ENVIRONMENTAL FACTORS AFFECTING FARMERS' INDIGENOUS KNOWLEDGE CREATION IN SOUTH-SOUTH NIGERIA

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ABSTRACT

*This study assessed environmental factors affecting farmers' indigenous knowledge creation in South-South Nigeria. In conducting the study, multi-stage sampling technique was used to select 360 farmers. Data collection were through structured questionnaire and analysed using both descriptive and inferential statistics such as mean ( ) and multiple regression. Findings showed that farmers had a mean age of 41.2 years old, 55.8% of the farmers were females while 44.2% were males, 46.7% were married. The farmers mean farm size was 1.3 hectares and had averagely 6 persons per household. The farmers were literate, experienced in farming with mean monthly estimated income of N18, 875. Moderate proportion (59.4%) of farmers engaged in part-time farming. The study showed that wind (= 2.0), flooding (= 2.0), rain pattern (= 2.0), and changing vegetation (=2.0) were the major environmental factors affecting knowledge creation. The multiple regression analysis revealed that educational (6.590***), access to credit (3.011***) and climate change (3.753***) were factors that affect farmer's indigenous knowledge creation in the study area at 1% significance respectively. From the findings, it could be concluded that weeds, parasites, diseases, predators, climate change, pest, wind, flooding, rain pattern, soil facility, soil erosion, change in vegetation and crop morphology were the major environmental factors that affects knowledge creation. The study recommended that both Government and Non-Governmental Organizations (NGOs) including individuals that are either opportune nor have experience should assist indigenous farmers on measures to control such factors by providing necessary information and material incentives that will enable such factors not to further be a challenge to farmers to ensure food security in South-South Nigeria.*

Keywords: Creation, Environmental, Factors, Farmers, Indigenous, Knowledge

INTRODUCTION

Traditionally, indigenous farmers in their localities began at the time when man planted his first seed and trained his first animal. This tie between man and the soil has increased and continued steadily till present day (Udoh, 2001).

It is obvious that over 60-70% of our population at present day relies on farming for living (Udoh, 2001; Akpabio, 2005). Livelihood activities in the rural areas combine production systems based on the nature, extent and quality of means of production available. In a general term, almost all rural means of livelihood are practiced with the aid of traditional agricultural knowledge (Ekong, 2010).

Indigenous Knowledge (IK) is the home knowledge; knowledge that is distinctive to a given culture or society, indigenous knowledge also known as earthnoscience contrast with the international knowledge system generated by universities, research institutions and private firms is the bases of local level decision making in agriculture, food preparation, education, health care, natural resources management and a host of other activities in rural communities.

According to Nwosu (2010), promotion of indigenous agricultural activities will lead to improved agricultural productivity, higher income earnings and improved standard of living. Problems of agricultural development in Nigeria as in most of the developing countries are generation and transfer of suitable agricultural technologies to farmers for adoption (Agbarevo, 2014). Technologies that have been developed by researchers and considered suitable have in many cases been unused by farmers because such technologies were adjudged by farmers to be inappropriate in solving their problems within their environment, which affects indigenous knowledge creation, thus having negative influence on rural farmers. In this regard, it is pertinent in assessing environmental factors affecting farmers' indigenous knowledge creation in south-south Nigeria in other to come up with recommendations in other to promote indigenous knowledge creation in ensuring food sustainability in the area of study. It is on these bases that the study was conceptualized. This paper hypothesized that farmers' indigenous knowledge creation is not influenced by the selected socio-economic and environmental factors in the study.

METHODOLOGY

The South-South region is made up of six out of 36 States of the Federal Republic of Nigeria. The six States are Akwa Ibom, Bayelsa, Cross River, Delta, Edo, and Rivers States. The area has a total population of 21,034,081 people (NBS, 2007). The South-South which is the core oil producing area provides the economic mainstay of the country's oil and gas. In addition to the oil and gas, the region also produces other key resources with potential huge opportunities in tourism and agriculture as well as urban commerce and transport business.

