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Abstract

Over the past two or three decades, it has become increasingly clear that small-scale farmers in sub-Saharan Africa produce the bulk of the food consumed by inhabitants of these countries, in spite of their poor working conditions in terms of access to inputs, improved technology and basic infrastructure. Again, the changing pattern of climate, the HIV/AIDS pandemic, unstable micro- and macroeconomic conditions, coupled with the rising poverty situation have even made the matter worse, especially for staple food crop farmers. The resultant effect of this is manifested in poor living conditions and dwindling interest in agriculture. In Nigeria, agriculture remains the largest employer of labour, providing a livelihood for over 70% of the population. This paper relied on primary data collected through a well-structured questionnaire from a random sample of 360 staple food crop farmers in southwest Nigeria, using a multi-stage sampling procedure. The data were collected in March and September 2008, depicting the peak of dry and rainy seasons in the country. Respondents' distribution by age indicates that average age of these farmers is 45 years, implying that majority of the farmers are young and still active. Distribution of respondents by gender reveals that there are more males than females, while their distribution by education level shows that about one-third are educated up to tertiary level while 36% have no formal education. However, respondents' distribution by household size reveals that mean household size is 7, an important reason for the low per capita income estimated in the study area. Also, about two-third of the respondents were estimated to be vulnerable going by the vulnerability benchmark constructed using the consumption expenditure data obtained for the two periods (March and September). A probit analysis employed to ascertain the determinants of vulnerability to seasonal fluctuations in production and marketing show that respondents' age, gender, years of formal education, household size, membership of cooperatives, access to inputs, access to extension services, distance to markets and price situation are major determinants of vulnerability in the study area. While the coefficients of age, household size, distance to market, price situation are positively associated with high vulnerability, those of gender, educational level, membership of cooperatives and access to extension services are negatively associated with high vulnerability. In other words, respondents that are young, having tertiary education, members of cooperatives and having access to extension services are less vulnerable than aged, those with no formal education, those not belonging to cooperatives and those lacking access to extension services. More so, an adaptive strategy index (ASI) was estimated to rank different adaptive measures employed to cushion the effect of seasonal variability in production and marketing. It was revealed that borrowing from cooperatives was very conspicuous, with over 65% employing the strategy. This is closely followed by diversification into non-farm activities. Other strategies employed include cutting down expenditure on non-food items, migration to cities and nearby towns in search of paid employment and relying on relatives/friends for buffer. Based on the study findings, it is suggested that government should encourage cooperative activities among small-scale farmers, having found that cooperatives are a veritable tool to cushioning the effect of income shortfall on farming households. Also, investment in capacity building through education (especially the girl child) should be intensified since education is known to enhance earning potentials and better adoption of innovations and technologies. Investment in market and road infrastructures should be made a priority in order to reduce wastages arising from bumper harvests, and this will equally encourage youths to embrace farming as a profession.

Key words: Adaptive strategies, Nigeria, Seasonality, Staple food crops, Vulnerability, Well-being

Introduction

Seasonal variability in production and marketing is a serious problem facing staple food crop farmers in Nigeria. This is attributable to the fact that Nigerian agriculture is rain-fed and often times influenced by the prevailing macroeconomic atmosphere. The sector is characterised by low input use, highly degraded and eroded land and poor markets. Meanwhile, the agricultural sector in Nigeria has potential for dominating the country's exports and foreign exchange, as it did prior to the oil boom period. Only about a third of the potential agricultural resources are currently under cultivation (WTO, 1998). Smallholdings, 0.1–5.99 hectares, account for about 81 percent of total farm holdings that are being worked by subsistence farmers lacking in capital and modern techniques of farming. Apart from resource under-utilisation, low productivity resulting from technological and investment constraints and infrastructural barriers are the other undesirable characteristics of the sector. Since the technology of agricultural production in the country is still backward, the fortune of the sector depends to a large extent on vagaries of weather and various activities of government agencies directed at minimising some of the constraints to the sector's development.

