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Research Article

**The Pull and Push Factors of Farm Income Diversification among Fluted Pumpkin (*Telfairia occidentalis* Hook) Farmers in Akwa Ibom State, Southern Nigeria**

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**Abstract:** The study examines the magnitude and factors influencing agricultural income diversification among small-scale fluted pumpkin (*Telfairia occidentalis*) farmers in Akwa Ibom State in the south-south region of Nigeria. The required information was collected from *Telfairia* farmers using a structured questionnaire. A regression analysis tool was used to analyse the specific objective. The finding revealed an average farm income diversification index of 2.29 suggesting that agricultural income diversification among small-scale *Telfairia* farmers is high and disturbing. The empirical results revealed that farmers' household size, hired labour, and educational qualification are the major "push factors" of agricultural income diversification. In contrast, "the pull factors" are farmers' age, extension visit, membership in a social group, land size, the quantity of fertilizer and manure, and household labour. To intensify farm income earnings among small-scale vegetable farmers, it is recommended that the government should encourage child spacing and family planning among fluted pumpkin farmers as these would reduce the household size and family burden always carried along with agricultural expenditures. Providing input subsidies to small-scale vegetable farmers is important to cushion the adverse effect of increased production costs. Agricultural extension services should be strengthened to render more effective services to vegetable farmers. The formation of social groups should be encouraged, primarily through cooperative farming. The government of Akwa Ibom State should set up tractor hiring centres in all the local government areas; these would help reduce the hard time vegetable farmers encounter hiring labour.

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**1. Introduction**

Several purposes and factors in recent times have prompted many rural farm families to diversify their livelihood or income (Sallawu et al., 2016, Aloba and Bignebat 2017; Akpan et al., 2017a; Yusuf et al., 2019). From the literature, the two significant reasons rural farm households diversified farm income can be grouped into two broad categories, namely "push" or factors that encourage farm income diversification and the "pull" or factors that discourage farm income diversification (Akpan, 2010; Nagler and Naudé, 2017; Akpan et al, 2017a). Farm income diversification provides opportunities for

alternative options to most rural farm households to avert farming risks and escape the venomous monster called poverty that is currently rampaging most of the rural communities in Sub-Saharan Africa, including Nigeria (Fan et al., 2013, Akpan et al., 2017b; Akpan et al., 2019b). The failure of governments of the region, including Nigeria, to provide sufficient economic incentives and security as well as the non-inclusion of farmers in the enunciation and implementation of agricultural policies/programs have aggravated farmers' desire to diversify their farm income sources (Ofuoku et al., 2019; Iraoya and Isinika, 2022, Ayana et al., 2022). Compared to a well-managed farm economy, farmers in Nigeria generally suffer low farm earnings, increased risk in production, poor commodity pricing system, low output and an undeveloped agro-economy (Oyewole et al., 2015; Akpan et al., 2016; Odemero and Gbigbi, 2019; Akpan et al., 2019a; Akpan and Monday, 2021). Being rational and for the need for survival, most farmers in the country have resorted to adjusting their livelihood strategies to cushion the effects of these adverse shocks, reduce poverty and increase their survival capacities (Akpan, et al., 2017b; Akpan et al., 2019b). Additionally, the issues of increasing population pressure emanating from rapid urbanization and the inability of market forces to allocate farm resources efficiently also explain the need for agricultural income diversification as the most preferred survival option among vulnerable rural farm households in the country (Hazell et al., 2007; Abdoulaye and Bekele, 2016; Akpan and Ebong, 2021).

