting innovative tactics to improve cassava production. Thus, social capital could create a synergy that would benefit all rural farmers in their respective farming activities.

It is worthy to note that cassava is an important source of dietary carbohydrate and provides food for over 61.1% of the people in Africa, used as raw material for the production of drugs, chemicals, starch, etc. The roots of cassava are processed into garri, fufu, tapioca, chips and cassava flour for human consumption as well as paper, pellets, adhesive and for pharmaceuticals and industrial usage. It is of great interest to note that Nigeria is the world's largest producer of cassava. Its current production was estimated in 2009 to be 36.8 million metric tonnes with a total cultivable land of 3.13 million hectares, which has an average of yield of 11.7 tonnes per hectares (Idrisa et al., 2010).

In spite of the importance of cassava as the largest cultivated crop in Nigeria; and the perceived impact of social capital in enabling the adoption of improved cassava innovation, there is no known empirical research in Abia State, Nigeria that has attempted to examine the role of social capital in facilitating the adoption of cassava innovation among rural farmers. As a result, there is little information on how social capital may influence adoption of cassava innovation for increased productivity and profitability. This scenario therefore created a gap that this study aims to bridge. Consequently, it is therefore necessary to study the role of social capital in expediting the adoption of improved cassava innovation among rural farmers in Abia State, Nigeria.

2. Methodology

2.1. Study Area

The study was carried out in Abia State, Nigeria. Abia State was created out of Imo State on August 27, 1991. It has a land mass of 700 square km with 17 local government areas. The state lies between coordinates 5°31'29.7" North and 7°29.677' East of the Greenwich meridian. Abia State is bounded on the east by Cross River and Akwa Ibom Sates, on the north by Ebonyi and Enugu States, on the West by Imo State and on the South by Rivers State. Abia State consists of three Agricultural Zones, namely; Aba, Umuahia and Ohafia. The annual rainfall in the State ranges from 200-250 mm while the temperature varies from 220c to 350c. Farming is done at a subsistence level with greater percentages in the rural areas. Cassava and yam is the most dominant crop cultivated in the State. The State is endowed with rich fertile soil that supports the growth of other crops such as cocoyam, melon, maize, oil palm, garden egg, cocoa, plantain, banana, cashew, rubber, coconut to mention but a few. Poultry, goat, pigs and sheep are the major livestock kept in the State. Livestock are kept mostly on a smallholder or subsistence basis (Nwaru, 2005).

2.2. Sampling Technique

A multi-stage sampling technique was employed, involving the three agricultural zones (Aba, Ohafia and Umuahia) in the State. In the first stage, two Local Government Areas (LGA) were selected at random from each agricultural zone (i.e. 2 LGAs from Aba, Ohafia and Umuahia Agric Zones respectively, making it 6 LGAs in total). In the second stage, one rural farming community was randomly selected from each of the designated LGAs, Stage three involved the random selection of 10 Cassava farming households in each community; bringing the sample size to 60 rural cassava farmers.

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2.3. Analytical Technique

Descriptive statistics was applied in examining the demographic variables of the rural cassava farmers. The use of tables and means was employed in identifying the available cassava innovation and its frequency of use by the rural cassava farmers in the State, as well as in determining the status of social capital among the rural cassava farmers in the study area. The 5 point rating scale was used to evaluate the constraints to the adoption of cassava innovation among the rural cassava farmers in Abia State, Nigeria.

The influence of social capital on adoption of cassava innovation among rural farmers was analyzed with the application of logistic regression model; while the casual relationship between social capital and adoption of cassava innovations among the rural household was analyzed with the correlation matrix.

2.4 Logistic Regression Model

Logistic regression (logit) analysis is a uni/multivariate technique which allows for estimating the probability that an event occurs or not, by predicting a binary dependent outcome from a set of independent variables. In this regard, adoption of cassava innovation as defined in this study could be either unconstrained or constrained. The dependent variable is adoption of cassava innovation and since probability ranges between 0 and 1, Cassava Farming Households with unconstrained adoption of cassava innovation were assigned 1 and the ones that were constrained have 0 assigned to them.