The resultant effect of this is manifested in dwindling production levels, low returns, rising poverty and often times consumption fluctuations. It is therefore no surprise that African agriculture lags behind the other developing regions, judging by all indicators of agricultural productivity and the use of modern inputs. In 2004, for example, the Food and Agricultural Organisation (FAO) reported that although Africa has the highest agricultural area per capita in the developing world, it has the lowest irrigated area (3.7 percent) and fertiliser consumption (12.6 kg/ha/arable land). This is much below the developing country average of 22.7 percent and 109.0 kg/ha/arable land respectively (Gayi, 2007). However, an important challenge in the quest for food security among poor agricultural households is sustaining food consumption during the lean season. This is especially true for farm households that rely on rain-fed agriculture, and who have poor post-harvest storage capacity, or limited market opportunities to monetise post-harvest surpluses. A number of studies have documented the extent of consumption seasonality in developing countries, as well as the behavioural responses that agricultural households display in the face of extreme fluctuations in income due to the agricultural cycle (Sahn, 1989; Paxson, 1993; Alderman, 1996).

In some parts of Nigeria, for instance, soil types and rainfall patterns allow for a relatively staple production of food surplus while in other areas with marginal climatic conditions, production levels are low and tend to fluctuate throughout the year. The seasonal nature of

agricultural production leads to fluctuations in food availability and intake, exacerbated by population pressures on available arable land. Small-scale farmers and the landless are increasingly vulnerable to the effects of these fluctuations. Better still, agriculture remains the primary source of livelihood for over 64 percent of the total population in Africa. The sector represents 34 percent of the continent's Gross Domestic Product (GDP) and accounts for 40 percent of its export earnings (World Bank, 2008). More so, over 90 percent of Africa's population lives in low-income countries where agriculture plays an even stronger role. Worse still, the sector is plagued with many problems that impede its growth. These problems stem from natural characteristics such as geography and environment as well as from socioeconomic factors, including patterns of land ownership, depleted human capital and low levels of public and private investments. In addition to its deteriorating natural capital, the agricultural sector in sub-Saharan Africa has suffered from the depletion of human capital due to diseases such as malaria and more specifically HIV/AIDS as more than 70 percent of known cases worldwide are concentrated in Africa (World Bank, 2008).

Other studies have also confirmed the poor quality of Africa's soil structure as one of the biggest impediments to agricultural growth on the continent, a situation which, according to the Intergovernmental Panel on Climate Change (IPCC), would be worsened by climate change (IPPC, 2007). Again, overall public spending on agriculture across the continent has fallen from 7.5 percent to 6 percent of agricultural GDP between 1984 and 2004 (Haggblade *et al.,* 2004). As a result, it is estimated that there were fewer than 100 full-time equivalent research staff in half of countries in sub-Saharan Africa in 2000 (Beintema and Stads, 2004). The paucity of public infrastructure and limited access to finance in turn hamper private investment in agriculture. High transport costs, domestic marketing costs and, in the aftermath of macroeconomic reforms, the paucity of suppliers of agricultural inputs result in high prices of fertilisers that constrain farmers' demand. Although these constraints partly explain why the quantity of fertiliser used in Africa amounts to about one tenth of the world average there is also evidence that the price elasticity of demand for fertiliser is much lower than that of crop prices.

From the foregoing, there is therefore no gainsaying the fact that agriculture plays a very prominent role in Africa's development. However, the task of assuring production and marketing stability remains a major challenge, especially in Nigeria where investment in agriculture continue to dwindle and farmers grapple with post-harvest losses resulting from poor storage and processing facilities, poor markets and dilapidating infrastructural facilities. It is against this backdrop that the paper examines the vulnerability of these farmers and the different adaptive strategies employed in managing seasonality, with a view to ensuring

consumption smoothening and sustainability in agricultural production and marketing in the study area.