Most recently, in Nigeria, farmers' decision to diversify income sources also stems from the mounting insecurity in the farm environment, volatile macroeconomic variables and wavering political environments as well as the climatic variability in the country (Agri et al., 2019, Fadare et al., 2019, Olagunju et al., 2020). The continuous occurrence of these factors has intensified the poverty incidence of most farm households and further deteriorates the well-being of the rural dwellers in the country. As noted by Dixon et al., (2004), creating a dynamic environment built on the framework of livelihood diversification options is one of the potent responses needed to eradicate the current suffering of the rural people in the developing World. In another submission, Regasa, (2016) noted that insufficient access to critical farm assets, cost-effective technologies, credit and lack of arable land induces rural farm families or households to engage in low-yielding/return opportunities. Hence, farm income diversification among small-scale farmers evolves to mitigate the harsh economic weather and the changing nature of our surroundings. For instance, the incessant attacks on farmers by the herdsmen and the activities of kidnapers, as well as poverty and political-driven terrorism, have further stimulated the echoes of farm income diversification among farmers in vulnerable farm communities in the country.

The continuous pervasiveness of farm income diversification among small-scale farmers is anticipated to worsen the already saturated labour market following the inability of the secular sectors to provide sufficient jobs for the unemployed. This could compound unemployment problem and further weaken the country's agro-economy. The leafy-fluted pumpkin-based farmers are critical in providing a cheap and easily accessible source of vegetables to millions of Nigerians, especially in the south-south region (Akpan et al., 2018; Akpan and Okon, 2019; Akanni-John et al., 2020, Adepoju et al., 2020; Utobo et al., 2022). This agro-enterprise is practised mainly on a small-scale basis and has constantly been affected by the economic environment, and pressure from alternative land uses (Ada, 2017, Akpan and Ebong, 2021, Nkanta et al., 2022a). Farm income diversification among *Telfairia* farmers is magnified because farm resources are rarely allocated efficiently in small-scale farming. This is because the production system is undeveloped and is characterized by using less efficient techniques than modern and improved methods. Anchored on these facts, many authors have attributed the resilience of *Telfairia* and other crop farmers' to multifaceted factors related to their socio-economic status and farm-specific characteristics, among others (Ada, 2017; Adeyonu et al., 2019; Ofuoku and Ekorhi-Robinson, 2020; Oyibo, 2020; Nkanta et al., 2022b). Hence, identifying these factors are vital to achieving a sustainable policy framework for production now and in the future for *Telfairia* and other vegetable farmers in the region and Nigeria.

Many researchers in developing countries have delved into this critical issue of farm income diversification to generate appropriate policy variables to boost agricultural production/intensification. Among them, Ahmed (2012) in Borno State, Nigeria reported that rural farmers' educational attainment and ownership of assets significantly impact farmers' income diversification drive. Later, Agyeman et al., (2014) in Ghana identified farmers' age, years of formal education, per capita household income, female-headed households, agricultural extension agent contact, assets owned, and access road as significant factors that influenced income diversification of farm households. Furthermore, Ogbanje et

al., (2014) and Oyewole et al., (2015) stated that farm size, farmers' age, educational qualification, non-farm income, credit utilized, number of livestock owned and household size are positive determinants of agricultural income diversification; while membership in a social organization, number of agricultural extension agent visits, farm size, farm income, leisure hours and farm asset owned were identified as negative determinants. Also, Ababbo (2015), in Leemo district, Hadiya zone, Ethiopia, found the educational qualification of household heads, farm size and income, farmers' social capital, and distance to the selling point as significant variables that influenced farm income diversification. In a similar vein, Sallawu et al., (2016) in Niger State, in the central region of Nigeria revealed that farmers' age, farm area, educational attainment, farm income and non-farm income, access to farm credit, household size, livestock owned, farmers' poverty position, and non-farm job were critical policy variables influencing farm income diversification or rural farmers. Similarly, Akpan et al., (2017a) identified factors influencing agricultural diversification among small-scale arable crop farmers in one of the southern States of Nigeria. The outcome showed that the educational attainment, cost of labour and the poverty level of farmers were positive determinants of agricultural income diversification. Contrarily, an increase in farming experience, fertilizer usage, farm size, household size and farm output was negative drivers. In addition, Etuk et al., (2018) found the amount of farm credit, family size, farm size and farmers' marital status as the significant variables affecting the farmers' livelihood diversification in Cross River State, Nigeria. In a similar study, Adeoye et al., (2019) showed that land ownership, educational qualification, access to electricity and farm location are significant dynamics influencing income diversification in rural farm households in the Western region of Nigeria. Besides, Yusuf et al., (2019) in northern Nigeria identified farmers' age, educational qualification, household size and farming experience as determinants of income diversification. Moreover, Tyenjana and Taruvinga (2019) identified the sex of the household head, educational attainment, family size, and livestock ownership as factors influencing livelihood diversification in South Africa.