The linear probability model depicted it given as:

$P_i=E(Y=1X_i) = \beta_{n+} \beta_n X_n$,

where

X_i is the explanatory variable and Y=1 means that the CFH has unconstrained adoption of cassava innovation

Considering the following representation of access to credit:

$$P_i=E(Y=1|X_i)=\frac{1}{1+\exp[-(\beta 1+\beta 2Xi)]}=\frac{1}{1+\exp(-Zi)}$$

Where $Z_i= \beta_1+\beta_2X_i$

$L_i=\ln[P_i/(1-P_i)]=Z_i=\beta_1+\beta_2X_i$

That is, the log of the odds ratio is not only linear in X, but also linear in the parameter. L is called the Logit, and it is thus specified below,

$\text{Log } P/1-P = b_0+b_1X_1+b_2X_2+b_3X_3...+b_{17}X_{17}+\mu$

Y= adoption of cassava innovation by rural cassava farmers

An odds ratio equal to 1 suggests that the explanatory variable leaves the dependent variable unchanged. If the odds ratio is greater (less) than 1, it implies that the effect of explanatory variable is to increase (reduce) the dependent variable (Balogun et al., 2011; Adinya et al., 2008).

Y= Adoption of Cassava Innovation by Rural Cassava Farmers (Dependent variable)

The explanatory variables included in the Adoption of Cassava Innovation model were:

(A) Household Characteristics

X_1 = Age of Household's head (Years)
X_2 = Education Level of Household's head (Years)
X_3 = Gender of Household's head (1= male, 0 = female)
X_4 = Marital Status (1= married, 0 = otherwise)
X_5 = Household size (number)
X_6 = Farming Experience (Years)

(B) Social Capital Variable

X_7 = Density of Membership Index (%)
X_8 = Cash Contribution Index of Households (%)
X_9 = Labour Contribution Index of Household to Association (%)
X_{10} = Decision Making Index (%)
X_{11} = Meeting Attendance of Household to Association (%)

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X_{12} = Heterogeneity Index of Association (%)

The formulae for correlation matrix is represented as

$$.r_i = \frac{n\sum xy - \sum x \sum y}{\sqrt{(n\sum x^2 - (\sum x)^2) - (n\sum y^2 - (\sum y)^2)}}$$

Y = Adoption of cassava innovations.
X = Social capital variables
$\sum$ = summation sign.
r_i= correlation coefficient in period
n = number of respondents studied

3. Results and Discussion

3.1 Socio – Economic Characteristics of Respondents

Table 1: Summary of Socio economic Characteristics of the Respondents

		Frequency	Percentage (%)
Gender	Male	24	40.00
	Female	36	60.00
Total		**60**	**100**
Age	18-24	6	10.00
	25-34	10	16.67
	35-44	11	18.33
	45-54	17	28.33
	55-64	12	20.00
	65+	4	6.67
Total		**60**	**100**
Educational Background	Never attended	6	10.00
	Nursery	11	18.33
	Primary	16	26.67
	Secondary	20	33.33
Total	Tertiary	7	11.67
		60	**100**
Monthly Household Income (N'000)	<5	7	11.67
	6-15	10	16.67
	16-25	12	20.00
	26-35	14	23.33
	36-45	8	13.33
	46-55	6	10.00
Total	>56	3	5.00
		60	**100**
Family Size	1-3 persons	12	20.00
	4-6 persons	27	45.00
	7-10 persons	10	16.67
	>10 persons	11	18.33
		60	**100**