Conceptual Framework/ Literature Review

The term *'vulnerability'* is a new research area and it is defined as the likelihood that at a given time in the future, an individual or a household will have a level of welfare below some norm or benchmark (Quisumbing, 2002). Ligon and Schechter (2003) defined the essence of vulnerability as the uncertainty of future income streams and associated loss of welfare caused by this uncertainty. In most developing countries, estimation of vulnerability has been mainly through the use of cross-sectional household surveys, but in principle the use of panel data permits the estimation of vulnerability within a more general framework and allows for the inclusion of time-invariant household effects and dynamic effects, and in some cases to get a sense of magnitude of biases in estimates of vulnerability generated from cross-sectional data (Chaudhuri, Jalan and Suryahadi, 2002).

Christiaensen and Subbarao (2004) defined vulnerability as the *ex ante* potential of a decline in future wellbeing, or the *ex ante* probability of falling below a particular welfare benchmark at some future date. Thus, vulnerability is multi-dimensional, and households face a number of risks. The risk faced by an individual/ household relates to events possibly occurring, i.e. with less than certainty. Individuals/ households have *a priori* some sense of the likelihood of these events occurring, without direct control over this likelihood. The lack of direct control over the risk they face is crucial and distinguishes it from the responses one can observe from individuals, households and communities, given the risk they face. According to Olaniyan *et al.* (2003) and Oluwatayo (2007), the welfare problem in Nigeria arises due to the absence and ineffectiveness of existing formal insurance or risk management interventions and the limitations of the informal coping or risk management strategies of the poor and non-poor. The risk management strategies used in Nigeria include prevention, mitigation and coping strategies. Prevention strategies seek to reduce the probability of welfare-reducing risk through activities such as education, immunisation, irrigation, extension services, etc. While mitigation strategies seek to decrease the impact of a future welfare reducing risk through activities such as insurance policy, crop diversification, mixed farming, storage programme and price support, coping strategies relieve the impact once the risk has occurred.

Moreover, a household facing a risky situation is subject to future loss of welfare. The likelihood of experiencing future loss of welfare, generally weighted by the magnitude of expected welfare loss, is called *vulnerability*. The degree of vulnerability depends on the

characteristics of the risk and the households' ability to respond to risk through the risk management strategies available and accessible to such households. Thus a household is said to be vulnerable to the outcome of an uncertain event, if it does not have sufficient resources to adequately contend with the outcome of the event. In other words, the extent to which a household is vulnerable to an uncertain event, namely the extent to which the household can become and/or remain affected, depends on the size of the shock and how effective the household is in managing the uncertain event both *ex ante,* as well as *ex post.* Households in developing agrarian economies in Africa face many risks, but among the many risks faced, recent research suggests that commodity price changes (both declines but also increases), droughts, and health shocks are the major risk factors both in terms of the frequency of their occurrence as well as the severity of their effects (Christiaensen, Hoffman and Sarris, 2007). The impact of sharp increases in food prices in the short run depends very much on whether people are mainly producers or consumers of food. A low-income household that spends a large proportion of its income on tradable food staples is more likely to suffer a decline in overall welfare. The extent of this decline depends on the ability of the household to shift consumption towards less expensive foods.

In short, households that derive some part of their income from the production and sale of internationally traded staples could benefit from higher world prices, although high fuel and fertiliser prices are likely to offset some of the gains households could earn. In Africa, despite beliefs to the contrary, most households, and especially rural poor households, are net staple food buyers (FAO, 2008). Wodon *et al.* (2008) analyse the impact of food price upswing on a number of West and Central African countries. Their results suggest that on average, a 50 percent increase in the price of selected food items will result in an increase in the share of population in poverty between 2.5 and 4.4 percent, as a large share of food is imported and the negative impact on food consumers outweighs the positive effect on the net sellers of locally produced goods. Wodon and Zaman (2008) find that the impact of increasing food prices on sub-Saharan African countries is significant, with a 50 percent increase in the prices of selected foods resulting in a 3.5 percent increase in the poverty headcount. This result implies that, at an aggregate level, for all sub-Saharan Africa, which has a population of 800 million, the food price upturn could have led to an increase in poverty of approximately 30 million.

