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Social Disruptions' Effects and Fruit-vegetable Production Resilience in Osun State, Nigeria

Khadijat Olaitan Olanrewaju[1]*, Olaide Kamila Akintunde[2], Abiodun Rukayat Fadodun[3], Adetunji Lawrence Kehinde[2] and Faridat Ifeoluwa Ismail[2]

[1] Department of Agricultural Extension and Rural Development, College of Agriculture, Osun State University, Osogbo, Nigeria
[2] Department of Agricultural Economics and Agribusiness Management, College of Agriculture, Osun State University, Osogbo, Nigeria
[3] Department of Agricultural Extension and Rural Development, Faculty of Agriculture, Obafemi Awolowo University, Ile-Ife, Nigeria

* Correspondence: khadijat.olanrewaju@uniosun.edu.ng (Nigeria)

Abstract: The COVID-19 pandemic effects in Nigeria are compounded by social unrests over palliative distribution and the END-SARS national protests that ensued. Thus, the study investigated the crisis's effects, the coping strategies, the level of resilience, and the constraining factors among fruit-vegetable producers in Nigeria. The study included 86 respondents from the Exotic Fruit-vegetable Growers Association in Osun State. The results showed that most fruit-vegetable farmers were males (87.2%) and people within active age ranges (43.44±9.53 years). The crisis mostly affected marketing (94.19%), product transportation (89.53%), and seed access (80%). Farmers used family labor in place of hired labor (54.81%) and used local varieties of seeds (48.84%) as coping strategies. Only 38% of farmers were adjudged resilient to the crisis and the vulnerability predisposing factors are weak inputs access (2.14), value addition incapacity (1.97), poor marketing power (1.21) and weak enterprise linkages (1.17). Probit analysis results show that enterprise characteristics, namely fruit-vegetable types grown (0.54), farm sizes (0.52), and cultivation years (-0.16), affect production resilience. In conclusion, the production capacity characteristics influences fruit vegetable enterprise resilience to shocks orchestrated by social disruptions. Support services should be provided for farmers to leverage available technological alternatives for improved enterprise resilience.

Keywords: agricultural enterprise; coping strategies; resilient farming; production capacity; social crisis; vulnerability

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1. Introduction

Global farming systems are subverted by fundamental changes in economic, technological, demographic, ecological, and social environments (Wustro et al., 2020). The interface between environmental changes, economic decline, and social redistribution through migrations, among other issues, has espoused an escalating effect on livelihoods, particularly in farming communities in developing countries like Nigeria (Besthorn, 2013). Thus, the incidence of crises amidst contemporary issues has a grave impact on the already struggling farming systems in the bid to combat food insecurity among the increasingly hungry population, which is highlighted by the United Nations Food and Agriculture Organization (UNFAO) (2021) as the most pressing issue confronting the global community. A crisis encompasses the occurrence of disruptive, harmful, or potentially destructive incidences in social systems which opportune uncertainties and tensions (Rolandsson and Ilsøe, 2023). Characteristically, crises occur infrequently and precipitate unanticipated anomalous situations linked with high-risk repercussions that are difficult to manage (Pearson and Clair, 1998). This causes appreciable economic, behavioural, safety, and social order disintegrations (Tasnim, 2020; Rowan and Galanakis, 2020; Desa and Jia, 2020).

The COVID-19 pandemic was a rare occurrence that exposed the vulnerability of agricultural production systems to social disruptions globally. Necessitated limitations in social interaction truncated access to agricultural inputs, markets, and labour availability for servicing time-bound production activities (Orjiakor, 2025). As fruit-vegetable production need for specialized management activities makes it more labour intensive compared to other arable crops, the enterprise is necessarily more vulnerable to shocks that limit labour accessibility (Laborde et al., 2020). Given this, the government relaxation of the covid -19 movement restrictions was hoped for the re-stabilization and recovery of the production system. However, the unfortunate breakout of civil unrest, especially in southwestern Nigeria, due to the widespread looting of the purported COVID-19 palliatives further befuddled the already overwhelmed farming livelihoods, specifically the food and vegetable enterprises. The accompanying nation-wide protests against the brutality of the police band 'Special Anti-Robbery Squad (SARS)' tagged #EndSARS protests which began in October 2020 further aggravated the already tense situation. The planned peaceful protests were hijacked by hoodlums causing a lot of chaos and further economic retrogression. This constituted another major crisis of national importance in Nigeria in the same year.

