Extension Journal

International Journal of Agriculture Extension and Social Development

The effect of Anambra state value chain development programme partnership with Nigerian Agricultural Insurance Corporation (NAIC) on farmer's production security and risk management

Chukwujekwu A Obianefo[1, 2*], John N Ng'ombe[3], Obiageli B Gbughemobi[2] and Nma O Okoroji[4]

[1]IFAD/FGN Assisted Value Chain Development Programme, Awka, Nigeria

[2]Department of Agricultural Economics and Extension, Nnamdi Azikiwe University, Awka, Nigeria

[3]Department of Agricultural Economics and Extension, University of Zambia, Lusaka, Nigeria

[4]Department of Cooperative Economics and Management, Nnamdi Azikiwe University, Awka, Nigeria

Abstract
The study on the effect of Anambra State Value Chain Development Programme partnership with Nigerian Agricultural Insurance Corporation (NAIC) on farmer's production security and risk management investigated the index base insurance cover provided to the farmers through the programme partnership, the extent of farmer's awareness of NAIC requirements for agricultural insurance participation, the benefit of agricultural insurance to food production security and risk management, and the challenges of agricultural insurance in the study area. The study used a well-structured questionnaire and face to face interview schedule to elicit information from a cross-section of randomly selected 200 old and 100 new participants, and 40 NAIC staff. Descriptive statistics, principal factor analysis and Logistic regression model were used to achieve the study objectives. The study revealed the average; age (41.25) and annual income from all sources (876.58 USD) among other variables for the new participants, and an average; age (36.38) and income from all sources (1650.42 USD) among other variables for the old participants. The farmers are insured against flood, surface depending/yield, and fire outbreak among others. The requirements by which the farmers are aware include access to farmland and keeping a good operation record among others, while new participants are only aware of access to farmland, and reporting incidence immediately they occur. The benefits of NAIC acknowledged are that it helps farmers to bounce back, reduce loan default among others. Furthermore, NAIC staff needs to address management issues that are hampering their smooth operations seeing that the three principal factors explained 77.43% of the variance of factors affecting implementation.

Keywords: Agricultural insurance, premium, food security, indemnity, claim, copying strategy, food security

Introduction
The agricultural sector over the years remained the highest source of employment especially in the rural areas, farmer's involvement in the sector is very important for food availability and supply (Obianefo, *et al.,* 2019) [15]. This sector is constantly under threat by climate change, human activities, pests and diseases, among other issues that need to be addressed. This, therefore, suggests the need to increase agricultural insurance packages in Nigeria (Mitu, 2008) [13]. The sector is saddled with numerous uncertainties (drought, flood, pest and disease) that have often prevented investors from venturing into agriculture. These uncertainties led to the danger of agricultural production loss that needs urgent attention to ensure continuous food supply for the teaming growing human population. Thus, Mitu (2008) [113] suggested that the concern for risks that stifle investment and contributes to the vulnerability of rural poor is a driving force behind various types of agricultural insurance. Advocacy for agricultural insurance cover against crop losses by the Central Bank of Nigeria (CBN) and other relevant agencies will attract public and private sector

involvement in agriculture.
To address the issues of production loss which adversely affects farmer's morale in the adoption and expansion of agricultural technology for food production and supply; the Federal Ministry of Agriculture and Rural Development (FMARD) in 2014 restructured and launched the Nigerian Agricultural Insurance Corporation (NAIC) to manage the risk inherent in the agricultural sector (Hansen *et al.*, 2016) [7]. The insurance of agricultural activities is aimed at helping the farmers to increase resilience in the face of various production risks in the sector, it will equally help farmers to quickly recover from depression suffered during a disaster (USDARMA, 2015). If this insurance policy is effective, farmers will rely heavily on it than the succor received during post-disaster payment. Therefore, agricultural insurance should be cost-effective to both small, medium and large scale farmers. Though, this assertion does not invalidate the need to verify a farmer's claim to avoid undue advantage (Janzen and Carter, 2019) [9].
Agricultural insurance became available in Nigeria in the form of Multi or named as a Peril crop insurance to reach an

estimated 35,000 farmers per annum through NAIC (Hansen et al., 2016) [7]. Gary (2015) [6] defined agricultural insurance as the act of providing protective cover to the farmers to absorb the shock and risk inherent in the agricultural loss. This insurance is provided by an entity that is willing to provide insurance coverage in exchange for a fee (or premium). In recent times, agricultural insurance in Nigeria is in a form of an index-based which covers a particular claim for a specific available window (Hes and Hazell, 2016; Ehiogu and Chidiebere-Mark, 2019) [8, 3]. Aggarwal et al. (2016) [1] noted that some of the insurance packages available in agriculture are not limited to yield index, drought and or weather index, surface insurance depending index, price and market index, transportation index, only to mention a few. If not structured, the indemnity claim becomes infinite while the farmers will pay less attention to risk aversion (Elabed and Carter, 2014) [4].