Source: Field Survey Data, 2017

Table 1 shows the socio economic characteristics of the rural cassava farmers. From the table, it was observed that a greater percentage of the respondents (60%) were females and only 40% were males. This implied that more females were engaged in farming than their male counterparts in the study area. A total of 28.33% of the respondents were within the age bracket of 45 -54 years, 20% of the respondents were within the age bracket of 55 – 64 years and 6.67%

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were within 65 years and above. This is an indication that most of the farmers were in their active and productive years (45 - 54 years) who can easily adopt new cassava innovations. Notwithstanding, majority of the youths in the study area (18 - 24 years and 25 - 34 years) recorded a low percentage of the rural cassava farmers. Unfortunately, the youths who are supposed to replace the elderly populace are either withdrawing from or reluctant to go into farming as a profession.

Farmers' level of education influences his/her ability to adopt modern agricultural innovations and make productive decisions on various aspects of farming. The results from table 1 shows that 10% of the farmers interviewed never attended to school, 18.33% had nursery education, 26.67% had primary education, while 33.33% had secondary education, only 11.67% had tertiary education. The result implied that majority of the respondents were relatively educated. Regarding rural cassava farmers household size, a total of 20% of the respondents had a household size of 1-3 persons, 45% had 4-6 persons living in the same household, while 16.67% had a household size of 7-10 members. Also, 18.33% have a household size greater than 10 people. Having a larger household size may provide most of the labour needed for Cassava farming. According to Kanu (2020), larger household size may result in reduction in the cost expanded in hiring farm labourers, thereby leading to increased productivity and income among the rural cassava farmers.

3.2 . Availability and Frequency of Usage of Cassava Innovations among the rural Cassava Farmers in Abia State, Nigeria

This sub-section identifies the various types of Cassava innovation available in the study area. The rate of utilization or usage of Cassava innovations was also ascertained. The various types of Cassava innovations available in the study area were rapid multiplication of Cassava Stems (by 2 – nodes stakes), mechanized peeler, mechanized Garri fryer, cabinet dryer, Cassava/Maize/Melon intercrop, slanting method of Cassava planting among others.

Table 2: Rate of Cassava Utilization (Do You Utilize Cassava Innovation in your Enterprise?)

Response	Frequency	Percentage (%)
Yes	53	88.33
No	7	11.67
Total	**60**	**100**

Source: Computed from Field Survey Data, 2017

Table 2 portrays the respondents view on the utilization of Cassava innovations in the study area. A total of 88.33% of the respondents have utilized Cassava innovations at one point in time in their enterprise; while the sum of 11.67% has not exploited Cassava innovations. This result infers that the farmers currently prefer improved varieties of Cassava because of the higher yields, early maturity, high suppression of weeds, greater resistance to diseases and pests. Hence, the high percentage of adopters.

Table 3: Cassava Innovation Availability and its Frequency of Use by Rural Cassava Farmers in Abia State, Nigeria

Variable	Frequency*	Percentage (%)
(A) Pre – Planting Operation		
(i) Rapid Multiplication of Cassava Stems (by 2 – nodes stakes)	51	85.00
(B) Planting Operation		
(ii) TMS 30572 (UMUCASS 36)	52	86.67
(iii) NR8082 (UMUCASS 37)	49	81.67
(iv) TMS 4 (2) 1425 (UMUCASS 38)	29	48.33
(C) Post - Planting Operation		

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(v) Harvesting Period (8-9 months)	54	90.00
(D) Processing Technology		
(vi) Mechanized Peeler	8	13.33
(vii) Cassava grater	26	43.33
(viii) Grinding machine	58	96.67
(ix) Fermentation tank	16	26.67
(x) Hydraulic press	48	80.00
(xi) Sifter	59	98.33
(xii) Cabinet dryer	34	56.67
(xiii) Mechanized Garri fryer	6	10.00
(D) Other Modern Innovations		
(xiii) Cassava/Maize/Melon intercrop	52	86.67
(xiii) Cassava/Maize/Cocoyam intercrop	51	85.00
(xiii) Cassava/Maize/Melon/Okra intercrop	46	76.67
(xiii) Slanting Method of Cassava Cuttings and Planting	44	73.33
Total Respondent*	**60**	**100**

* = Multiple Responses. *Source: Computed from field survey data, 2017*

Table 3 shows the availability of Cassava innovations and its frequency of use by rural farm households' in Abia State, Nigeria. At each level of production from the cultivation stage, harvesting, and processing; particular innovations were adopted to facilitate the production of the crop.