Aside from mobility limitations due to pronouncements of curfews, the disruptions resulted in substantial destruction of markets, warehouses, and other essential agricultural infrastructures. The breakdown of law and order also orchestrated direct damage of some farms and thereby worsen the plight of the concerned farmers. Generally, farmers had to devise means of coping despite their unpreparedness as the exploration of alternative measures of action becomes critical for the survival of the enterprise. The extent of enterprise resilience would shape the capacity for weathering the heavy storm of the crisis's effects through alternative measures for adequate continuation of production activities.

In view of this, the peculiarity of fruit-vegetable production in managing relatively technical processes (such as staking, irrigation, and fertigation) and high product perishability highlights the enterprise's prominence in consideration of agricultural production resilience to the crisis's effects. The dearth of evidence on the highlighted crises incidence in literature motivates this study. This is aimed to provide evidence for learning into the future for resilience capacity development of the fragile fruit vegetable production enterprise in Nigeria. Thus, to fill this gap in literature, this study was aimed at addressing the following unanswered research questions:

i. what are the socio-economic characteristics of fruit-vegetable farmers in Osun State;
ii. what fruit-vegetable production activities were affected by the social crises;
iii. how did the farmers cope with the crisis effects;
iv. how resilient were the fruit-vegetable enterprises to the crisis effects;
v. what were the constraining factors to the farmers during the crisis; and
vi. Is there any relationship between fruit-vegetable production resilience and enterprise-related features.

2. Materials and Methods

The study area is Osun State, Nigeria. The state was chosen based on its prominence as an agriculture-dependent state which witnessed a recognized level of social unrests that emanated from the 2019 legislated COVID-19 restrictions, the associated palliatives crisis as well as the END-SARS protest disruptions of normal activities in south-west Nigeria.

2.1. Study population and sample size

For the special interest in fruit-vegetable enterprises, which are deemed fragile due to the high perishability of the products, the registered Exotic Fruit-vegetable Growers' Association in the state constitutes the study population. From a reconnaissance inquiry about the group, the population size was stated to be 108 members. The calculation of the representative sample was done using the Yamane sampling formula:

$(\frac{N}{1+N(e^2)})$, ……..(1)

Where N is the population size (108) and e is the allowable error level (0.05). This yielded the required sample size of 85 which was increased to 90 during data collection.

2.2 Data collection

Simple random sampling technique was employed for data collection using a validated interview schedule. The data collection was conducted between March and April, 2021. A total of 86 responses were obtained as sufficient for data processing and analysis.

2.3 Measurement of variables

Data were collected on the socioeconomic characteristics of the farmers, the fulfilment of enterprise activities during the crises, the coping strategies employed, and the constraints faced. A binary scale was used to identify the production activities affected by the crises. The use of coping strategies was measured as greatly used, moderately used, slightly used, and not used, with corresponding scores of 4, 3, 2, and 1, respectively. For resilience assessment, factors including expertise of family labour, access to tractor, capacity to purchase inputs in bulk, transportation and logistics capacity, storage facility, processing capacity, capital base, marketing outlet, price control power and contract for products uptake by industries were presented to measure the limitations faced on each item using severity rating scale, highly severe, moderately severe, partly severe, and not severe scored 1, 2, 3, and 4, respectively. This was summarized to a dichotomous resilience variable: resilient and not resilient for scores above the mid-benchmark of 22 and below 22, respectively. This is based on the extrapolation from the scoring of the severity levels: high and moderate severity (as an indication of non-resilience) and not severe and slightly severe (for resilience) for the 11 items.