The benefit of agricultural insurance cannot be overemphasized as the shock from farm production loss could be detrimental to the food security and livelihood of farmers. Elabed and Carter (2014) [4] pointed that the loss is capable of spurring the farmers towards poverty. Though, Maccini and Yong (2009) [10] contend that the absence of agricultural insurance will prompt the farmers to adopt a coping strategy suitable to manage their situation. Such strategies include but are not limited to liquidating a productive asset, loan default, migration, reduction in nutrient intake, child withdrawal from school and over-exploitation of natural resources (Maccini and Yong, 2009; Aggarwal et al., 2016) [10, 1]. Supportively, Janzen and Carter (2019) [9] reported that agricultural insurance is an important tool to avoid a reduction in food quality intake and exploitation of the natural resource for the future generation. Also, Dercon and Christaiensen (2011) [2] said that agricultural insurance will encourage the access and adoption of new farm technologies different from what the farmers are indigenously used to, this adoption is geared towards improving food security in an economy. The researcher(s) reiterate that agricultural insurance will help to boost the confidence and morale of a financial institution in providing credit to the stakeholders of the agricultural sector. This credit from financial institutions as studied by Madajewicz et al. (2013) [11]; Oxfarm and Amenea (2014) [18] will increase the number of drought animals purchased, increase savings, increase the purchase of farm inputs, among others.

In a brief, agricultural insurance was introduced in the year 1987 through the Nigerian Agricultural Insurance Scheme (NAIS) with the mandate of stimulating financial institutions to offer rural credit, minimize the need for government to assist with post-disaster succour, encourage agricultural sectoral investment, and provide financial remediation to farmers after natural hazard (World Bank, 2011) [20]. Furthermore, in 1993 Nigerian Agricultural Insurance Corporation (NAIC) was established to aid the function of NAIS through Public Sector Corporation and to foster agricultural credit and increase production (Epetimehin 2011; Hansen et al., 2016) [7]. Through the assistance of the Federal and State government, NAIC can offer up to 50% premium subsidies for many types of agricultural insurance packages in a crop, livestock, poultry and aquaculture (World Bank, 2011) [20]. Often time, NAIC

pay more attention to medium and large scale farmers due to some (administrative cost, poor farmers sensitization, crowding out by post-disaster relief effort, limited access to the reinsurance market, lack of insurance culture, inadequate regulating environment (Mahul and Stutley, 2010) [12] that are easily avoidable in medium and large scale farms. These challenges can be resolved if the government play a vital role in the areas of the data system, awareness and capacity building, smart subsidies, and creating an enabling environment for the stakeholders (World Bank, 2015) [21]. Thus, it becomes necessary for the farmers to organize themselves into a formidable group (farmer's cooperative society) to enable them to increase their land-holding capacity to attract the presence of NAIC staff.

Rural farmers are encouraged to pay as low as 4% of their production cost as a premium to guarantee their indemnity claim. Being that the Value Chain Development Programme is implemented in some areas (Ogbaru, Anambra East, Anambra West and Ayamelum) that are flood-prone, it, therefore, necessitates the programme partnership with NAIC to provide insurance cover to the programme participants or beneficiaries. Anambra State Value Chain Development Programme (ANSVCDP) then contributes 50% of the premium insurable by the programme beneficiaries. It is important to bring to the public domain that ANSVCDP is a Federal Government and the International Fund for Agricultural Development (FGN & IFAD) counterpart project that started in 2014 with project objectives to; increase agricultural production, reduce rural poverty, and improve rural livelihood. Considering the above programme mandates, it becomes necessary to investigate the effectiveness of ANSVCDP partnership with NAIC by operationalizing the following research specific objectives which are to;

1) Identify the index base insurance cover provided to the farmers through a programme partnership with NAIC,
2) Ascertain the extent of farmer's awareness of NAIC requirements for agricultural insurance participation,
3) Determine the benefit of agricultural insurance to food production security and risk management, and
4) Explain the challenges of agricultural insurance in the study area.

Hypotheses of the study
H_{O1}. Socioeconomic characteristics are not determinants of farmer's awareness of NAIC requirements.
H_{O2}. The awareness among old and new participants is significantly not different.

Research methodology
Study Area
Anambra state is located in the south-eastern part of Nigeria and comprises 21 Local Government Areas which include Aguata, Awka North, Awka South, Anambra East, Anambra West, Anaocha, Ayamelum, Dunukofia, Ekwusigo, Idemili North, Idemili South, Ihiala, Njikoka, Nnewi North, Nnewi South, Ogbaru, Onitsha North, Onitsha South, Orumba North, Orumba South and Oyi. The state is subdivided into four (Onitsha, Aguata, Awka and Anambra) agricultural zones to aid planning and rural development. The state is bounded by Delta State to the West, Imo State and Rivers State to the South, Enugu State to the East, and Kogi State

to the North. The indigenous ethnic groups in Anambra state comprised of 98% Igbo and 2% Igala mainly living in the north-western part of the state. Anambra East, West and Ayamelum (Anambra zone), Orumba North (Aguata zone), Awka North (Awka zone) plays host to the programme, later in 2018, three more LGAs (Ogbaru, Ihiala and Orumba South) were added due to their comparative advantage in the rice and cassava production.