The TMS 30572 variety (86.67%) was the most planted improved Cassava variety in the study area followed by NR 8082 variety (81.67%), TMS 4 (2) 1425 variety have 48.33% adoption rate. The low adoption rate of TMS 4 (2) 1425 (48.33%) variety by the farmers in the area may possibly be due to unfamiliarity or lack of planting materials of the variety. This could suggest that TMS 4 (2) 1425 variety do not possess desirable characteristics or are relatively new in the study area.

In terms of frequency of use of processing innovation, 98.33% of the respondents opined that they employ Sifter in Cassava processing, 96.67% use grinding machine, 80% employ hydraulic press, 56.67% uses the cabinet dryer, while 43.33% of the respondents interviewed uses Cassava grater for processing. Only 13.33% of the respondents uses mechanized peeler while 10% uses mechanized Garri fryer. The implication of this result is that mainstream of the processing innovations adopted by the respondents in the study area were basically traditional or manual base.

A total of 86.67% of the rural farm households in the study area were involved in Cassava/Maize/Melon intercrop, 85% employs Cassava/Maize/Cocoyam intercrop, while 76.67% were involved in Cassava/Maize/Melon/Okra intercrop. The sum of 73.33% of the respondents uses Slanting Method of Cassava Cuttings and Planting.

3.3. Status of Social Capital among Rural Farm Households' in Abia State, Nigeria

The Social Capital variables that were considered in this analysis include: Density of Membership Index, Cash Contribution Index, Labour Contribution Index, Decision Making Index, Meeting Attendance Index and Heterogeneity Index. The measurement of these six social capital indices is as explained as follows:

Density of Membership Index: This is captured by the summation of the total number of associations to which each household belongs. In other words, membership of associations by individuals in the household was summed up.

Cash Contribution Index: This was obtained by the summation of the total cash contributed to the various associations which the household belong. The actual cash contribution for each household is rescaled by dividing this amount by the maximum fee and then multiplying the resultant fraction by 100 (or %).

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Labour Contribution Index: This is the number of days that household members belonging to their social institutions/group claimed to have worked for their institutions. This represents the total number of days worked by household members for their group. This is also rescaled to 100 using the same process as for cash contribution.

Decision Making Index: This was calculated by summation of the subjective responses of households on their rating in participation in decision making in their various social institutions. The responses were averaged across their various social institutions and multiplied by 100 for each household.

Heterogeneity Index: This is an aggregation of the responses of each household to the questions on the diversity of members of their various social institutions. Each household answered questions on whether members in their various social institutions live in same neighbourhood, are same kin group, belong to same occupation, are of same economic status or are of the same religion. Other include if they were of the same gender, age group or occupation. Hence, for each of the factors a 'yes' response is coded 0 while 'no' response is coded 1. A maximum score of 10 for each association represents the highest level of heterogeneity. The various 'no's are then multiplied by the total number of observations, in order to generate a heterogeneity index. This index is then multiplied by hundred. (A zero value represents complete homogeneity while 10 represent complete heterogeneity).