2.4 Data analysis

All data entry was done using an excel spreadsheet, which was imported into STATA version 16 for analysis. For this, the analytical tools utilized include descriptive statistics and probit regression analysis. Simple descriptive statistics like means, percentages, and frequency distribution were used to analyse research questions (i), (ii), and (iii), while question (iv) also included the use of factor analysis and probit regression analysis for testing resilience, scoring 1 and 0 for resilient and non-resilient production, respectively, for question (v).

2.4.1. Factor analysis

The 11 listed items on resilience constraints were reduced into critical constraining factors using principal component analysis with varimax rotation. Kaiser criterion of retaining factors having eigen values of ≥1 was used to identify the critical factors. On each factor, only items having loading of at least 0.3 were retained as contributing to the factor. More so, the naming of the factors was based on the interpretation of the connection among jointly loaded items on the factor and the literature explanation of the association (Olanrewaju and Farinde, 2014).

2.4.2 Probit regression analysis:

Probit analysis was used to test the influence of enterprise-related variables on resilience. The probit model is a non-linear model used to analyze the relationship of a response or dependent variable with several predictors or independent variables, where the response variable is qualitative data dichotomized as 0 and 1 (Jain et al., 2016). The probit regression method uses the cumulative distribution function Normal (normal cumulative distribution function) to explain the function of the equation. Since the response/dependent variable is dichotomous or binary, the response/dependent variable (y) follows the binomial distribution with the probability function as follows:

$$f\ (y_i, \pi_i) = \pi_i{}^{y_i}(1-\pi_i)^{1-y_i} \quad \text{..... (2)}$$

with $y_i = 0; 1$, π_i is the probability occurrence of the i for $y_i = 1$, and 1-π_i is the probability of occurrence of the i for $y_i = 0$.

In general, the probit regression model can be expressed as follows:

$$\pi_i = \emptyset(Z_i) = \emptyset(\beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots \beta_p x_{ip} + e_i \quad \text{..... (3)}$$

Since probit model is related to the cumulative function of Normal distribution, it can be written as:

$$Z_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots \beta_p x_{ip} + e_i \quad \text{..... (4)}$$

To obtain an expectation of the probit value (Z_i), then the inverse of the normal cumulative distribution function can be obtained:

$$Z_i = \emptyset^{-1}(\pi_i) = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots \beta_p x_{ip} + e_i \quad \text{.....(5)}$$

Then, it will explain the estimation of the $\boldsymbol{\beta}$ parameter in probit regression by using Maximum Likelihood Estimation (MLE).

The probit model for this study is expressed as:

$$Z_i = \emptyset^{-1}(\pi_i) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots \beta_6 X_6 + e_i \quad \text{..... (6)}$$

Where Z_i is the probability that fruit-vegetable farmer has an enterprise resilience given X_i;

The independent variables are itemized below:

X_1 = Number of types of fruit-vegetables produced (numbers)
X_2 = Use of coping strategies (total scores)
X_3 = Total farm size (ha)
X_4 = Social organization participation (total scores)
X_5 = Fruit-vegetable farm size (ha)
X_6 = Years of cultivation of fruit crops (years)

3. Results and Discussion

3.1. Socio-economic characteristics of fruit-vegetable farmers

Evidence in Table 1 shows that many (40.70%) of the farmers were within the age range of 40–49 years and the mean age was found to be 43.44±9.53. Most (87.21%) of these farmers were males. These reveal a high male dominance and a good representation of youth and middle-aged people in fruit-vegetable production. This confirms the findings of Obaniyi, et al. (2019) that reported active and productive ages of people engaged in fruit-vegetable farming. This could come into play in their level of resilience to social crises. More so, the mean household size of the farmers was 5±1 persons, and a majority (74.42%) had at least a secondary school education. Accordingly, there is a higher literacy level among fruit-vegetable farmers compared to the characteristic low literacy highlighted by Abegunrin et al. (2020) about the contemporary arable crop farmers in the State. More than half (53.49%) of the farmers have had more than a decade of experience in farming, and this indicates a

substantial number of farmers with veritable experience in crop farming. This indicates a substantial influx of new entrants into farming livelihoods, specifically the fruit-vegetable production system.