Anambra State is situated between Latitudes 5°32ʹ and 6°45ʹ N and Longitude 6°43ʹ and 7°22ʹ E. The State has an estimated land area of 4,865sqkm² with a population of 4,177828 people as at the last official census (NPC, 2006). The State equally have an annual temperature and rainfall of 25.9°C and 138mm respectively. It is very important to bring to the public notice that value chain programme activities in the 8 LGAs of operation include; farmers organization strengthening on good governance and business development, 50% input support to farmers, 70% support to farmers on farm machinery, land development to support mechanized agriculture, construction of farm access road, and water scheme.

Sampling Procedure and Method of Data Collection
A multi-stage sampling technique was adopted for the study, at stage one, the list of farmers that benefited from the ANSVCDP and NAIC agricultural insurance scheme in the 2018 farm season was made available to the researcher(s) by the State programme management unit (SPMU) which comprises 610 (356 male and 254 female) farmers. At stage two, a Taro Yamane sample size determination technique cited in Otabor and Obahiagbon (2016) [17] was used to estimate an adequate sample size for the study. The Taro Yamane method is mathematically stated as:

$$n = \frac{N}{1 + N(e)^2}$$

Where:
N = Population of the Study
n = Sample Size
(e) = Level of significance
1 = Unit (a constant)
Note: (e) = 0.05

$$n = \frac{610}{1 + 610(0.05)^2} \quad \frac{610}{2.525} = 240$$

In stage three, 48 programme participants were randomly selected from each of the 5 old LGAs to make the participant's sample size 240. Again, in stage four, 35 farmers were randomly selected from each of the three new LGAs to make their own sample 105. In the fifth and last stage, 40 NAIC staff were subjectively sampled for information on the bottleneck to the implementation of agricultural insurance. These made the entire sample 385 respondents. In the end, only 83.31% of the research instrument was returned and treated for further analysis as shown in table 1.

Table 1: The questionnaire return rate for the analysis

S. n.	Location	Distributed	Returned	Percentage (%)
1	Old LGAs	240	200	83.33
2	New LGAs	105	100	95.24
3	NAIC staff	40	40	100.00
	Total	385	340	88.31

Source: Field Survey Data, 2019

Method of Data Analysis
The study utilized both descriptive statistics, the mean threshold from 5 points Likert scale, principal factor analysis, logistic regression model and sign test of the non-parametric tool. Objective one was achieved with descriptive statistics which include; Table, frequency and percentage, objectives two and three were achieved from the mean threshold of 5 points Likert scale, while objective four was achieved with principal factor analysis (PFA) after been subjected to a series of data treatment (reliability check, and data adequacy test) to ensure that items that are peculiar to the study areas are reported. Furthermore, null hypothesis one was tested from the Z-ratios of logistic regression analysis, while null hypothesis two was achieved with a Z-test. The models are mathematically defined by;

A). the mean threshold of 5 Point Likert Scale;

$$\overline{X} = \frac{1 + 2 + 3 + 4 + 5}{5} = 3.0$$

Where
$\overline{X}$ = Mean threshold ($\geq$ 3.0 imply agree or aware, < 3 imply disagree or not aware as the case may be).
5 = strongly agree or strongly aware,
4 = agree or aware,
3 = somewhat agree or somewhat aware,
2 = disagree or not aware,
1 = strongly disagree or strongly not aware.

B). Principal factor analysis (PFA):

$$Z_i = \delta_{i1}F_1 + \delta_{i2}F_2 + \cdots \delta_{im}F_m + \delta\varepsilon_i$$

Where: Z_i = observed challenges on i_{th} sample number, F_1-F_m = number of common factors, ε_i = the value on the residual variable or stochastic error term, δ_{i1} - δ_{im} = factor loading (regression weight). The associated assumption was applied accordingly while the suitable number of factors were subjectively selected based using the Pro-max rotation method in SPSS version 25.0 software to avoid a constructive loading of variables in more than one component.

C) Explicit logit regression model

$AW^* = \log(X_1/X_8) = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + \dots b_8X_8 + e$

Where
AW = level of farmer's awareness (aware = 1, not aware = 0)
X_1 = Age (years),

53

X_2 = level of education (years),
X_3 = Farming experience (years)
X_4 = household size (No),
X_5 = farm size (ha),
X_6 = Annual income,
e = error term.