Table 4: Status of Social Capital among Rural Farm Households'

Social Capital	Mean (in %)	SD	Min (in %)	Max (in %)
Density of Membership Index	64.38	19.2	12	100
Cash Contribution Index	38.67	22.1	7	89
Labour Contribution Index	60.15	24.3	10	100
Decision Making Index	62.85	29.3	9	100
Meeting Attendance Index	57.45	21.6	7	78
Heterogeneity Index	49.67	31.5	4	72
Total	**100**		**100**	**100**

Source: Computed from field survey data, 2017

Table 4 shows the status of Social Capital among rural households in the study area. The mean is considered 50%. The mean density of Membership Index was marginally above average (64.38%). This implied that there were 64.38% of active household farmers in existing social association or organizations. Cash Contribution Index was generally below average (35.5%). The Cash Contribution Index implied that only 35.5% of the rural farm households were involved in payment of membership dues and other contributions. Lawal *et al.*, (2014) observed that the poor financial strength of groups or associations were a major constraint to group activities and development. They also noted that membership financial contributions have an overriding effect on group's sustenance and benefit.

The mean density of Labour Contribution Index was 60.15%. This inferred that there were 60.15% (>average) of the respondents who have contributed their labour skills in terms of productive work in their social organizations. This is measured by mandays.

Decision Making Index, Meeting Attendance Index and Heterogeneity Index have mean values of 62.85%, 57.45 and 49.67% respectively. The implication of these results is that 62.85% of the rural farm households (which is above the mean of 50%) follow a democratic pattern of decision making. Accordingly, about 57.45% are attendance at meetings schedule of their various social associations. A total of 49.67% of the respondents were heterogeneous. The criteria for heterogeneity was differences in neighbourhood, kin group, income group, religion, sex, age, level of education, belief and cultural practices, and trust.

3.4. Influence of Social Capital on Adoption of Cassava Innovation among Rural Farm Households' in Abia State, Nigeria

This objective was realized with the use of Logistic Regression Model or Logit. The Logistic Regression model is a multivariate technique which allows for estimating the probability that an event occurs or not, by predicting a binary dependent outcome from a set of independent variables. In this regard, adoption of Cassava innovation could be either unconstrained or constrained. The dependent variable is adoption of Cassava innovation and since probability ranges

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between 0 and 1, rural farm households in Abia State with unconstrained adoption were assigned 1 and the ones that were constrained have 0 assigned to them.

Table 5 Influence of Social Capital on Adoption of Cassava Innovation among Rural Cassava Farmers in Abia State, Nigeria

Variable	Odd Ratio	95% Confident Interval	P - Value
(X_1) Age of Households' Head	2.07*	0.73-1.03	0.0564
(X_2) Education Level of Households' head	0.79***	0.83 -1.12	0.003
(X_3) Gender of Households' head	0.84	0.42-5.12	0.722
(X_4) Marital Status	0.21	0.24-3.98	0.652
(X_5) Household size	1.03	0.76-1.05	0.942
(X_6) Farming Experience	1.87	0.95-1.06	0.756
(X_7) Density of Membership Index	1.07***	0.98-1.04	0.003
(X_8) Cash Index of Households	1.01	0.96-1.02	0.819
(X_9) Labour Contribution Index	1.63	0.98-1.04	0.535
(X_{10}) Decision Making Index	2.08***	0.95-1.01	0.002
(X_{11}) Meeting Attendance Index	2.03***	0.75-1.02	0.001
(X_{12}) Heterogeneity Index of Association	1.87	0.84-1.05	0.537
Chi square	36.89***		0.004

Legend: *** Significance at 1%, * Significance at 10%: ***Source: Field Survey Data, 2017***

The Influence of Social Capital on Adoption of Cassava Innovation among Rural Farmers in Abia State, Nigeria was presented in table 5 above. Iyanda et al., (2014) observed that when reporting the results of a logistic regression analysis, the estimated odds ratios for the regression coefficients, their confidence intervals and associated probability (P)-values should be presented. In addition, it is indispensable to give some statistics about the goodness of fit of the model to the data. The coefficient of likelihood ratio of Chi-square was estimated as 36.89, which is significant at 1% level; indicating a good fit for the estimated logistic model. The result shows that Age of Households' Head (X1), Education level of Household (X2), Density of Membership Index (X7), Decision Making Index (X10) and Meeting attendance Index (X11) were the significant variables influencing adoption of Cassava innovation among the rural farming households in the study area.