On the other hand, *'seasonality'* is defined as a fluctuating phenomenon that entails significant alterations in the biotic potential of the landscape within the annual cycle. Season, simply put, is the section of the year associated with a type of weather. In Nigeria, two major seasons of the year are known, namely: wet season and dry season. The wet season is

associated with much rainfall, high relative humidity and shorter periods of sunshine. At this time of the year, usually between March and August, certain rain-fed crops (staple food crops) such as maize, vegetables, etc. are in surplus, simply because most farmers see this season as the time when they can grow these kinds of crops. Deterioration of stored farm produce is also common in this season of the year, because of high relative humidity. The rate at which stored farm produce absorb water is high compared to the rate of moisture loss, thereby, increasing the tendency of spoilage of stored goods. The wet season is also known to encourage high build-up of innoculum. Glut (a situation of excessive supply of farm produce) is also another feature that characterises the wet season. The supply of most crops at this time of the year is higher than their demands, simply because the season encourages better production. This seasonal glut leads to rapid reduction in the market prices and farmers will have no option other than to dispose of this produce at give-away prices, because sellers are more than buyers at this time.

The dry season is associated with little or no rainfall, relatively low humidity, and longer periods of sunshine, usually between September and February. Most rain-fed crops are not always grown at this time of the year, except for farmers who have access to irrigation facilities and those that practice valley bottom agriculture (*Fadama*). Storage activity is best carried out at this time of the year because of low relative humidity and the presence of dry air which hastens drying of farm produce. Agricultural produce is always costlier than in the wet season because of scarcity or under-supply. This period, according to Bloom and Sachs (1998), poses several inherent difficulties that limit agricultural performance. Such difficulties include constant drought and aridity problems in African tropical zones due to low rainfall and high mean temperatures, which result in an unfavourable soil to water balance compared to other tropical regions of the world.

Thus household vulnerability to seasonal variations in agricultural production and marketing require timely and appropriate social protection interventions to mitigate such stresses. In regards to agricultural production seasonality, Devereux (2007) highlights the importance of facilitating access to inputs for smallholders who face seasonal cash constraints. While fertiliser subsidies or free inputs distribution are controversial due to their adverse market and distributional effects (World Bank, 2007), they have successfully boosted food crop production in some African countries, with positive impacts on food production and on household and national food security (Levy, 2005). With respect to commodity price seasonality, fluctuations in food and asset prices undermine household food security by raising the cost of accessing food while reducing the market value of assets sold at ‘distress prices’ to buy food. Uncertainty in commodity markets makes it difficult for farmers to

allocate productive resources efficiently, and may cause producers, consumers and traders to engage in risk-reducing strategies such as diversification into lower value but more stable products, not using purchased inputs, and not trading in remote locations (World Bank, 2005). While market-based tools such as futures markets are able to insulate producers from short-term price volatility, they are typically not accessible in low-income countries. Commodity exchanges and futures markets have been established in China, India, South Africa and Thailand, but the establishment of such instruments are dependent on good financial and legal institutions (World Bank, 2007).

Methodology

Study Area and Sampling Method

The study was conducted in southwest Nigeria. Southwest Nigeria is one of the six geopolitical zones of the country and it is where one of the three major ethnic groups (i.e. the Yoruba) resides. The region is comprised of six states (Ekiti, Lagos, Ogun, Ondo, Osun and Oyo). Occupations of residents of the region include farming, trading, government salaried jobs and those engaged in the informal sector. A random sampling technique was employed in selecting 360 staple food crop farmers covering three states – Ekiti, Ogun and Osun – and respondents were selected based on probability proportional to size in order to make it representative. The three states were selected because agriculture is the predominant activity in the area.

Analytical Techniques

In addressing the study objectives, descriptive statistics, a measure of vulnerability index, probit regression analysis and adaptive strategy use index were employed.