E) Z-test

$$Z = \frac{\bar{X}_2 - \bar{X}_1}{\sqrt{\left(\frac{S_2^2}{n_2} + \frac{S_1^2}{n_1}\right)}}$$

Where:

Z = computed z-value for judging the significance of the mean difference,

$\bar{X}_1 =$ Mean awareness of NAIC requirement for old LGAs

$\bar{X}_2 =$ Mean awareness of NAIC requirement for new LGAs

S_1^2 = standard deviation of mean awareness for old LGAs

S_2^2 = standard deviation of mean awareness for new LGAs

n_1 and n_2 = sample observation for old and new LGAs

respectively.

Results and Discussions
Summary of the Farmer's Socioeconomic Characteristics
The description of the farmer's socioeconomic characteristics is presented in Table 2. The information was displayed for both old and new LGA participants. The Table, therefore, revealed the average; age (41.25), years of formal learning (11.76), farming experience (14.85) household size (5.95), farm size (0.376 ha), and annual income from all sources (876.58 USD) for the new LGAs and an average; age (36.38), years of formal learning (13.28), farming experience (13.3), household size (6.51) farm size (1.20 ha) and annual income from all sources (1650.42 USD) for the old LGAs respectively. This clearly shows that the old LGAs participants have more access to land which affords them easy participation in agricultural insurance for production security and risk management. The average age for both groups has clarified that the programme targets more youths which have shown while they are less experienced compared to the new LGAs participants.

Table 2: Description of farmer's socioeconomic characteristics

Variable	New participants		Old-participants	
	Mean	Std. Dev.	Mean	Std. Dev.
Age (years)	41.25	8.86	36.38	11.296
Years of formal learning (years)	11.76	3.88	13.28	5.494
Farming experience (years)	14.85	7.35	13.3	8.16
Household size (No)	5.95	2.66	6.51	3.024
Farm size (plot)	0.376	0.215	1.20	0.961
Annual income (USD)	876.58	258.60	1,650.42	3130.65

Source: Field Survey Data, 2019. NGN380 = 1USD

The Index-Based Insurance Cover Provided to the Farmers through Programme Partnership with the Nigerian Agricultural Insurance Corporation (NAIC)
Through the programme partnership with NAIC, the production risk cover the beneficiaries are insured is presented in Table 3. Respondents were allowed to record multiple responses and their result was ranked. Thus, the study found that the majority (96.0%) of the insurance cover provided by NAIC through this partnership was a cover for the flood that has become rampant in the study area in recent times. This finding correlates with Aggarwal *et al.* (2016) [1] who noted that the insurance package is also in a form of a weather index in this changing climate situation.

The other insurance cover the farmers are protected includes; surface depending/yield (94.5%), fire outbreak (60.5), price and market (43.5%), transportation (43.5%) among others (Table 3). This cover is provided on an annual basis, thus, aligning with Hes and Hazell (2016) [8]; Ehiogu and Chidiebere-Mark (2019) [3] who suggested that agricultural insurance should cover a particular claim for a specific available window. An effective farmer's claim during hazardous moments will help to boost the morale of youths to engage in agriculture since they can recover their investment if any risk breaks out.

Table 3: Insurance cover provided to the farmers through a programme partnership with NAIC

S. n.	Insurance cover	Frequency	Percentage (%)	Ranking
1	Flood	192	96	1st
3	Surface depending/yield	189	94.5	2nd
7	Fire outbreak	121	60.5	3rd
2	Price and market	87	43.5	4th
8	Transportation	87	43.5	4th
4	Pest and diseases	43	21.5	6th
6	Livestock	24	12	7th
5	Drought	5	2.5	8th
9	Herder-farmers attack	1	0.5	9th

Source: Field Survey Data, 2019. Note: multiple responses were recorded

The Extent of Farmer's Awareness on NAIC Requirements for Agricultural Insurance Participation
The extent of farmer's (old and new participants) awareness of NAIC insurance requirements is presented in Table 4. Data on farmer's awareness was captured with a 5 point Likert scale, a mean score of 3.0 was set as the decision or benchmark. Those variables with a mean score of 3.0 and above suggest that farmers are aware, while those below 3.0 signal that farmers are not aware of the NAIC requirement. Eleven (11) items of requirements were captured for the study, the old participants are aware of seven requirements

while the new participants are aware of only two requirements. The cluster mean score of 3.10 for old participant's signals that most farmers are aware of NAIC requirements, while the cluster mean score of 2.24 for new participants is an indication that most farmers are not aware of the NAIC requirements.