The region is bordered to the south by the Atlantic Ocean, and to the East by Cameroon, occupies a surface area of about 112,110 square kilometres. This represents about 12% of Nigeria's total surface area. The very rich cultural heritage of the region is based on the presence of about 40 different ethnic groups speaking different languages and dialects. Some of the ethnic groups include the Izon people comprising the Ijaws' Okrikans, Kalabaris, Nembe. The heritage of the people is reflected in their modes of dressing, marriages, traditions and festivals.

In drawing the sample, multistage sampling technique was used to select a sample size of three-hundred and sixty (360) farmers for the study. In stage one, three states were purposively selected out of the six States that make-up South-South Nigeria; the States were Akwa Ibom, Bayelsa and Delta States respectively.

In the second stage, one agricultural zone was selected to represent each of the sampled three states; the agricultural zones were Ikot Ekpene Agricultural Zone that represents Akwa Ibom State, Bayelsa Central Agricultural Zone was used to represent Bayelsa State, while Delta South Agricultural Zone was used to represent Delta State. In stage three, two Local Government Areas were selected to represent each of the sampled Agricultural Zones from the three States. In the fourth stage, six (6) communities were used to represent each of the sampled Local Government Areas from the various Agricultural Zones selected for the study.

In the fifth stage, ten (10) farmers were selected from each of the sampled communities which give the study three-hundred and sixty (360) farmers as sample size. Data were collected using questionnaire. A 5-point rating scale over an array of questions was adopted. Data collected for the study were analysed using mean (a mean of 3.0) and above was regarded environmental factor affecting knowledge creation, while a mean less than 3.0 was regarded as otherwise. Factors that influence knowledge creation by farmers in the area of study area was determined using Ordinary Least Square (OLS) regression analysis.

The model is implicitly stated as;

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, \ldots\ldots\ldots\ldots X_{18}, e_i) \quad \textbf{(1.0)}$$

Where;

Y = Knowledge creation (mean response of the respondent on a 5-point scale rating);
X_n = socioeconomic and environmental related factors

X_1 = age (Years); X_2 = Gender (male = 1; female = 0); X_3 = marital status (Married =1; Unmarried = 0); X_4 = Educational level (number of years spent in school); X_5 = household size (number of people living/feeding from the same pot); X_6 = farm size (hectares); X_7 = farm income (naira); X_8 = non-farm income (naira); X_9 = access to credit (always = 4, often = 3, seldom = 2 and never = 1); X_{10} = farmers' farming experience (years); X_{11} = access to information (always = 4, often = 3, seldom = 2 and never = 1); X_{12} = distance to farmland (kilometres); X_{13} = land tenure system (always = 4, often = 3, seldom = 2 and never = 1); X_{14} = soil fertility (high = 2, and low = 1); X_{15} = climate change such as drought, monsoons, flooding, rain fall, sun shine, humidity, etc. (favourable = 1, unfavourable = 0); X_{16} = topography (undulating = 1, flat = 0); X_{17} = rainfall pattern (strongly agree = 4, agree =3, disagree = 2 and strongly disagree = 1); X_{18} = humidity (exceptionally favorable = 4, favourable = 3, somewhat favorable = 2 and unfavourable = 1); and e_i = error term.

RESULTS AND DISCUSSION

Socioeconomic Characteristics of the Respondents

Result presented in table 1 shows that 36.7% of the farmers were within the age bracket of 41-50 years old in South-South Nigeria. The mean age of the farmers was 41.2 years old. This implies that most of the farmers in the study area were still in their active stage in life and would be predisposed to knowledge creation. This finding is also in tandem with those of Nze and Azubuike (2016) who reported that most farmers in Abia State were in their productive stage and were thus able to cope with the rigours of agriculture. The result showed that 55.8% of farmers in South-South Nigeria were females while 44.2% were males. This implies that females dominated farming activities in South-South Nigeria. This finding is similar to those of Mohammed and Abdulquadri (2012) who reported a higher involvement of women than men in agricultural production in some parts of Nigeria.