Descriptive statistics: This was used to summarise and describe respondents' socioeconomic characteristics in the study area.

Measuring Vulnerability to Seasonal Fluctuations: In measuring the vulnerability of respondents to seasonal fluctuations, they were categorised into two groups based on the following measures;

- The probability of being always affected, defined as being affected in the two survey rounds (March and September).
- The probability of becoming affected, defined as not being affected in the first round but affected in the second survey round.

Vulnerable respondents were then defined as a combination of those 'becoming affected' and 'always affected' by seasonal fluctuations in production and marketing, i.e. vulnerable = (becoming affected + always affected).

***** *Note that being affected in this case has to do with negative changes in output, sales as well as consumption between survey rounds.*

The Vulnerability Index for each subgroup is estimated as:

$$= \frac{\text{Number of vulnerable respondents in the subgroup}}{\text{Total numbers of respondents in the subgroup}}$$

The transitional matrix box for respondents in the study area is defined as follows:

	Vulnerable	**Non-vulnerable**	**Total**
Vulnerable	N_1	N_2	N_1+N_2
Non-vulnerable	N_3	N_4	N_3+N_4
Total	N_1+N_3	N_2+N_4	Y

Where,

N_1 = Numbers of respondents that were vulnerable to seasonal fluctuations in the two survey rounds (March and September)

N_2 = Number of respondents that were vulnerable in the first survey round but non-vulnerable in the second round

N_3 = Number of respondents that were non-vulnerable in the first survey round but vulnerable in the second survey round

N_4 = Number of respondents that were non-vulnerable in the two survey rounds

Y = Total numbers of respondents i.e. $N_1 + N_2 + N_3 + N_4$

Probit Regression Model: In order to ascertain the influence of certain variables on the vulnerability of respondents to seasonal fluctuations, a probit model was estimated using data from the panel (March and September, 2008). The probit regression analysis was used since Ordinary Least Squares (OLS) estimating technique will not be appropriate, especially when most of the explanatory variables are dichotomous. The probit model assumes that while we observe the values of 0 and 1 for the variable Y_i there is a latent, unobserved continuous variable Y* that determines the value of Y_i, we assume that Y* can be specified as follows:

$$Y^* = \beta_o + \beta_1 X_{1i} + \beta_2 X_{2i} + - - - + \beta_k X_{ki} + U_i \quad \text{----------} \quad \text{(Equation 1)}$$

And that; $Y_i = 1$ if $Y^* > 0$

$Y_i = 0$ if $Y^* < 0$

Where, Y_i = Vulnerability level. Respondents were classified into vulnerable and non-vulnerable categories as:

Thus, Y_i = 1, for respondents vulnerable to seasonal fluctuations

Y_i = 0, for Non-vulnerable respondents

$X_{1k} - - - X_{ki}$ = Vector of explanatory variables

β_o = constant

$\beta_{1k} - - - - \beta_{ki}$ = Coefficient estimates

U_i = disturbance term

$$P_r(Y_i = 1) = (\beta_o + \beta_1 X_{1i} + \beta_2 X_{2i} + - - - + \beta_k X_{ki} + U_i > 0 \quad \text{----------} \quad \text{(Equation 2)}$$

Rearranging terms,

$$P_r(Y_i = 1) = P_r [U_i > -(\beta_o + \beta_1 X_{1i} + \beta_2 X_{2i} + - - - + \beta_k X_{ki}]$$
$$= 1 - P_r [U_i < -(\beta_o + \beta_1 X_{1i} + \beta_2 X_{2i} + - - - + \beta_k X_{ki}]$$

If we make the usual assumption that U is normally distributed, we have:

$$P_r(Y = 1) = 1 - \phi[-\beta_o + \beta_1 X_{1i} + \beta_2 X_{2i} + - - - + \beta_k X_{ki} = 1 - \phi(-X_1\beta) = \phi(X_1\beta)$$