In furtherance of the research on farm income diversification, Teji (2020) in Southern Ethiopia stated that human capital, household assets and infrastructure-related variables were significant determinants of farm income diversification. Also, Kwizera (2021) in Burundi opined that household income, access to the market, and age of household head are positive factors of income diversification of rural households. Recently, Ayana et al., (2022) in western Ethiopia revealed that educational qualification, household dependency ratio, access to irrigation, and household-urban linkage are significant predictors of farm income diversification.

The evidence from the literature reviewed revealed scanty empirical studies on farm income diversification in small-scale farm production in the south-south region of Nigeria. The region is known for its distinct characteristics and challenges (such as oil spillage, gas flaring, increasing soil infertility and land fragmentation, tides and ocean waves, among others) that often push farmers to extreme conditions. Due to the differences in the environmental and climatic as well as the edaphic conditions among regions in the country, research inferences from other regions might not yield the appropriate policy direction needed to uplift the well-being of the rural farmers in the southern region of the country. As Wang (2018) noted, livelihood activities are fundamentally interwoven with the environment. Therefore, there is an overwhelming need to expand the frontier knowledge about farm income diversification among farmers in the State and the south-south region. Also, given the current downturn in the country's economy and the continuous deterioration of agricultural productivity, there is a need to revalidate previous results to sustain vegetable production in the State and the country. The choice of small-scale fluted pumpkin-based farmers is vital in that the leafy pumpkin constitutes the major dietary component of the vast population of the State and the region. Moreover, small-scale farmers are mostly rural dwellers and are more vulnerable to the scourge of poverty and hence have a high probability of diversifying their livelihood sources. Hence, the study is specifically designed to estimate the farm income diversification indices of fluted pumpkin-based farmers and identify the factors that influence the indices in Akwa Ibom State in the southern region of Nigeria.

## 2. Material and Methods

### 2.1. Study area

The study was conducted in the Oruk Anam local government area of Akwa Ibom State. The area lies on latitudes 4° 40'N and 5° N, and longitude 70° 30'E and 70° 50'E. The total land area is about 511.73km sq., equivalent to 7.23% of the total land area of the State. The mean annual rainfall lies from 2000mm to 4000mm. The area has an average annual temperature range of 26°C – 28°C. Most of the population is engaged in farming, while others are involved in trading, fishing, and craft making etc. The estimated population composition of the Oruk Anam in 2021 consists of 86,239 males and 86,415 females and a total population of 172, 654 (NPC, 2022).

### 2.2. Selection of sample size

Based on the specification of Cochran (1963); the study derived a representative sample size from a relatively large population of fluted pumpkin farmers in the study area by applying the equation (1) specified thus:

$$S_x = \frac{\phi^2 P(1 - P)}{D^2} \quad (1)$$

Where  $S_x$  is the required sample size needed from a large population of fluted pumpkin farmers; “ $\phi^2$ ” is the area under the acceptance region in a standard distribution curve ( $1 - \alpha$ ), (at 95% confidence interval, type 1 error; 1.96). “P” is the estimated proportion of *Telfairia occidentalis* farmers in the total population of farmers in the study area. It is estimated that about 85% of arable crop farmers in the study area cultivate fluted pumpkins (AKS Ministry of Agriculture, 2022). The farmers cultivate fluted pumpkins either in the home garden, as sole cropping or mixed cropping, and in fragmented lands. In the dry season, the crop is planted near a water source. “D” is the desired level of precision at 5% (type 1 error). The sample size ( $S_n$ ) is estimated following the substitution shown in equation 2.

$$S_n = \frac{(1.96)^2 0.85(1 - 0.85)}{(0.05)^2} = 196 \quad (2)$$

However, for convenience, the estimated representative sample was scaled up from 196 to 200. This was done to ease sampling.