Therefore, the old participants are aware of the following requirements which include; access to farmland (3.03), keeping a good operation record (3.68), use of the business plan for the farm operation (3.69), fire tracing of farm to reduce risk (3.67), comply to the instruction of NAIC staff (3.18), paying 4% insurance fee (premium) (3.27), and observe good agronomic practice (3.73). Furthermore, the NAIC requirements that new participants are aware of include; access to farmland (3.04), and report incidence immediately they occur (3.54). These findings have proven beyond doubt that rural intervention programs are key to making the farmers aware of most farm risk management strategies as this is the only way out to get the interest of women and youth in the agricultural sector.

Table 4: Extent of farmer's awareness of NAIC requirement

S. n.	NAIC requirement	New participants						Old participants					
		SNA	NA	SWA	A	SA	Mean	SNA	NA	SWA	A	SA	Mean
1	Access to farm land	1	2	3	4	5	3.04*	11	50	90	21	28	3.03*
2	Good and safe site selection	0	52	10	20	18	2.32	27	104	44	9	16	2.42
3	Involving NAIC staff at different stages of operation	18	50	14	18	0	1.70	26	49	2	9	0	2.34
4	keeping good operation record	39	54	6	0	1	2.04	64	51	57	14	14	3.68*
5	Use a business plan for farm operation	34	43	8	15	0	2.79	38	16	14	35	97	3.69*
6	Fire tracing to reduce risk	9	36	22	33	0	1.78	30	18	40	16	96	3.67*
7	Complying with the instruction of NAIC staff	40	48	7	4	1	1.87	14	26	94	45	21	3.18*
8	Report incidence immediately is occur	22	69	9	0	0	3.54*	43	102	21	12	22	2.36
9	Pay 4% insurance fee (premium)	3	29	3	41	24	2.61	32	14	60	67	27	3.27*
10	Observe good agronomic practice	9	46	22	21	2	1.47	25	39	7	28	101	3.73*
11	On the occurrence of the risk, produce pictorial evidence	57	40	2	1	0	1.45	48	48	56	21	25	2.67
	Cluster mean						2.24						3.10*

Source: Field Survey Data, 2019. Key: (*) implies aware, SNA (strongly not aware), NA (not aware), SWA (somewhat aware), A (aware) SA (strongly aware)

The Benefit of Agricultural Insurance to Food Production Security and Risk Management

The benefit of agricultural insurance as perceived by the farmers (participants and non-participants) is presented in Table 5. A mean score of 3.0 was set as a benchmark for the five-point Likert scale used for data capturing. Variables with a mean score of 3.0 and above signal that the farmers agree with the insurance benefits, while those with a mean score less than 3.0 are not in agreement with the insurance benefits. From the thirteen items of benefits listed, the old participants agree with nine benefits while new participants agree with only 1 benefit. The cluster mean of 3.03 for old participants means that most of the farmers are in agreement with the benefits of agricultural insurance, while the cluster mean of 2.78 for new participants shows that most of the farmers are not in agreement with the benefit of agricultural

insurance listed.

Therefore, the old participants agree that the benefit of agricultural insurance includes; it helps farmers to bounce back (3.49), reduces loan default (3.35), encourages agricultural investors (3.01), reduces production risk (3.04), act as a risk transfer measure (3.33), prevents the liquidation of farm asset (3.18), prevents migration of loan defaulters (3.24), avoids child's withdrawal from school (3.53), and prevent over-exploitation of the environment (3.33). The new participants agree with only reduction of production risk (3.06) as the benefit of agricultural insurance in the study area. These findings were all in agreement with the study of Maccini and Yong (2009) [10]; Janzen and Carter (2019) [9]; Madajewicz et al. (2013) [11]; Aggarwal et al. (2016) [1] who allude that the benefit of agricultural insurance is immeasurable.

Table 5: Benefit of agricultural insurance to food production security and risk management

S.n.	Economic benefit	New participants						Old participants					
		SDA	DA	SWA	A	SA	Mean	SDA	DA	SWA	A	SA	Mean
1	It help farmers to bounce back	12	27	28	22	11	2.93	3	46	53	46	52	3.49*
2	Reduce loan default	3	34	30	33	0	2.93	5	41	58	72	24	3.35*
3	Encourage agricultural investors	3	56	23	18	0	2.56	1	83	45	54	17	3.01*
4	Increase farmer's resilience	9	44	23	21	3	2.65	31	85	35	39	10	2.56
5	Reduction in production risk	11	21	44	22	2	2.83	12	59	58	51	20	3.04*
6	Prevent depression among farmers	4	44	29	23	0	2.71	15	90	60	35	0	2.58
7	Risk transfer	7	31	27	26	9	2.99	12	46	42	64	36	3.33*
8	Prevent liquidation of farm asset	5	29	40	25	1	2.88	10	51	60	50	29	3.18*
9	Prevent migration of loan defaulters	7	22	46	25	0	2.89	5	44	70	61	20	3.24*
10	To avoid child's withdrawal from school	5	31	20	41	3	3.06*	5	37	66	71	21	3.53*
11	Prevent over exploitation of the environment	13	23	40	24	0	2.75	3	104	54	34	5	3.33*
12	Increases savings	3	66	20	11	0	2.39	3	104	54	34	5	2.67
13	Increase purchase of farm input	6	50	29	12	3	2.56	17	73	47	48	15	2.85
	Cluster mean						2.78						3.03*