The result further showed 46.7% of the farmers were married while 23.3% were widowers. This implies that married individuals dominated among the sampled farmers in South-South Nigeria. This finding is in conformity with those of Mafimisebi, Famoofo and Mafimisebi (2016) who reported that the majority (76.0%) of sampled fish farmers in Southwest Nigeria were married. This finding is also in agreement with that of Adegboye (2016) who reported that 90.0% of the sampled respondents in Northern Nigeria were married. Still**,** 42.5% of the farmers had farm sizes of at most one (1) hectare. The mean farm size of the farmers in the study area was 1.3 hectares. This implies that most of the farmers in South-South Nigeria operated on a subsistent basis. This finding is similar to those of Ajani and Igbokwe (2012) who reported that majority of farmers in Nigeria are small scale farmers that cultivate between 0.8 and 1.3 hectares of land.

Table 1: Distribution of socio-economic characteristics of the respondents

Variables	Akwa Ibom (n=120)		Bayelsa (n=120)		Delta (n=120)		South-South (n=360)	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Age (years)								
≤ 30	18	15.0	24	20.0	14	11.7	56	15.6
31-40	35	29.2	38	31.7	33	27.5	106	29.5
41-50	38	31.7	35	29.2	44	36.7	117	32.5
51 and above	29	24.2	23	19.2	29	24.2	81	22.
Mean	41.5 years		39.8 years		42.3 years		41.2 years	
Gender								
Male	58	48.3	51	42.5	50	41.7	159	44.2
Female	62	51.7	69	57.5	70	58.3	201	55.8
Marital status								
Single	31	25.8	42	35.0	18	15.0	91	25.2
Married	64	53.3	61	50.8	56	46.7	181	50.2
Divorced	6	5.0	4	3.3	18	15.0	28	7.7
Widow	14	11.7	6	5.0	22	18.3	42	11.6
Widower	5	4.2	7	5.8	28	23.3	40	11.1
Farm size								
≤ 1ha	56	46.7	57	47.5	40	33.3	153	42.5
1 ha	29	24.2	33	27.5	27	22.5	89	24.7
2-2 ha	21	17.5	14	11.7	29	24.2	64	17.8
2-5 ha	9	7.5	8	6.7	16	13.3	33	9.2
Above 5 ha	5	4.1	8	6.7	8	6.6	21	5.8
Mean	1.2 ha.		1.3 ha.		1.5 ha.		1.3 ha.	
Household size								
1-5	66	55.1	55	45.8	71	59.2	192	53.3
6-10	43	35.9	56	42.6	47	39.1	146	40.5
11-15	11	9.2	14	11.6	2	1.6	27	7.5
Mean	6 persons		6 persons		5 persons		6 persons	
Farm involvement								
Part time	72	60.0	78	65.0	64	53.3	214	59.4
Full time	48	40.0	42	35.0	56	46.7	146	40.6
Estimated income								
Below 10,000	39	32.5	36	30.0	30	25	105	29.1
10,000	16	13.3	15	12.5	10	8.3	41	11.4
11,000-20,000	24	20.0	32	26.7	25	20.8	81	22.5
21,000-30,000	12	10.0	8	6.7	18	15.0	38	10.6
31,000-40,000	17	14.2	21	17.5	20	16.7	58	16.1
Above 40,000	12	10.0	8	6.7	17	14.2	37	10..3
Mean	N17, 916.67		N17, 541.67		N21, 166.67		N18, 875	
Education								
Non formal education	11	9.2	10	8.3	16	13.3	37	10.4
Primary education	16	13.3	13	10.8	16	13.3	45	12.5
Secondary education	33	27.5	31	25.8	34	28.3	98	27.2
Tertiary education	60	49.9	61	55.0	54	45.0	175	48.6
Farming experience								
1-10	46	38.3	61	50.7	43	35.8	150	41.6
10-20	46	37.5	46	39.0	42	35.1	134	37.2
20-30	18	15.0	12	9.9	22	15.8	52	14.4
Above 30	11	9.1			13	10.8	24	6.7
Mean	14.1 years		10.9 years		15.4 years		13.6 years	