The age of household head was significant at 10% level; with a positive odds ratio of 2.07. This implies that the adoption of Cassava innovation increases as the Cassava farmers grows older. This implies that if the age of the household head is increased by 1 year, adoption of Cassava innovation will increase by 2.07. This result suggests that increasing the magnitude of the Cassava farmers' age will boost their adoption rate. This is because the older the Cassava farmer the more experience he/she is in adopting innovation to enhance his farming skills. Age is therefore a major consideration in designing strategies to increase adoption of innovation. The significant of age among rural farmers could be attributed to increased maturity and experience; as the farmers are bound to make better cognizant decisions following increased life encounters over time.

The Logit result from the Influence of Social Capital on Adoption of Cassava Innovation among Rural Farmers in Abia State, Nigeria shows that the educational level of household head was significant at 99% level of confidence; with odds ratio of 0.79. This result implies that the adoption of Cassava innovation increases as the farmers' years of education rises. This means that if the level of education of the household head is increased by 1 year, adoption of Cassava innovation will increase by 0.79; all things being equal. Pradhan (2009) posited that the returns on investment in education translate to economic growth and of course extend to improvement in the quality of the society because education affect rural farmers' attitudes and assist them to grow up with social values that are more beneficial to themselves and the nation at large. Thus, a fundamental way of generating sustainable economic growth should focus solely on educational development. Therefore, education is the most important instrument to enhance rural farmers' capabilities and to achieve their desired objectives of agricultural, socio and economic development. To this end, education enables rural farming households to make informed choices and adopt improved Cassava innovation; amongst others.

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Membership Index is the summation of the total number of associations to which each rural farm household belongs. The density of membership index was found to influence rural farmers in their Cassava innovation adoption process. Density of membership index was significant at 1% level with an odd ratio of 1.07. This implies that, a unit increase in membership index among the rural farming households in their various social associations/group will increase the likelihood of them adopting Cassava innovation by 1.07. The result implies that, the more rural farmers belongs to associations/groups the higher their cassava innovation adoption process.

Decision making index with odds ratio of 2.08 was found to be positively significant at 1% level in the adoption of Cassava innovation among the rural Cassava farmers in Abia State. A unit increase in decision making among the respondents in their various social associations/group will increase the likelihood of adopting Cassava innovation by 2.08. Efficient decision making enables an individual to plan, implement and execute actions that leads to the realization of their set goals and objectives. Farmers involved in decision making are drivers, risk-takers and not laggards. Decision making in various social organizations increases the chances of rural farm households in adopting more improved innovation in their Cassava enterprise.

Meeting attendance index is the number of times rural farmers belonging to their various association/group actually met over a period of time. It is simply the summation of attendance of household members at meetings. Meeting attendance index with odds ratio of 2.03 was found to be positively significant at 1% level in the adoption of Cassava innovation among the rural Cassava farmers in Abia State. This implies that a unit increase in meeting attendance among the respondents in their various social associations/group will increase the likelihood of adopting Cassava innovation by 2.03. This result infers that the higher the meeting attendance of rural farming households, the higher their cassava innovation adoption. In veracity, the more a farm household attends to his cooperative/social meetings, the higher the probabilities of getting useful information that will enhance his farming operation.