Table 1. socio-economic characteristics of fruit vegetable farmers

Socio-economics	Frequency	Percentage (%)	Mean ± SD
Age (years)			
30-40	31	36.05	43.44±9.53
40-49	35	40.70	
50 and above	20	23.26	
Sex			
Male	75	87.21	
Female	11	12.79	
Household size (persons)			
0-4	39	45.35	5±1
5-8	45	52.33	
9 and above	2	2.33	
Level of education			
Non formal	8	9.3	
Primary education	14	16.28	
Secondary education	39	45.35	
Tertiary education	25	29.07	
Production experience (years)			
0-5	15	17.44	14.13±9.3
6-10	25	29.07	
11-15	18	20.93	
16 and above	28	32.56	

Results in Figure 1 show the distribution of farmers by the types of fruit-vegetables grown. It was evidenced that tomato (65.12%) is the most widely grown fruit crop in the study area, followed closely by cucumber (59.30%) and watermelon (58.14%), as well as green pepper (41.86%) and carrot (20.93%) in that descending order. This reveals that the most cultivated fruit-vegetable were tomatoes, cucumbers, and watermelon. Also, the results in Figure 2 show the average farm sizes. Tomatoes cultivated by farmers were averagely 1.27 ha by farm sizes, followed by cucumber (1.09 ha) and watermelon (1.06 ha). Carrot mean farm sizes were the lowest (0.35 ha) and then green pepper (0.45 ha). In the same way, the farmer's level of production experience (Figure 3) was affirmed to be longer for tomatoes (7.06 years), cucumbers (6.67 years), and watermelon (5.72 years)

These results affirm that tomato production is the foremost fruit-vegetable farming enterprise in which farmers are more experienced and devote a larger farm size. This highlights the importance of tomato production in the area, as well as cucumber and watermelon production. Indicated here is the improvement in the diversity and production size of fruit-vegetables, as posited by Dijkxhoorn et al. (2021) that fruit-vegetable production in Nigeria has improved significantly in recent years and these negate the old assertion of Fakayode et al. (2012) that the primary focus of Osun state fruit-vegetable farmers is on orange and okra production.