The mean household size of the farmers was 6 persons per household. This implies that the farmers in the study area had relatively large household size. Ekwe and Ukanwolu (2016) opined that large household sizes were accompanied with greater family responsibilities, as such rural farm households are expected to create and utilize knowledge that would improve their productivity in order to improve their standard of living. This finding is in consonance with that of Inyang (2019) who reported a mean household size of 6 persons among rural farm households in South-South Nigeria. The study still revealed that 48.6% of the sampled farmers in South-South Nigeria had tertiary education. This implies that most of the farmers in the study area were literate which should positively influence their knowledge creation. The result is similar to those of Eze and Osahon (2016) who reported that the majority (91.7%) of sampled farmers in Southeast Nigeria had one form of formal education or the other.

Table 2: Mean score responses on the environmental factors faced by farmers in creating knowledge

Variable	Akwa-Ibom (n=120) $\bar{x}$	Bayelsa (n=120) $\bar{x}$	Delta (n=120) $\bar{x}$	Pooled (n=360) $\bar{x}$	Remark
Drought	1.5	1.4	1.5	1.5	Non factor
Monsoons	1.6	1.6	1.6	1.6	Non factor
Wind	2.0	2.0	2.0	2.0	Factor
Flooding	2.0	2.0	2.0	2.0	Factor
Temperature	1.8	1.8	1.8	1.8	Non factor
Sunshine	1.8	2.0	1.9	1.9	Non factor
Rain pattern	2.0	2.2	1.9	2.0	Factor
Climate change	2.0	2.2	2.0	2.1	Factor
Humidity	1.7	1.9	1.9	1.8	Non factor
Pest	2.0	2.2	2.0	2.1	Factor
Topography/gradient	1.8	2.0	2.0	1.9	Non factor
Soil facility	2.0	2.0	2.0	2.0	Factor
Soil erosion	2.0	1.9	2.0	2.0	Factor
Soil type (characteristics)	1.8	1.8	1.9	1.8	Non factor
Change in vegetation	2.0	2.0	1.9	2.0	Factor
Diseases	2.0	2.2	2.1	2.1	Factor
Predators	2.0	2.2	2.1	2.1	Factor
Weeds	2.3	2.4	2.2	2.3	Factor
Parasites	2.1	2.2	2.1	2.1	Factor
Crop morphology	2.0	2.0	1.9	2.0	Factor
Grand mean	**1.9**	**2.0**	**1.9**	**2.0**	**Factor**

Source: Field survey data, 2019

Table 2 revealed that weeds ($\bar{x}$ = 2.3), parasites ($\bar{x}$ = 2.1), diseases ($\bar{x}$ = 2.1), predators ($\bar{x}$ = 2.1), climate change ($\bar{x}$ = 2.1), pest ($\bar{x}$ = 2.1), wind ($\bar{x}$ = 2.0), flooding ($\bar{x}$ = 2.0), rain pattern ($\bar{x}$ = 2.0), soil facility ($\bar{x}$ = 2.0), soil erosion ($\bar{x}$ = 2.0), change in vegetation ($\bar{x}$ = 2.0) and crop morphology ($\bar{x}$ = 2.0) were the major environmental factors affecting knowledge creation in South-South Nigeria. This finding is not in consonance with the views of Chinaka *et al.* (2012) who noted that pests and diseases were not major environmental factors affecting indigenous knowledge systems in cocoyam production in Imo State. The result further reveals that topography ($\bar{x}$ = 1.9), sunshine ($\bar{x}$ = 1.9), temperature ($\bar{x}$ = 1.8), soil type ($\bar{x}$ = 1.8), humidity ($\bar{x}$ = 1.8) and drought ($\bar{x}$ = 1.5) were not major environmental factors affecting knowledge creation in South-South Nigeria.