### 2.3. Sampling technique and sources of data

The study used multi-stage random sampling methods to select respondents. The first phase involved a random selection of 5 clans from the nine (9) clans available in the Oruk Anam Local Government area. In the second phase, two villages renowned for fluted pumpkin production were randomly picked from each clan. Therefore, ten (10) villages were randomly selected for data collection. The third phase used a random sampling technique to select twenty (20) fluted pumpkin-based farmers from each of the previously selected ten (10) villages. Hence, a total of two hundred (200) leafy-fluted pumpkin-based farmers were randomly selected and used for information collection. Note that the required respondents or fluted pumpkin-based farmers were vegetable/arable crop farmers majorly involved in cultivating leafy fluted pumpkin as sole or mixed cropping system. The required information was collected from the respondents using a structured questionnaire instrument. Primary information was obtained from the respondents, covering a wide range of cross-sectional data such as social features, farm characteristics and economic status of farmers, among others. The data were collected during the first planting season of the 2022 planting year.

### 2.4. Measuring farm income diversification

Farm income diversification is how rural farm families in rural areas generate additional income by engaging in non-farm economic activities. In the literature, authors have employed different methods to measure income diversification based on the data available and the target population. Some

techniques used and the respective authors include the Simpsons Index of Diversity (Ibrahim et al., 2009; Agyeman et al., 2014; Olugbire et al., 2020; Ayana et al., 2022). The use of the number of non-farm income-generating activities by farm households (Halliru and Bara’u, 2018); the share of farm income from off-farm activities (Sallawu et al., 2016); binary method (Ababbo, 2015). The third method is the Herfindahl-Hirschman Index (Akpan et al., 2015a; Akpan et al, 2017a; Teji, 2020; Iraoya and Isinika, 2022). Some scientists also employed the entropy diversification index and Ogive diversification index approaches (Akpan et al., 2015a and 2015b). Few authors have utilized the share of non-farm income generated in the total household income (Awoyemi 2004; William 2016; Odoh et al., 2019).

However, this study adopted the weighted share of non-farm income method, similar to the last method to measure the income diversification index of fluted pumpkin farmers. The approach is simple to analyze and well-fitted with the farmers' data. The method also allows the farmer’s non-farm income to be compared with the total farm income. The index is described implicitly as follows:

$$\text{Summation of non – farm income of a farmer} = \sum_{i=1}^n X_{1i} + X_{2i} + X_{3i} + X_{kn} \quad (3)$$

Where  $X_i$  represents the stream of income (Naira) from non-farm sources available to a fluted pumpkin-based farmer. In the study,  $X$ 's is either or a combination in no particular order and number of the following:

$X_{1i}$  = income from salary paid as a civil servant

$X_{2i}$  = income obtainable from pension

$X_{3i}$  = income from okada/bus driving business

$X_{4i}$  = income obtained from artisan activity

$X_{5i}$  = income from petty trading

$X_{6i}$  = income from remittances

$X_{ki}$  = income obtained from any other non-farm source of livelihood

Equation 3 was weighted by the respondent’s total farm income and expressed as follows:

$$\text{Diversification Index} = \frac{(\sum_{i=1}^n X_{1i} + X_{2i} + X_{kn})}{(\sum_{i=1}^n Y_{1i} + Y_{2i} + Y_{ni})} \quad (4)$$

Where  $Y_s$  is farm income (Naira) defined as;

$Y_1$  = income from the sales of pumpkin leaves (Naira)

$Y_2$  = income from the sale of pumpkin fruits (Naira)

$Y_3$  = income from other farm sources other than fluted pumpkin production (for mixed crop farmers) (Naira). Note, the major source of farm income for the respondents is derived from the cultivation of fluted pumpkins.