Where, ϕ = standard cumulative normal distribution using data from the panel

X_i = vector of explanatory variables

$\beta' s$ = estimates of coefficients which give the impact of the explanatory variables on the latent variable Y*

The explanatory variables are;

X_1 = Age

X_2 = Gender

X_3 = Marital status

X_4 = Household size

X_5 = Years of formal education

X_6 = Primary occupation

X_7 = Membership of cooperatives

X_8 = Access to inputs

X_9 = Extension contact

X_{10} = Distance to market

X_{11}= Price situation

X_{12} = Asset

Adaptive Strategy Use Index: This method was employed to rank respondents' use of all the available and accessible adaptive strategies to production and marketing fluctuations in

the study area. This was done by itemising all the strategies and ascertaining the frequency of use of each of the strategies. The strategy recording the highest patronage in terms of usage was ranked first and this was closely followed by the second and so on. The advantage of using this method is that it assists government or individuals in knowing which intervention programme(s) to embark upon, because the implementation of such a strategy will have a multiplier effect or have a wider coverage since such intervention(s) cannot be targeted at individual respondent or household as the case may be.

Results and Discussion

Socioeconomic Characteristics of Respondents

Result of descriptive analysis of respondents' socioeconomic characteristics reveals that the average age of respondents is 45 years. Respondents' distribution by gender reveals that there are more males (57.5 percent) than females (42.5 percent). Distribution of respondents by marital status indicates that there are more married respondents (46.7 percent) than single (30.8 percent), divorced (11.7 percent) or widowed (10.8 percent) respondents in the study area. Average household size is 7 with over one-third (35.5 percent) having more than 9 members. The distribution generally indicates that respondents' household size in the study area is fairly large. Also on educational status of respondents, only about one-third (26.1 percent) are educated up to tertiary level while 36.4 percent of them have no formal education. The rest have either primary (17.2 percent) or secondary (20.3 percent) education. Again, on membership of cooperative societies, over three-quarters (78.6 percent) are members of a cooperative society while only about 21.4 percent do not belong to a cooperative society. Their belonging to cooperative society enables them to access credit facilities which otherwise would not have been possible by going to formal financial institutions. The stringent conditions and the formal procedures for credit acquisition from the formal financial institutions make credit acquisition from this source very cumbersome and discouraging for the farmers. However, in terms of occupational distribution of respondents, farming is the highest employer of labour engaging about 58 percent of the respondents. This is closely followed by government salaried job (16.7 percent), while others are engaged in the informal sector. Again, respondents' distribution by those having contact with extension officers reveal that only about one-third (36.4 percent) have extension contacts while the rest (63.6 percent) do not have extension contacts. This generally shows that extension contacts to staple food crop farmers in rural Nigeria are very low and this could contribute to the low productivity and inadequacy of market information flow to these farmers and this could have a negative impact on the marketability of their produce. Again, in terms of accessibility to agricultural inputs, only about 34.2 percent of the respondents have access to inputs like fertilisers and agrochemicals while the rest (65.8 percent) do not have

access to these inputs. This also has significant implications on the productivity and marketability of agricultural produce in the study area as it pertains to availability/scarcity of farm produce all year round.

Table 1: Respondents' Distribution by Socioeconomic Characteristics

Respondents' Characteristics	Number of Respondents	Percentage of Respondents
Age		
0-30	47	13.0
31-40	65	18.1
41-50	153	42.5
51-60	59	16.4
>60	36	10.0
Total	**360**	**100.0**
Gender		
Male	207	57.5
Female	153	42.5
Marital Status		
Married	168	46.7
Single	111	30.8
Divorced	42	11.7
Widowed	39	10.8
Educational status		
No formal education	131	36.4
Primary	62	17.2
Secondary	73	20.3
Tertiary	94	26.1
Household Size		
1-4	109	30.3
5-8	123	34.2
9-12	57	15.8
≥13	71	19.7
Primary Occupation		
Farming	208	57.7
Trading	52	15.0
Government Salaried Job	61	16.7
Private Salaried Job	22	6.1
Artisan	17	4.5
Extension Contact		
Yes	131	36.4
No	229	63.6
Access to Input		
Yes	123	34.2
No	237	65.8
Membership of Cooperative Society		
Yes	283	78.6
No	77	21.4
Total	**360**	**100.0**