3.5 . Relationship between Social Capital and Adoption of Cassava Innovations among Rural Household in the Study Area

Table 6: Correlation Matrix showing the Relationships between Social Capital and Adoption of Cassava Innovations in Abia State, Nigeria

	Y	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}
Y	1	0.531	0.640	0.627**	0.702	0.692**	-0.543***
X_7	0.531	1	-0.349	0.441	0.660	0.512	-0.434
X_8	0.640	0.349	1	0.211	0.495**	0.728	-0.143
X_9	0.627**	0.441	0.211	1	0.579	0.617	0.063
X_{10}	0.702	0.660	0.495**	0.579	1	0.405	0.288***
X_{11}	0.692**	0.512	0.728	0.617	0.405	1	-0.085
X_{12}	-0.543***	-0.434	-0.143	0.063	0.288***	-0.085	1

**Correlation is significant at the 0.01 level ***Correlation is significant at the 0.05 level *Source: Field Survey Data, 2017*

Table 6 is the Correlation Matrix showing the relationships between Social Capital and Adoption of Cassava Innovations by the respondents in Abia State, Nigeria. For the purpose of simplicity, 'Y' is the dependent variable, which is tagged 'Rate of Adoption of Improved Cassava Technology.' X_7 –X_{12} were the different Social Capital Variables. The Correlation matrix is bi – directional in response; that is, if Y influences X, therefore X influence Y.

The following variables were significant in the Correlation Matrix:

i. $Y – X_9$ or $X_9 – Y$ (r = 0.627**) at 1% level of significant,
ii. $Y – X_{11}$ or $X_{11} – Y$ (r = 0.692**) at 1% level of significant,
iii. $Y – X_{12}$ or $X_{12} – Y$ (r = -0.543***) at 5% level of significant,
iv. $X_8 – X_{10}$ or $X_{10} – X_8$ (r = -0.495**) at 1% level of significant,
v. $X_{12} – X_{10}$ or $X_{10} – X_{12}$ (r = -0.288***) at 5% level of significant.

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The analysis showed a high positive (r = 0.627**) relationship between Adoption of Cassava Innovations (Y) and Labour Contribution Index (X9) of the rural farmers. The result of the study implies that the higher the Adoption of Cassava Innovations, the greater the Labour Contribution Index. As a result, a 1% change/increase in adopting Cassava Innovations will result in 62.7% shift/upsurge in Labour Contribution. Hence, it could be concluded that adoption of Cassava innovations influence Labour Contribution Index of rural farmers.

The variables – adoption of Cassava innovations and meeting attendance index were positively correlated (r = 0.692**). There is a significant relationship between adoption of Cassava innovations and meeting attendance. The result of this analysis implies that the higher the acceptance of Cassava innovations, the greater the meeting attendance in the various social organizations. By implication, it can be deduced that a 1% shift/increase in adoption of Cassava innovations will result in 69.2% modification or increase in meeting attendance. Meeting attendance and adoption of Cassava innovations were found to be positively linked, thus reducing one entails the reduction of the other.

There is a negative (r = -0.543**) relationship between Adoption of Cassava Innovations and Heterogeneity index. The result of the analysis suggest that the higher the adoption of Cassava innovations, the lower the heterogeneity by the various social groups. By implication, it can be deduced that a 5% shift/increase in Adoption of Cassava Innovations will result in 54.3% shift/decrease in heterogeneity index.

Other result from the correlation matrix articulates a weak negative connection (r = -0.288***) between Decision Making Index and Heterogeneity Index at 5% level of significance. This denotes that a 5% upsurge in Decision Making Index will result in 28.8% decrease in Heterogeneity Index and vice versa.

3.6 Constraints to the Adoption of Cassava Innovation among Rural Farm Households' in Abia State

The constraints limiting the adoption of Cassava Innovation among rural farm households' in Abia State was analyzed with 5 point Likert scale. The following scales were **Very Serious** (VA), **Serious** (S), **Minor** (M), **Unserious** (U) and **Don't know** (DN).