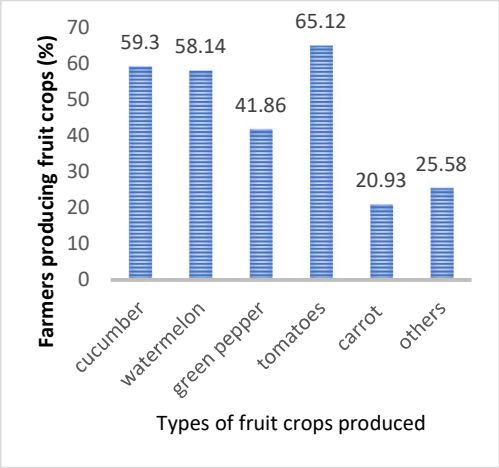

Figure 1. Types of fruit vegetables grown

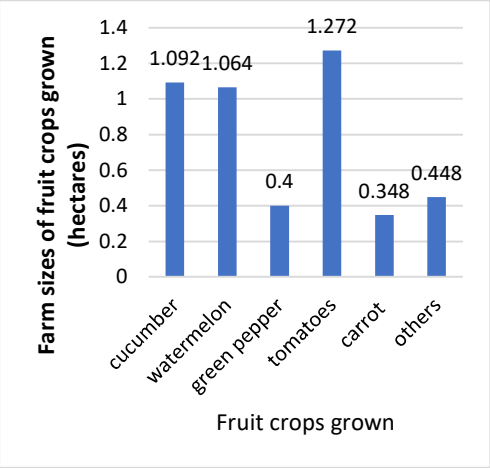

Figure 2. Farm sizes of fruit crops grown

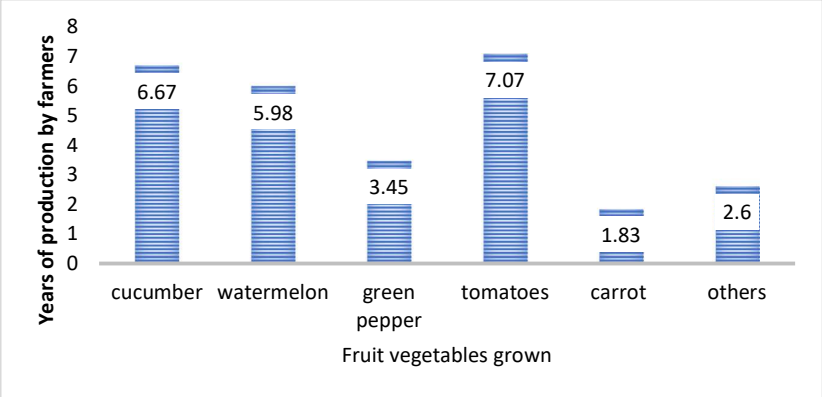

Figure 3. Years of cultivation of fruit vegetables

3.2 Fruit vegetable production activities affected by COVID 19 and END SARS crises

Results in Table 2 shows the fruit-vegetable production activities that were affected by the social unrests. It was shown that most of the production activities were greatly affected, as the majority recounted that the crises undermined proper marketing of the farm produce (94.19%), transportation of harvested produce (89.53%), access to seeds (79.07%), ease of getting to the farm regularly to perform routine crop management activities (77.91%), and timely harvesting of fruit crops produced (72.09%). More so, it was affirmed by many of the farmers that the crisis affected the ease of getting labour to service operations (68.6%), access to tractors for land preparation (66.28%), farm and worker security (60.47%), and access to extension services (53.49%) in the descending order.

These results revealed that post-harvest activities relating to the harvesting of mature fruits, transportation, and periodic marketing of fruit-vegetables by farmers were grossly affected by the social unrest in the study area. This adds to the widespread evidence of agricultural products' marketing disruptions due to the COVID-19 pandemic incidence as reported by Diao et al., (2021); Obayelu et al., (2021); Sridhar et al., (2023); and Hammond et al., (2022). The perishability of harvested fruit-vegetables in these scenarios earmarks the huge potential for unanticipated and drastically increased postharvest losses and attendant income losses for farmers. In the same vein, the farmers' level of access to production inputs was found to be dominantly affected by the situation. This indicates that the conventional route of input access became largely unfunctional during the crisis periods.

It is known that rural households did not have access to required inputs at reasonable costs for the dominant agricultural livelihood during the COVID-19 period (Akuffo and Gourlay, 2021;

Hammond et al., 2022). These affirm that the majority of the farmers were beset by the crisis that ensued with the incidence of the COVID-19 outbreak and the ENDSARS protest in the study area. These expose the fragile system of fruit-vegetable production in Nigeria in terms of a lack of industrialization in the post-harvest stages and a poor marketing system, amidst other production logistics inadequacies. This revelation is in tandem with that posited by Dijkxhoorn et al. (2021) that the Nigerian fruit-vegetable production system remains underdeveloped and underperforming due to extensive reliance on informal trading, poor infrastructure, and inadequate facilities. As such, this study buttresses that the fruit-vegetable enterprises are highly vulnerable to social shocks, despite their innumerable potentials.

Table 2. Fruit vegetable production activities affected by COVID 19 and END SARS crises

Enterprise activities	Affected (%)	Rank
Proper marketing of Produce	94.19	1st
Transportation of harvest Produce	89.53	2nd
Access to viable seeds for production	80	3rd
Ease of buying fertilizer at normal	79.07	4th
Ease of getting to farm regularly	77.91	5th
Timely harvesting of fruit crops produced	72.09	6th
Ease of getting labourers	68.6	7th
Access to tractor for land preparation	66.28	8th
Security of farm workers and farm produce	60.47	9th
Access to extension or consultancy services	53.49	10th

3.1. Farmers coping strategies to COVID-19 and 'EndSARS' social unrests

The result in Table 3 reveals that the coping strategies that were greatly used during covid-19 and EndSARS social unrest include the use of personal or family labour in place of hired labour (55.71%), the use of local variety seeds (48.84%), seeking help from farmers associations (40.70%), seeking logistics help from relations (29.07%), selling farm produce at the farm gate (23.26%), appeasing movement restriction officers (22.09%), and transporting produce at night (22.09%). Also, moderately used strategies mainly include: limiting marketing to the farm gate (47.67%); seeking help from relatives and friends (45.35%); seeking help in associations (39.53%); selling farm produce at lower prices (39.53%); exploring other means to obtain inputs (37.11%); selling farm produce at the farm gate (36.05%); procuring inputs at a higher price (34.88%); and delaying or skipping some routine management practices (34.88%).