Source: Author's Computation from Survey Data, 2008

Vulnerability Level of Respondents

Analysis of the data collected using the transitional matrix box (Table 2) revealed that about 207 (57.5 percent) respondents were vulnerable in both survey rounds while 38 (10.6 percent) respondents were vulnerable in the first survey but non-vulnerable in the second survey round. It was also observed that 52 respondents (14.4 percent) which were non-vulnerable in the first survey round had become vulnerable in the second survey round and only 63 respondents (17.5 percent) were non-vulnerable in the two survey rounds. In all, the total number of vulnerable respondents among the staple food crop farmers were 245, representing 68.1 percent of those surveyed those that were non-vulnerable were 115 representing 31.9 percent of the staple food crop farmers. Result of the transitional matrix generally revealed the high vulnerability levels of respondents since over two-third of them were found to be vulnerable to production and marketing fluctuations.

Table 2: Distribution of Respondents by Vulnerability Level

Vulnerability Status	Vulnerable	Percentage	Non-vulnerable	Percentage
Vulnerable	207	57.5	52	14.4
Non-vulnerable	38	10.6	63	17.5
TOTAL	**245**	**68.1**	**115**	**31.9**

Source: Author's Computation from Survey Data, 2008

Vulnerability of Respondents to Seasonal Fluctuations in Production and Marketing

A probit analysis was employed to examine the determinants of vulnerability to seasonal fluctuations in production and marketing among the staple food crop farmers. The results of the analysis showed that respondents' age, gender, years of formal education, household size, membership of cooperatives, access to inputs, access to extension services, distance to markets, price situation and asset were major determinants of vulnerability in the study area. While the coefficients of age, household size, distance to market, price situation were positively associated with high vulnerability, those of gender, educational level, membership of cooperatives, access to extension services and asset were negatively associated with high vulnerability. In other words, respondents that were young and with tertiary education, members of cooperatives with access to extension services and having assets were less vulnerable than aged/old, those with no formal education, those not belonging to cooperatives and those lacking access to extension services. Again, while the coefficients of age, years of formal education, membership of cooperatives and asset were significant at one percent ($P<0.01$), those of gender, household size and distance to market were significant at five percent ($P<0.05$). Also, the coefficients of access to inputs and price situation were significant at ten percent ($P<0.10$). Thus, the

level of significance of some of these variables indicated how important they are in explaining the determinants of these seasonal fluctuations. For instance, the negative sign of the coefficient of cooperatives membership indicated that those belonging to cooperatives had lower likelihood of being vulnerable to seasonal fluctuations than those that were not members of cooperatives. This is because cooperative activities provide an avenue for easy credit accessibility and this can be used by these farmers to cushion whatever shortfalls recorded in output and marketing especially during the lean periods. In the same vein, those with tertiary education and assets like land and other usable and easily disposable properties had lower likelihood of becoming vulnerable than those with no asset. This is because education enhances the earning potentials of individuals and ease of accessing information on innovative and modern technologies and this can help in cushioning seasonal fluctuation in production and marketing. Again, those with assets can sell them to augment incomes from main occupation. The result of the analysis is shown in Table 3.