The result of the Ordinary Least Square (OLS) regression model used to test the hypothesis that farmer's indigenous knowledge creation is not influenced by the selected Socio-economic and Environmental factors in South-South Nigeria is presented in Table 3**.** Four functional forms – linear, exponential, semi-log and double-log were tried for choice of a lead equation. Based on the magnitude of the coefficient of multiple determinations (R^2), the significance of the regression coefficients, the number of significant variables and the signs of the significant variables as they conform to *a priori* theoretical expectations as well as the significant of the entire model as shown by the F- statistic, the double-log model was chosen as the lead equation. The value of the coefficient of multiple determinations (R^2) was 0.903, implying that about 90.3% of the variations in the farmer's indigenous knowledge creation in South-South Nigeria was explained by the regressors (selected socio-economic and environmental factors) included in the model.

The regression coefficient of educational level of the farmers was positive and significant at 1%, implying that a direct relationship exists between educational level and indigenous knowledge creation by farmers in South-South Nigeria. Therefore, increase in educational level of farmers in South-South Nigeria leads to increase in their indigenous knowledge creation. This finding supports the work of Kiplang'at and Rotich (2008) and Lwoga, Ngulube and Stilwell (2010) who established that farmers learnt about Agricultural Indigenous Knowledge (AIK) not only through parents and grandparents, neighbours and friends, and through personal experience, but also through secondary and college education. The finding of the study however contradicts that of Akullo *et al*. (2007) who established that there is no significant effect of education on the knowledge elicited since farmers provide a platform for the easy transfer of knowledge from the old to young people.

Table 3: Ordinary Least Square (OLS) multiple regression result of the factors influencing indigenous knowledge creation by farmers in South-South Nigeria

Variable	Linear	Exponential	Double-log+	Semi-log
Constant	-14606.4	5.123	10.411	1215388.45
	(-9.059)***	(8.480)***	(6.631)***	(5.430)**
Age	-209.62	-1.773	-0.190	-24431.240
	(-3.189)***	(-3.739) ***	(-1.320)	(-1.090)
Gender	621.24	-0.429	0.117	15530.611
	(0.163)	(-1.495)	(0.914)	(1.417)
Marital status	3830.66	0.032	0.013	155683.954
	(4.492)***	(0.153)	(1.040)	(2.880)***
Education Level	4053.48	0.424	1.464	23640.551
	(8.854)***	(2.844) ***	(6.590)***	(1.430)
Household size	-1178.067	-0.115	1.183	-19560.384
	(-3.739)***	(-12.921)***	(2.629)**	(-3.683)***
Farm size	320.217	-0.001	1.451	25680.180
	(0.832)	(-2.930)***	(4.240)***	(2.416)**
Farm income	-4641.298	6.87E-07	0.793	11256.109
	(-1.076)	(0.803)	(2.361)**	(0.767)
Non-farm Income	-101.327	-0.958	-0.253	32040.013
	(1.125)	(-1.169)	(-0.780)	(2.598)**
Access to credit	242.319	0.119	1.653	11660.162
	(-0.460)	(1.620)	(3.011)***	(0.710)
Farming experience	4.36e-06	2.06e-06	0.877	10311.631
	(1.595)	(4.690)***	(3.030)***	(3.470)***
Access to information	-1778.045	6.96e -06	1.567	-18105.726
	(-3.590)***	(4.690)***	(3.470)***	(-3.652)***
Distance to farmland	111.197	-0.001	0.264	1215.859
	(0.736)	(0.304)	(1.239)	(2.598)**
Land tenure system	321.434	0.005	-0.009	1311.971
	(1.138)	(0.972)	(-0.818)	(0.821)
Soil fertility	218.287	-0.002	-0.125	-2234.530
	(-5.216)***	(3.365)***	(-3.336)***	(-0.427)
Climate change	224.497	0.024	1.013	4124.087
	(1.319)	(3.753)***	(2.491)**	(2.410)**
Topography	343.001	1.08-04	-0.025	2111.187
	(4.408)***	(0.873)	(-1.336)	(0.185)
R^2	**0.782**	**0.872**	**0.903**	**0.860**
Adj. R^2	**0.765**	**0.855**	**0.881**	**0.841**
F-statistic	**42.622*****	**50.411*****	**55.489*****	**49.586*****