Source: Field Survey Data, 2019. Key: (*) implies agree, SDA (strongly disagree), DA disagree), SWA (somewhat agree), A (agree), SA (strongly agree)

The Challenges of Agricultural Insurance in the Study Area

The challenges of agricultural insurance in Anambra State is presented in Table 6. The staff of NAIC were interviewed to ascertain the issues that affect the implementation of NAIC packages which was analyzed with the principal factor analysis (PFA) tool. The challenges were rotated into three matrices and named as management factor, institutional factor, and economic factor. The diagnostic analysis of the variables adapted the values reported in Obianefo, Osuafor, Ezeano, and Anumudu (2020) [16] who suggested that the benchmark reliability is 0.700. Based on the rule of thumb, they allude that the total variance explained by the factors should not be lower than 53% as well as that any variable with commonalities below 0.3 correlation value should be removed or reported as not peculiar to the study area. Thus, the KMO and Reliability value was 0.532 and 0.787 respectively showing that the respondent's data was consistent.

The management factor (factor 1) explained 37.02% variance of factors challenging the implementation of NAIC packages, the variables that make up this factor with their effect size include lack of or poor farmer's awareness on NAIC modality (0.978), bureaucracy (0.948), poor record-keeping by farmers (0.770), late reporting of damage slows the system (0.644), and poor documentation of events 0.632).

The institutional factor (factor 1) explained 24.09% variance of factors challenging the implementation of NAIC packages, the variables that make up this factor with their effect size include inadequate regulating environment (0.916), lack of insurance culture (0.799), poor sensitization of farmers (0.762), and crowding out by post-disaster relief (0.658).

The economic factor (factor 1) explained 16.31% variance of factors challenging the implementation of NAIC packages, the variables that make up this factor with their effect size include farmers inability to pay 4% premium (0.919), and non-compliance to the requirements (0.919). Cumulatively, the three factors explained 77.43% of the total variance of factors challenging the implementation of NAIC packages. Thus, the challenges are all peculiar to those by Aggarwal *et al.* (2016) [1].

Table 6: Challenges of agricultural insurance in the study area

S. n.	Constraints implementation	Component factors		
		Management	Institutional	Economic
i	Lack of/poor farmers awareness on NAIC modality	0.978		
ii	Bureaucracy	0.948		
iii	Poor record-keeping by farmers	0.77		
iv	Late reporting of damage slows the system	0.644		
v	Poor documentation of events	0.632		
vi	Inadequate regulating environment		0.916	
vii	Lack of insurance culture		0.799	
viii	Poor sensitization of farmers		0.762	
ix	Crowding out by post-disaster relief		0.658	
x	Farmers inability to pay 4% premium			0.919
xi	Non-compliance to the requirements			0.919
Adequacy analysis				
	Cronbach's Alpha (reliability)	0.787		
	Kaiser-Meyer-Olkin (KMO)	0.532	Significant @ 0.05	
	% variance of factor 1	37.02		
	% variance of factor 2	24.09		
	% variance of factor 3	16.31		
	Total % variance of the factor	77.43		

Source: Field Survey Data, 2019

The Socioeconomic Characteristics Determinants of Farmer's Awareness of NAIC Requirements

The Logit model (LM) used to investigate the socioeconomic characteristics determinants of farmer's awareness of NAIC requirements is presented in Table 7. The choice of LM was to take care of the heteroscedasticity of the samples. The analysis produced log-likelihood for old participants (-125.047) and new participants (-33.485), the more negative the log-likelihood value, the better the LM to explain the socioeconomic relationship for the two groups. A significant Likelihood ratio for new participants (27.31) *** and old participants (17.40) *** at a 1% level of probability implied that the overall model was a good fit.

The years of formal learning (education), farming experience, household size and annual income from all sources are not the determinants of NAIC awareness for new participants, while years of formal learning, farming experience, farm size and annual income from all sources are not the determinants for the old participants. Thus, null hypothesis one was accepted based on the aforementioned variables.

The findings for new participants revealed that the marginal effect size (β = 0.016) for age was positive and significant at a 1% level of probability, this implies that a unit increase in the farmer's age will increase their extent of awareness of NAIC requirement by 1.6%. This result suggests that older farmers are more risk aversive in the study area. Again, the marginal effect size (β = 0.028) for farm size was positive and significant at a 5% level of probability, the implication is that a unit increase in farmer's cultivable land will proportionately increase the extent of farmer's awareness of NAIC requirement by 2.8%. One of the criteria to participate in the NAIC insurance scheme is to have a minimum of 1 ha farmland, thus, increasing farmer's

landholding allows them to participate. This finding is therefore in line with the *a priori* expectations of the study as well as agrees with Mahul and Stutley (2010) [12] who pointed farm size as one important requirement to participate in NAIC insurance scheme.