The diversification index explains in equation 4 is farmer’s specific, and if greater than one unity, it implies a farmer has a higher tendency to diversify his/her farm income sources. On the other hand, an index less than unity implies increasing agricultural income intensification and less diversification. A unity index suggests that a farmer is indifferent to income diversification and intensification.

### 2.5. The pull and push factors of farm income diversification in fluted pumpkin-based households in Akwa Ibom State

The multiple regression model was used to capture the pull and push factors associated with the farm income diversification of fluted pumpkin-based farmers. The push factors are conceptualized as the “positive determinants” (significant coefficients), while the pull factors are the “negative determinants” (significant coefficients) of farm income diversification. The estimation technique was based on the Ordinary Least Squares (OLS) method. The model is implicitly shown below:

$$DIV = \phi_0 + \phi_1 MAR + \phi_2 AGE + \phi_3 HHS + \phi_4 EXT + \phi_5 EXP + \phi_6 SOC + \phi_7 EDU + \phi_8 LAN + \phi_9 MAN + \phi_{10} FER + \phi_{11} HIL + \phi_{12} HHL + \phi_{13} GEN + \mu_i \quad (5)$$

Where,

DIV = Agricultural Income Diversification index as described in equation 4.

MAR = Marital status of a farmer (dummy; 1 for married farmers and 0 for the rest of the farmers)

AGE = Age of a fluted pumpkin farmer (years)

HHS = Family size of a fluted pumpkin farmer (number)

EXT = access to extension agent by a fluted pumpkin farmer in a year (Number of times)

EXP = Farming experience of a fluted pumpkin farmer (Years)

SOC = Member in social organization (number of years), Non-members are coded zero.

EDU = Educational qualification of a fluted pumpkin farmer (years)

LAN = Farm size of a fluted pumpkin farmer (ha)

MAN = Manure used by a fluted pumpkin farmer (Kg)

FER = Fertilizer used by a fluted pumpkin farmer (Kg)

HIL = Hired labour (number)

HHL = Household labour (number)

GEN = Gender of a fluted pumpkin farmer (1 for male and 0 for female)

$\mu$  = Error term

Note that the Ordinary Least Squares (OLS) estimation technique was preferred over other techniques because the distribution of the indices of diversification was non-zeros, continuous and normally distributed. The error term generated was also normally distributed.

### 3. Results and Discussion

#### 3.1. Farm income diversification indices of fluted pumpkin farmers

The distribution of the estimated farm income diversification indices of fluted pumpkin farmers in the study area is presented in Table 1. The average farm income diversification index of 2.290 was discovered from the fluted pumpkin-based farmers/households. The finding suggests that farm income diversification among fluted pumpkin farmers is assuming an alarming dimension. Alternatively, the result reveals that most fluted pumpkin farmers rely on alternative non-farm income sources than income generated from the cultivation of fluted pumpkin crops. The minimum index of 0.096 units and maximum index value of 48.00 units were obtained from the pooled analysis. The breakdown of the income diversification index revealed that only 2.00% of the fluted pumpkin farmers had an index in the range of 0.001 – 0.200. This implies that no fluted pumpkin farmer solely depended on income generated from his/her farm. However, very few farmers were close to being dependent on farm income.

Table 1. Farm income diversification indices of fluted pumpkin farmers

Category of income diversification	Frequency	Percentage
0.001 – 0.200	4	2.00
0.201 – 0.400	12	6.00
0.401 – 0.600	14	7.00
0.601 – 0.800	4	2.00
0.801 – 1.000	24	12.00
Greater than one	142	71.00
Mean	2.29	
Minimum	0.096	
Maximum	48.00	

Source: Calculated by authors, data from field survey 2022.