Source: Field survey, 2019

Note: ***, **, and * indicates statistically significant at 1%, 5% and 10% levels of significance respectively. + = Lead equation. Figures in parenthesis are t-values

The regression coefficient of access to credit of the respondents was positive and significant at 1%, implying that a direct relationship exists between access to credit and indigenous knowledge creation by farmers in South-South Nigeria. Therefore, increase in access to credit by farmers in South-South Nigeria leads to increase in their indigenous knowledge creation. Access to credit will influence knowledge creation by serving as a motivating factor as does farm income. Farmers with increased access to credit will be empowered to generate new ideas, or best practices that will help them to increase their output and thereafter generate income that will enable them repair their loans. This finding supports Ezenwa *et al*., (2018) who noted that farmers with loans to repay are more committed to generating new ideas on farm practices that will increase their chances of having more output so as to enable them repay their loans. As a result, farmers' ability to create knowledge indigenously increases with increase in their access to credit.

The regression coefficient of climate change of the farmers was positive and significant at 5%, implying that a direct relationship exists between climate change and indigenous knowledge creation by farmers in South-South Nigeria. Therefore, increase in climate change in South-South Nigeria leads to increase in their creation of indigenous knowledge. The growing unpredictability of weather often leads to spurts of flood and drought. This will force farmers to create various strategies to cope with the adverse effects of flood, drought and other related climate change issues. As a result, farmers' ability to create knowledge indigenously increases with increase in climate change.

Although, the F-statistic value of 55.489 was significantly higher than the critical F-value of 3.04 at 1% level of significance, signifying the significance of the entire model. However, not all the selected socio-economic and environmental factors in the model did not influence farmer's indigenous knowledge creation as expected from the null hypothesis. Specifically, socio-economic and environmental factors such as educational level, household size, farm size, farm income, and access to credit, farming experience, access to information, soil fertility, and climate change influenced indigenous knowledge creation of farmers in South-South Nigeria. The result also showed that such variables as gender, marital status, non-farm income, and distance to farmland, land tenure system and topography did not influence farmer's indigenous knowledge creation.

The study therefore rejected the null hypothesis that socio-economic and environmental factors such as educational level, household size, farm size, farm income, access to credit, farming experience, access to information, soil fertility, and climate change did not influence indigenous knowledge creation by farmers in South-South Nigeria but could not reject the null hypothesis that gender, marital status, non-farm income, distance to farmland, land tenure system and topography did not influence farmer's indigenous knowledge creation

CONCLUSION

The study concluded that weeds, parasites, diseases, predators, climate change, pest, wind, flooding, rain pattern, soil facility, soil erosion, change in vegetation and crop morphology were the major environmental factors that affects knowledge creation in South-South Nigeria. The study further concluded that age, gender, marital status, farming experience, access to information, existing infrastructure, relationship with community leaders/extension agents and residency/native of a community were the socioeconomic factors that influenced knowledge creation.

RECOMMENDATIONS

i. The farmers should be encouraged to enroll in formal education in other to enable them document indigenous knowledge created and shared with other farmers.

ii. Government and Non-Governmental Organizations (NGOs) including individuals that are either opportune nor have experience should assist indigenous farmers on measures to control such factors by providing necessary information and material incentives that will enable such factors not to further be a challenge to farmers to ensure food security in South-South Nigeria.

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