Table 3: Result of Probit Analysis on Determinants of Vulnerability to Seasonal Fluctuations

Variable	Coefficient
X_1	0.367***
	(2.710)
X_2	-0.201**
	(2.501)
X_3	0.105
	(1.082)
X_4	0.320**
	(2.211)
X_5	-0.057***
	(2.630)
X_6	0.110
	(1.239)
X_7	-0.925***
	(3.307)
X_8	0.514*
	(1.652)
X_9	1.210*
	(1.651)
X_{10}	2.003**
	(1.982)
X_{11}	1.432*
	(1.701)
X_{12}	-0.819***
	(3.061)
Constant	-3.354
	(1.020)

Author's Computation from Survey Data, 2008

**** Coefficients significant at 1 percent ** Coefficients significant at 5 percent*

** Coefficients significant at 10 percent t-values are in parenthesis*

Log likelihood = - 67.000308, Prob. > chi 2 = 0 >. 0001200, Number of observation = 360

Estimation of Adaptive Strategies Employed by Respondents

An adaptive strategy index (ASI) was estimated to rank different adaptive measures employed (Table 4) to cushion the effect of seasonal variability in production and marketing. Of all the ten adaptive strategies employed by the respondents, it was revealed that borrowing from cooperatives was most conspicuous, with over 65 percent using the strategy. This was closely followed by diversification into non-farm activities, with only about 11 percent employing the strategy. The third most employed strategy was cutting down expenditure on non-food items with about 7 percent using the strategy. Other strategies employed include: selling assets like land and livestock for those raising animals, migration to cities and nearby towns in search of paid employment, opting for paid jobs or employment where they reside and relying on relatives/ friends for buffers. Also, the startling revelation from the findings was that majority of the respondents were very reluctant to borrow or take loan from the available formal financial institutions (commercial banks) in the study area. This further explains the fear being entertained by the farmers in that money sourced from this source is very risky because their investment is also prone to vagaries of weather and macroeconomic conditions, and any attempt to default could cause them untold hardship and further aggravate their living conditions.

Table 4: Ranking of Adaptive Strategies Employed by Extent of Patronage/Usage

Adaptive strategy	Number of respondents	Percentage	Rank
Migration to cities for paid employment	12	3.3	4
Cutting down expenditure on non-food item	26	7.2	3
Borrowing from cooperatives	233	64.7	1
Going to relatives/friends	5	1.4	8
Selling assets e.g. land and livestock	9	2.5	5
Taking loan from commercial banks	2	0.5	9
Going for paid jobs where they reside	6	1.7	7
Diversification	59	16.4	2
Withdraw children from school to assist	1	0.3	10
Reduce meals taken daily	7	1.9	6

Source: Author's Computation from Survey Data, 2008

Conclusion

Seasonality in production and marketing is a serious problem facing staple food crop farmers in rural Nigeria. This is so because farming activities in the country are faced with several challenges, ranging from poor infrastructure to the new challenge of weather uncertainty or climate change. The resultant effect of this is manifested in poor living conditions exacerbated by consumption fluctuations, dwindling productivity and the untold hardship of selling farm produce at give-away prices due largely to lack of market, and the poor road

conditions preventing them from taking the advantage of the paucity of their produce in the city centres. In conclusion, production and marketing fluctuations/seasonality have increased the vulnerability of staple food crop farmers in the study area and unless something urgent is done, the survival of the teeming population may be at stake since the country and other developing countries of the world depend largely on the activities of these farmers (being the sole producer of the food need of the growing population in these countries).

Recommendations

Going by the findings from the study, the following recommendations were made;

1. Government in the study area should intensify its effort at capacity building through investment in education (especially of the girl child) since education is known to enhance earning potentials and better adoption of innovations and technologies.

2. Cooperative activities should also be encouraged and farmers should be advised and sensitised on the need to form cooperatives, because cooperatives could be a veritable insurance mechanism for seasonal fluctuations. The negative coefficient of the cooperative variable implies that respondents belonging to cooperatives were not as vulnerable as those not belonging to cooperatives. In other words, those belonging to cooperatives can easily access credit or loans, unlike those not belonging to cooperatives and the loan obtained can be used to augment whatever shortfall is recorded due to the seasonal changes in output, consumption or sales.

3. Investment in market and road infrastructure should be made a priority in order to reduce wastage arising from bumper harvests, and this will equally encourage youths to embrace farming as a profession.

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