The result also showed that, 6.00%, 7.00%, 2.00% and 12.00% of the farmers belong to the income diversification index range of 0.201 – 0.400, 0.401 – 0.600, 0.601 – 0.800 and 0.801 – 1.00 respectively. The result also showed that 29.00% of the fluted pumpkin-based farmers or households

generated farm income greater than their respective non-farm income. The finding suggests that farm income intensification among fluted pumpkin farmers is fast losing its mastery in the southern region of Nigeria. The findings revealed that more fluted pumpkin farmers are diversifying their sources of farm income to non-farm enterprises. The result further revealed that 71.00% of the farmers operated at an index greater than unity. This indicates that far more fluted pumpkin farmers have non-farm income greater than their farm income. The finding is in accordance with the reports of Djido and Shiferaw (2018), Odoh et al. (2019) and Iraoya and Isinika, (2022). They asserted that most rural farm households have increasing sources of farm income diversification or alternative non-farm income-generating activities in Nigeria.

### 3.2. Pull and the push factors of income diversification in fluted pumpkin-based farmers

The estimates of the multiple regression analysis representing the income diversification equation of fluted pumpkin-based farmers are presented in Table 2. The estimates represent the pull and push factors of income diversification of fluted pumpkin-based farmers. The diagnostic statistics revealed an  $R^2$  of 0.778, which implies that about 77.83% of total variations in the calculated indices of income diversification are explained by the specified explanatory variables. The estimated F-calculated is about 14.0253 and is statistically significant at a 1% probability level. The outcome connotes that the  $R^2$  is statistically significant. This means that the estimated equation has the goodness of fit. Also, the RESET test statistic's magnitude revealed the specification's adequacy. This implies that the estimate equation has structural rigidity. The null hypothesis defining the normality of the error term is strongly upheld, and this justifies the use of the OLS estimation technique.

The estimates revealed the following significant pull factors that influence farm income diversification among fluted pumpkin-based farmers/households: farmer's age, extension agent visits, membership in a social organization, farm size, the quantity of manure used, the quantity of fertilizer used, and the number of family labour. These variables negatively correlate with the farm income diversification index of fluted pumpkin-based farmers in the study area. These pull factors are the fundamental policy instrument that can effectively, efficiently and significantly tackle and address the issues related to farm income diversification in fluted pumpkin-based farmers. This means that an increase in these variables would lead to an increase in farm income intensification or a corresponding reduction in the diversification index of farm income of fluted pumpkin-based farmers/households in the study area.

The finding precisely revealed that a year increase in a farmer's age would result in a 0.07 unit decrease in the farm income diversification index of fluted pumpkin farmers in the region. This means that, as a farmer's age increases, the tendency to diversify declines. The result suggests that farm income diversification is predominant among youth farmers as opposed to intensification for older farmers. This finding aligns with the reports of Ahmed (2012), Agyeman et al. (2014), Ogbanje et al. (2014), Oyewole et al. (2015), Sallawu et al. (2016), Yusuf et al. (2019), Teji (2020) and Kwizera (2021).

Similarly, a 10% increase in agricultural extension workers' visits to fluted pumpkin farmers would decrease farmers' index of income diversification by 49.37 units. An increase in agricultural extension workers' visits to fluted pumpkin farmers will likely increase the rate of innovation adoption and also expose farmers to modern production techniques. Also, market potentials could be open through persistent interactions with the extension agents. This interaction will enhance the efficiency of resource use, farm productivity and farm income. As a result of an increase in farm income, farmers' well-being will be enhanced, and they will likely choose income intensification instead of diversification. The finding corroborates Agyeman et al. (2014), Ogbanje et al. (2014), Oyewole et al. (2015) and Teji (2020).