On the other hand, the results of old participants show that the marginal effect size (β = 0.164) for age was negative and significant at a 5% level of probability, this implies that an increase in the age of old participants will reduce the farmer's extent of awareness of NAIC requirements by 16.4%. This explains while the project targets more youth than older farmers as seen in Table 2. Many rural farmers especially the older ones may have had one ugly experience with the implementation of intervention programs which

may reduce their confidence in some synergic programs like NAIC and value chain development partnership.

The marginal effect size (β = 0.042) for household size was positive and significant at a 5% level of probability, this implies that an increase in a household size by one person, will increase the farmer's extent of awareness of NAIC requirements by 4.2%. Apart from that large household size reduces the cost of farm labour as opined by Uchemba *et al*. (2021) [19], there is a tendency that information about NAIC modalities could be heard by any member of the family. The researcher(s), therefore, rejected the null hypothesis one based on the variables that were significant (age and farm size for new participants, and age and household size for old participants) in the study area.

Table 7: Socioeconomic characteristics determinants of farmer's awareness of NAIC requirements

Variable	New participants			Old participants		
	Coefficient	Marginal effect	Z-ratio	Coefficient	Marginal effect	Z-ratio
Constant	-12.982		-4.37	0.401		0.64
Age	0.153	0.016	3.54***	-0.075	-0.164	-2.64**
Years of formal learning	0.268	0.028	1.58	0.034	0.007	0.9
Farming experience	0.092	0.009	1.02	0.038	0.008	1.07
Household size	0.179	0.019	0.73	0.191	0.042	2.17**
Farm size	0.266	0.028	2.69**	0.010	0.002	0.63
Annual income	-0.000	-0.000	-1.3	0.000	0.000	1.51
Diagnostic tool						
Log likelihood	-33.485			-125.047		
Likelihood ratio	27.31***			17.40***		
Prob.	0.000			0.008		
Obs.	100			200		

Source: Field Survey Data, 2019. (*) Significant @ 10%, (**) Significant @ 5%, (***) Significant @ 1%.

The Awareness among old and new participants is significantly not different.

The null hypothesis two that assumes no difference in awareness among old and new participants was presented in Table 8. The result revealed the mean score of awareness for old participants (3.10) and new participants (2.24) respectively. The Z-calculated value of 5.56 *** was significant at a 1% level of probability. The researcher(s), therefore, rejected the null hypothesis two and accepted the

alternate that assumes a significant difference in the farmer's extent of awareness of NAIC requirements. The percentage difference in the extent of awareness was 38.39% which clearly shows that old participants are knowledgeable about NAIC requirements than new participants. This is an indication that the programme has done well to sensitize its beneficiaries on different agricultural risk management strategies through NAIC partnership.

Table 8: Significant difference between the extent of awareness on NAIC requirements for participants and non-participants

Variable	Observation	Mean	Std. Err.	Std. Dev.
Participants awareness	200	3.10	0.1039447	1.47
Non-participants awareness	100	2.24	0.111	1.11
Difference		0.86	0.1520707	
Z-calculated		5.6553***		
% difference in mean score	38.39%			

Source: Field Survey Data, 2019. Z = 1.96 @ alpha level of 0.05

Conclusion and recommendations

This study on the effect of Anambra State Value Chain Development Programme partnership with Nigerian Agricultural Insurance Corporation (NAIC) on farmer's production security and risk management at this present time agricultural sector has witnessed a different type of loss such as persistent flooding, the herders-farmers clash among others, it, therefore, becomes necessary to insure farmers to enable them to reduce the shock of losing their investment at any stage of production. Poor implementation of agricultural insurance policy has also contributed to the low

influx of investors in the sector. Above all, financial institutions have found it very difficult to grant credit to farmers especially among rural farmers which constitute over 60% of the farming population (Obianefo *et al*., 2019) [15], this could be attributed to high loan default and high administrative costs to manage the transaction of small scale farmers (World Bank, 2015) [21].

It is therefore preponderant for the government to intervene in this sectorial investment especially now that the need to diversify Nigeria's oil-based economy cannot be overemphasized. At this point, it becomes necessary to

make the modality of NAIC very open to the farmers in rural areas. Sadly; most of these farmers find it difficult to meet up the scheme's requirements due to their subsistence operation. Further, it is necessary to encourage the farmers to organize themselves into a formidable group (farmer's cooperative) that will help improve their access to land. This study have equally established that old programme participant seems more aware of NAIC implementation, the study, therefore, recommends that;

1. Other agricultural programmes in the rural area should adopt this partnership method of value chain development programme to encourage the farmers into insuring their farm against production loss.
2. Farmers should be sensitized to improve their insurance culture and equally increase the insurance market among rural farmers.
3. Too much bureaucracy should be relaxed a bit especially when the farmers need to claim their indemnity.
4. More training should be organized for farmers to help them improve their documentation senses, as this will help to facilitate their claim.