The researcher considered the average mean score of 3.00 to be ***Accepted*** (A) while any item/score below 3.00 was *Rejected* (R). The score of ***3.00*** was calculated using the weightings attached to the response options of:

Very Serious	**(VS)**	= 5
Serious	**(S)**	= 4
Minor	**(M)**	= 3
Unserious	**(U)**	= 2
Don't know	**(DN).**	= 1

Hence, $\frac{5+4+3+2+1}{5} = \frac{15}{5} = 3.0$

Table 7: Distribution of Respondents by Constraints to the Adoption of Cassava Innovation in Abia State, Nigeria

S/N	Responses	V S	S	M	U	D N	Mean	Decision
1	Difficulty to Operate	90	64	36	18	5	3.55	Accepted
2	High Cost of Technologies	120	56	27	12	7	3.70	Accepted
3	Instability in Govt. Policies	65	64	27	28	8	3.20	Accepted
4	High Cost in Hiring Technology	65	48	33	30	9	3.09	Accepted
5	Lack of Knowledge	35	36	66	32	6	2.92	Rejected
6	Land tenure system	40	48	30	44	8	2.83	Rejected
7	Poor Extension Services	80	40	24	42	5	3.18	Accepted

Source: Field Survey Data, 2017

Table 7 is the distribution of rural farm households according to the Constraints limiting their adoption of innovation in Cassava farming. Any response with <3.0 mean value was rejected as a major constraint. High Cost of Technologies

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(mean = 3.7), Difficulty to Operate the technology (mean = 3.55), Instability in Government Policies (mean = 3.2), Poor extension services (mean = 3.18) and high cost in hiring the technology (3.09) were the accepted constraints to the adoption of Cassava innovation in the study area.

In regards to the High cost of Technologies, Isitor *et al*., (2014) observed that the availability of credit needed for the purchase and transfer of innovations is essential to the adoption rate. Agricultural production is capital intensive and farmers in developing countries like Nigeria need to inject money into it. Credit makes it easy for rural farmers to use modern improved technology in their farming operations. In the same way, instability in Government policies is a key constraint deterring the adoption of Cassava innovation in the study area. Attitude of the Nigerian government towards agriculture has been perceived to be scruffily poor since the discovery of petroleum in the country. The government has nose-dived to support agriculture reasonably. Such fiascoes include the non-enactment of favourable agricultural policies, poor funding of extension services, and poor development of infrastructure and so on.

Poor performance of the agricultural extension service is among the hindrances to the adoption of innovations by rural farmers in the study area. Limited budget experienced by educational institution is one of the contributory factors to the failure of extension service. This has led to poor research findings and implementation.

4. CONCLUSION AND POLICY RECOMMENDATIONS

- Mainstream of the rural Cassava farmers currently prefer improved varieties of Cassava because of the higher yields, early maturity, high suppression of weeds, greater resistance to diseases and pests. Hence, the high percentage of adopters;
- Greater percentage of the Cassava processing innovations adopted by the respondents in the study area were basically traditional and manual base;
- Adoption of Cassava innovation increases as the farmers grow older. Also, the higher the number of days that household members belonging to their social institutions/group claimed to have worked for their social organizations, the more the Cassava innovation adopted.
- The more Cassava innovations were adopted, the greater the labour contribution index of the rural farming households. Also, the greater the acceptance of Cassava innovations, the greater the meeting attendance of the various social organizations.
- High cost of innovation technologies, difficulty in operation and instability in Govt. policies were the major constraints to the adoption of improved Cassava innovation among the rural farmers in Abia State, Nigeria

The following recommendations are advised:

- Policies should be enacted that promote innovation in agriculture, because majority of the farmers currently prefer improved varieties of Cassava because of the higher yields, early maturity, high suppression of weeds among others;
- The ministry of agriculture and other research agencies should develop mechanical Cassava processing device, as a way of making work easier for the rural farmers;
- Rural farming households should be encouraged to participate actively in their various social organizations through regular meeting attendance and partaking in the decision making process of their group. This will increase their rate of innovation; through relevant discussion and brainstorming.
- Policies should be directed at the improvement in various social capital development/cooperative societies in Nigeria; that would enhance rural farmer's access to productive farm resources, especially credit and labour, so as to achieve farming objectives.

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