Table 2. The Push and pull factors of income diversification in fluted pumpkin farmers

Variable	Coefficient	Standard error	t-value	P-value
Constant	-3.8088	3.1813	-1.197	0.2345
Marital status	-0.9463	1.0273	-0.9212	0.3595
Age	-0.0674	0.0257	-2.6278**	0.0201
Household size	0.6788	0.3290	2.063**	0.0411
Extension agent	-4.9367	2.2443	-2.200**	0.0305
Experience	-0.0474	0.0783	-0.6063	0.5459
Social group	-0.7830	0.2926	-2.676***	0.0089
Education	0.2403	0.1381	1.740*	0.0804
Farm size	-4.0499	2.3882	-1.696*	0.0935
Manure quantity	-0.0018	0.0009	-2.000**	0.0497
Fertilizer quantity	-0.0221	0.0127	-1.736*	0.0861
Hire labour	0.1185	0.0253	4.685***	<0.0001
Household labour	-0.0158	0.0089	-1.775*	0.0793
Gender	-0.0291	1.1669	-0.0249	0.9801
<b>Diagnostic tests</b>				
R-squared	0.7783	Adjusted R-squared		0.6843
F(calculated)	14.0253***	Mean dependent Var.		2.2904
Normality test	12.944(0.1263)	Log-likelihood		-275.4004
RESET test	10.354(0.2109)	White's test		7.136(0.1234)

Source: Data from Field Survey, 2022. Note \*, \*\* and \*\*\* represent Significant level at 10%, 5% and 1% respectively.

According to the results, a one-year increase in farmers' membership in farm/social organizations reduces the income diversification index by 0.78 units. The increase in the year(s) of membership in a social organization would increase social capital formation among fluted pumpkin-based farmers. Farmers' encouragement, social interactions, sharing of farm production experiences and market information are quickly and effectively obtained in a social gathering. These social interactions create opportunities for farmers to expand production, the source for buyers and extend the value addition chain. Hence, increased social capital formation among fluted pumpkin farmers would breed opportunities for an enhanced farm income while reducing diversification activities. Ogbanje et al. (2014), Oyewole et al. (2015), Ababbo (2015) and Kwizera (2021) have submitted similar reports.

The findings also showed that the coefficient of farm size is statistically significant and negatively correlated to the index of farm income diversification at a 10% significance level. This connotes that a hectare increase in farm size cultivated by the fluted pumpkin-based farmer would reduce the farmers' diversification index by 4.05 units. The increase in farm size will likely enhance the economy of scale in production. Consequently, an increase in the size of production is often accompanied by increasing demand for credit and commercialization of farm activities vis-à-vis farm income. The increase in farm income and market share are possible incentives encouraging farm income intensification rather than diversifying. The finding aligns with the reports of Ogbanje et al. (2014), Oyewole et al. (2015), Ababbo (2015), Sallawu et al. (2016), Akpan et al. (2017a), Etuk et al. (2018), Adeoye et al. (2019), Yusuf et al. (2019) and Teji (2020).

Besides, the coefficients of manure and fertilizer were negative and significantly related to the index of income diversification. This implies that a kilogram surge in the use of manure and fertilizer by a fluted pumpkin-based farmer will lead to a 0.0018 kg and 0.0221 kg reduction in its income diversification index, respectively. Alternatively, an increase in the use of manure and or fertilizer/inorganic manure in the cultivation of leafy fluted pumpkin farms would increase the tendency of the farmers to intensify farm income generated. The increase in manure and fertilizer usage increase farm output and, subsequently, farm income. An increase in farmers' output and income would great incentives for farmers to intensify their production rather than diversification. The finding is similar to Akpan et al. (2017a).

Moreover, the finding revealed that a unit boost in household labour utilized by a fluted pumpkin farmer would result in a 0.0158 unit reduction in the index of income diversification. This connotes that the increase in family labour reduces the marginal effect of farm income diversification. Since hired labour is expensive and farm credit is difficult to get, most farmers rely so much on family labour. This reduces the cost of production but instead increases farm income, especially for small-scale producers



like fluted pumpkin farmers. This finding substantiates the previous research reports of Akpan et al. (2017a).