Strategies slightly used include appeasement of the movement restriction officers (51.16%), exploration of online networks for extension advice (41.86%), mechanical weed and pest control instead of chemical controls (37.37%), procurement of inputs at a higher price (34.88%), manual land preparation instead of ploughing and harrowing with a tractor (34.88%), exploring other means to obtain inputs (33.71%), and storage of farm products or delaying harvesting (26.74%). These revealed that farmers adopted alternative means of getting labour and other resources for managing their production activities, as exemplified by the findings of Bolarin et al. (2022). Also, alternatives sought to crisis undermined market access were selling products at farm gates, nighttime transportation of farm products, bribing security officers, and others. This has serious implications, including higher marketing costs, delayed product disposal, and increased post-harvest waste.

Also indicated is the farmers' poor awareness and exploration of online media and networks for product marketing. Thus, the farmers are largely oblivious to opportunities for higher-level marketing through online surfing for potential linkage to industrial processing companies. This is similar to the findings of Olanrewaju et al. (2019), which indicated poor vertical linkage and communication between farmers and industrial uptakers of their produce. Overall, the findings affirm the position of Hammond et al. (2022), which emphasized African farmers' deployment of

coping strategies in response to the COVID-19 disruptions within their limits given the lack of official government aid to agriculture.

Table 3. Coping strategies employed during COVID-19 and END-SARS social crises

Coping strategies	Greatly used (%)	Moderately used (%)	Slightly used (%)	Not used (%)	Weighted Mean
Manual land preparation instead of ploughing	13.95	33.72	34.88	17.44	2.56±0.9
Procurement of inputs at higher price	2.33	34.88	34.88	27.91	2.88±0.8
Exploring other means to obtain inputs	10.47	37.71	37.21	15.12	2.57±0.9
Use of family/ personal labour in place of hired	55.81	20.93	20.93	2.33	1.69±0.9
Mechanical weed and pests' control	6.98	27.91	38.37	26.74	2.85±0.9
Delaying routine crop management	11.63	34.88	24.42	29.07	2.71±1.0
Appeasing movement officials	22.09	20.93	51.16	5.81	2.41±0.9
Limiting marketing to farm gate	13.95	47.67	26.74	11.63	2.36±0.8
Transporting farm produce at night	22.09	22.09	18.60	37.21	2.7±1.1
Selling of farm product at lower price	15.12	39.53	38.37	6.98	2.37±0.8
Use of local variety of seed	48.84	25.58	6.98	18.60	1.95±1.1
Storage of farm products	10.47	18.60	26.74	44.19	3.04±1.0
Selling of farm product at farm gate	23.26	36.05	31.40	9.30	2.27±0,9
Seeking of help from relations or friends	29.07	45.35	17.44	8.14	2.05±0,9
Exploration of on-line networks	4.65	16.28	41.86	37.21	3.11±0.8
Seeking of help from union or association	40.70	39.53	9.30	10.47	1.89±0.9

Source: Field survey 2021

3.4. Enterprise Resilience to Social Crisis and The Contributing Factors:

The results in Figure 4 indicated that at least 60% fruit-vegetable production enterprises were not resilient to shocks generated by the COVID-19 and END-SARS social unrests. Only about one-third were resilient and adequately carried out production activities during the crisis. This reveals the high vulnerability of fruit-vegetable production in Nigeria to the destabilization of normal activities. While entrenching Ashkenazy et al. (2017) as a clear indication of poor resilience of food systems and rural communities generally, this study re-affirms the permeation of long-recognized potentials of social crises as a critical and intractable obstacle to the Nigerian agricultural production system and development (Zakaree and Egwaikhide, 2012). The revelation substantiates the need highlighted by Treimikien et al. (2023) that food systems require immediate action to improve their resilience to enable sustainability.