References

1. Aggarwal PK, Chand R, Bhutani A, Rao KN *et al.* Report of the Task Force on Enhancing Technology Use in Agriculture Insurance. NITI (National Institute for Transforming India) Aayog, Government of India 2016, 11.
2. Dercon S, Christaiesen L. Consumption risk, technology adoption and poverty trap. Evidence from Ethiopia. Journal of Development Economics 2011;96:159-173.
3. Ehiogu CP, Chidiebere-Mark NM. Challenges and prospects of agricultural insurance market development in achieving sustainable development goal (SDG) 8 in Nigeria. African Journal of Applied Research 2019;5(2):131-149.
4. Elabed G, Carter MR. Ex-ante impacts of agricultural insurance: Evidence from a field experiment in Mali. University of California at Davis 2014. https://arefiles.ucdavis.edu/uploads/filer_public/2014/0 4/25/elabed-impact_evaluation_0422_vdraft2_1.pdf
5. Epetimehin F. Agricultural insurance in Nigeria and its economic impact: A review. International Journal of Current Research 2010;3:233-238.
6. Gary R. Introduction to Agricultural Insurance and Risk Management. International Management Institute. International Finance Corporation 2014. All rights reserved. 2121 Pennsylvania Avenue, N.W. Washington, D.C 20433, 2015, 12.
7. Hansen JW, Debisi A, Hellin J, Goslinga R. A roadmap for evidence-based insurance development for Nigeria's farmers. Working paper No. 218. CGIAR research program on climate change agriculture and food security 2016.
8. Hess U, Hazell PBR. Innovations in insuring the poor: Sustainability and scalability of index-based insurance for agriculture and rural livelihoods 2016.
9. Janzen SA, Carter MR. After the Drought: The Impact of micro-insurance on consumption smoothing and asset protection. American Journal of Agricultural Economics 2019;101(3):651-671.
10. Maccini S, Dean Y. Under the Weather: Health, Schooling, and Economic Consequences of Early-Life Rainfall. American Economic Review 2009, 99(3). Doi: 10.1257/aer.99.3.1006.
11. Madajewicz M, Tsegay AH, Norton M. Managing Risks to Agricultural Livelihoods: Impact Evaluation of the Harita Program in Tigray, Ethiopia 2013. http://www.oxfamamerica.org/static/media/files/Oxfam _America_Impact_Evaluation_of_HARITA_2009-2012_English.pdf
12. Mahul O, Stutley CJ. Government Support to Agricultural Insurance: Challenges and Options for Developing Countries. World Bank 2010. https://openknowledge.worldbank.org/handle/10986/24 32
13. Mitu NE. Market niche in agricultural insurances. University of Craiova, Faculty of Economy and Business Administration, A. I. Cuza Street 2008;13:358-362.
14. Nigerian Population Commission (NPC). List of Nigerian population by States 2006. https://en.wikipedia.org/wiki/List_of_Nigerian_states_b y_population.
15. Obianefo CA, Okafor IP, Bola-Audu I, Umebali EE. Assessment of the education background on the perception of a single digit interest rate among members of farmers' cooperative in Anambra State. International Journal of Trend in Scientific Research and Development 2019;3(5):113-117.
16. Obianefo CA, Osuafor OO, Ezeano CI, Anumudu OO. Mediation effect of adopting good agronomic practices on rice productivity in Anambra State. International Journal of Agricultural and Rural Development 2020;23(1):4913-4926.
17. Otabor JO, Obahiagbon K. Statistical approach to the link between internal service quality and employee job satisfaction: A Case Study. American Journal of Applied Mathematics and Statistics 2016;4(6):178-184.
18. Oxfam America. Impact evaluation of the HARITA project in Ethiopia (2009 – 2012) 2014. http://www.wfp.org/content/harita-r4-impact-evaluation
19. Uchemba VU, Nenna GM, Obianefo CA. Adoption of Improved Cassava Production Technologies among small-scale Farmers in Anambra State, Nigeria. Journal of Plant Sciences 2021;9(4):119-127.
20. World Bank. Weather index insurance for agriculture: guidance for development practitioners. Agriculture and Rural Development Discussion Paper No. 50. Washington, DC: World Bank 2011. http://documents.worldbank.org/curated/en/2011/11/15 643352/weather-index-insurance-agriculutre-guidance-development-practitioners
21. World Bank. The role of the public sector in agriculture insurance PPs 2015. http://blog.worldbanks.org/psd/files/agricultural-insurance-public-sector-policy-note_15sept2015.pdf