On the other hand, an increase in farmers' educational qualification, household size, and quantity of hired labour used was identified as the push factors to farm income diversification of fluted pumpkin-based farmers. This means that an increase in these variables increase fluted pumpkin farmers' tendency to increase their income diversification desires. For instance, a year increase in the formal education of a fluted pumpkin farmer will lead to a corresponding 0.2403 unit rise in its farm income diversification index. The boost in years of formal education qualification of fluted pumpkin-based farmers would likely expose them to wider job opportunities with better returns or earnings. Rationally, workers would migrate from one job to another based on wage differential and would likely be settled on the one that commands a higher wage rate. Since agriculture yields less income than other sectors, an advance in years of formal education of fluted pumpkin-based farmers would increase the potential of them moving away from agricultural production to better-yielding livelihood options. The result agrees with Ahmed (2012), Agyeman et al. (2014), Ogbanje et al. (2014), Oyewole et al. (2015), Ababbo (2015), Sallawu et al. (2016), Akpan et al. (2017a), Adeoye et al. (2019), Yusuf et al. (2019), Tyenjana and Taruvinga (2019) and Teji (2020).

The hired labour slope coefficient is positive and statistically significant at a conventional 1% significance level. The finding indicates that a number increment in the quantity of hired labour used by the fluted pumpkin-based farmer will increase the farm income diversification indicator by 0.1185 units. This means that the increased use of hired labour increases farm income diversification by the fluted pumpkin farmers in the State. The increased number of hired labour would increase the total production cost resulting in a decrease in farm returns. A continuous decrease in farm earnings would lead to an increase in income diversification. The result validates the submission of Akpan et al. (2017a).

Similarly, the coefficient of the household size exhibited a positive correlation with the income diversification index of fluted pumpkin farmers in the State. This connotes that an increase in a farmer's family size increase the possibility of increasing its diversification index. A person's increase in family size will increase the diversification index of a farmer by approximately 0.2403 units. The finding implies that an increase in household size would likely increase household expenditure and lower farm investment. In an attempt to better the family's well-being and break out from the captivity of poverty, diversification remains the best option. The finding is in agreement with the assertion put forward by Sallawu et al. (2016), Akpan et al. (2017a), Etuk et al. (2018), Tyenjana and Taruvinga (2019) and Teji (2020).

#### 4. Conclusion

This study has shown overwhelming evidence of increased farm income diversification drive among fluted pumpkin-based farmers in the southern region of Nigeria. About 71.00% of the leafy-fluted pumpkin-based farmers in the study area derived their household income from non-farm sources. None of the sampled farmers depends solely on fluted pumpkin cultivation. The empirical results have revealed the important push and pull factors of farm income diversification of fluted pumpkin farmers in the study area. A designed policy framework based on these identified factors would help to slow the rate of farm income diversification among fluted pumpkin farmers and other stakeholders in the agricultural sector of the State and the region in general.

Based on the findings and the need to discourage agricultural income diversification, the following policy recommendations are wished-for: the Akwa Ibom State should encourage child spacing and family planning programmes among fluted pumpkin or vegetable farmers as these would reduce the household size, and family burden always carried along with agricultural expenditures. Input subsidy to small-scale farmers is important to cushion the adverse effect of increased production costs. Agricultural extension services should be reorganized to provide more effective services to farmers. The formation of social groups should be encouraged through cooperative farming. Also, there is an overwhelming need to provide the farming population in the State with farm inputs such as fertilizer and manure to encourage their adoption. This strategy can help minimise crop loss, and risks and sustainably increase yield. The government of Akwa Ibom State should set up tractor hiring centres in all the local government areas as these would help reduce the hard time farmers encounter in hiring manual labour.

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