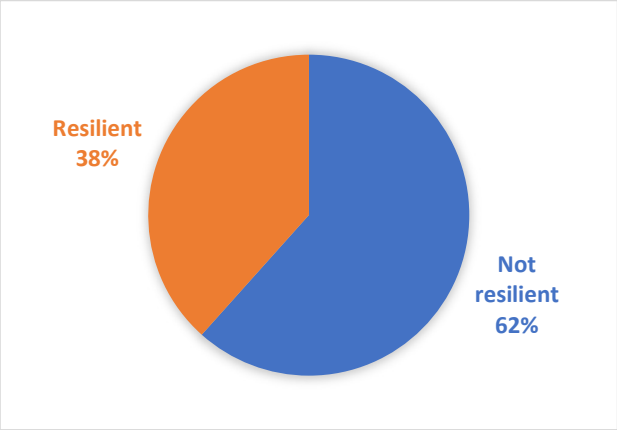

Figure 4. Resilience of fruit vegetable production enterprises

The results in Table 4 show the critical constraining factors for fruit-vegetable production resilience during social unrest periods. Following this, factor 1, having an Eigen value of 2.14, was named as having weak access to inputs and logistics, as indicated by the high loadings of farmers' poor capacity to purchase inputs in bulk (L = 0.78), lack of transportation and logistics capacity (L = 0.75), and indirect access to use tractors (L = 0.71). This factor explains 27.16% of the variations in the constraints on fruit-vegetable farms' resilience. This demonstrates that the prevalently weak access of the farmers to inputs and logistical capacity is a major factor in their low level of resilience. This validates the potential of uninterruptible input access as an unwavering necessity for fueling time-bound farm operations, which is a critical factor in enterprise sustainability, resilience, and vulnerability. This is in accordance with the study of Nasr et al. (2021) which highlighted resource accessibility as one of the most important factors of resilience in agriculture.

The second factor (λ = 1.94) named postharvest value addition incapacity was indicated by farmers' lack of storage facilities (L = 0.78), no capacity for processing fruit drinks (L = 0.73), and inadequate capital (L = -0.72). This factor explains close to one-fifth (18.18%) of the variance in the constraints on fruit-vegetable farming resilience in Nigeria. It signifies the importance of farmers' capacitation with postharvest value addition for produce transformation and shelf-life extension as a panacea for strengthening resilience and securing value optimization from their harvests. Value addition is undoubtedly a proven mechanism for postharvest loss reduction and agricultural income improvement. This is substantiated by the findings of Wright and Annes (2016), which exemplified the distinctiveness of agricultural value addition for farmers empowerment.

More so, the third factor (λ = 1.22) identified was poor marketing power as indicated from the understanding of the connection between farmers' dependence on open markets for product disposal (L = 0.76) and poor price control power (L = 0.77). The fourth factor (λ = 1.18), poor linkages, was mostly indicated by no contract secured by farmers for product uptake by industries (L = 0.89). Farmers' poor price control power and weak linkages accounted for 12.29% and 11.77%, respectively, of the variance in constraints to resilient fruit-vegetable production. This reveals that the shortage of processing industries highlighted by Ibeawuchi et al. (2015), persists. Hence, fruit-vegetable farmers cannot conveniently secure industrial off-takers for their farm produce. This annuls the potential for sustainable product movement that could be availed of by the market contracts from the farm level to higher-level markets.

These results affirm that the observed low level of resilience in fruit-vegetable production is mainly constrained by the weakness of accessibility to inputs and logistical needs, the incapacity for postharvest value addition, poor marketing power or control, and poor inter-linkages.

Table 4. Results of principal component analysis of the constraining factors

Constraining variables	**Factor 1:** Weak access to inputs and logistics	**Factor 2:** Postharvest value addition incapacity	**Factor 3** Poor marketing power	**Factor 4:** Poor linkage to industries
Poor expertise of family labour	0.539			-0.595
Lack of direct access to use of tractor	0.707			
Poor capacity to purchase inputs in bulk	0.780			
Poor transportation and logistics capacity	0.749			
Poor storage mechanism for fruit vegetables		0.775		
Lack of capacity for processing to fruit drinks		0.725	0.51	
Inadequate capital		-0.719		
Dependence on open market for products sale			0.764	
Lack of control over fruit vegetable prices			0.769	
No contract for products uptake by industries				0.819
Eigen values	2.144	1.937	1.219	1.177
Percentage of variance explained	**27.157**	**18.185**	**12.29**	**11.772**

3.5 Relationship between fruit vegetable enterprise features and resilience to social crises

The result of the probit analysis converged after six iterations and it is presented in Table 5. The results show that the number of types of fruit-vegetables grown (-0.541) inversely affect the resilience of the enterprise. This implies that higher number of types of fruit vegetables grown decreases the probability of resilience of the enterprise by 54.1%. which predicates lower resilience. The implication of this finding is that an additional crop to an enterprise tends to decrease the resilience to the social shocks. Also, the marginal effect of years of cultivation (0.163) depicts that a year increase in the farming experience increases the resilience of enterprise by 16.3%. This means higher experience in the production predicates higher resilience. Also, the deployment of coping strategies (0.177) and fruit-vegetable farm size (0.521) are positive predictors of probable production resilience to social shocks. This implies that deployment of coping strategies increases the probability of resilience to social shocks of enterprise by 17.7%. This reveals that the application of coping strategies by the farmers was adaptive. Also, in the case of fruit vegetable farm size; the marginal effect reveals that an increase in farm size by a unit increases the probability of production resilience to social shocks by 52.1%. This is expected due to the fact that economy of scale could make large farms to be more resilient to social shocks than small farms.

The significance of these predictors highlights that each is statistically different from zero, given the presence of the other specified variables in the model. In the same vein, the model constant is found to be statistically different from zero on the condition that all the tested variables are present in the model and that they are evaluated at zero. The importance of these can be felt in the potential of these variables in shaping the adaptive capacity of the agricultural production system to shocks and stressors. As such, the finding is backing that of Nasr et al. (2021), who found that the adaptive capacity of farms underpins their resilience.

Table 5. Results of probit regression analysis of fruit vegetable production resilience and selected enterprise characteristics

Characteristics of fruit vegetable production system	**Marginal effect (dy/dx)**	**Standard error**	**P-value**
Number of fruit vegetables produced	-0.541	0.261	0.038*

Use of coping strategies	-0.177	0.045	0.000*
Total farm size	0.056	0.039	0.152
Social organization participation score	-0.293	0.160	0.068
Fruit vegetables farm size	0.521	0.217	0.017*
Years of cultivation of fruit crops	0.163	0.077	0.034*
Constant	-6.243	1.982	0.002*

log likelihood =-37.059, pseudo R^2=0.352, chi =40.41 at P-value =0.000
*Significant at 0.05 level

4. Conclusions

Social crises precipitated by the COVID-19 and END-SARS protests undermined vital processes and activities of fruit-vegetable production. Many farms were incapacitated to transport and market their produce promptly, just as access to inputs, especially seeds and agrochemicals, at normal costs was truncated. Coping with the disruptions necessitated the prominent use of alternative measures by farmers, including selling products at the farm gate, nighttime transportation of produce, bribing security officers, and family labour deployment for managing farm operations, among others. Also indicated is the farmer's poor awareness and exploration of online media and emerging networks for product marketing. These exposed that a high proportion of the fruit-vegetable farms were not resilient to the shocks occasioned by the crisis. Underscoring the observation of a high incidence of non-resilience in fruit-vegetable holdings are constraining factors, including overtly weak access to inputs, incapacity for postharvest value addition, poor marketing power, and weak inter-linkages to industries. Furthermore, characteristic fruit-vegetable farm production capacity significantly entrenches improvements in resilience. In conclusion, the production capacity characteristics influences fruit vegetable enterprise resilience to shocks orchestrated by social disruptions. It is recommended that fruit-vegetable farmers be supported with an exposition on leveraging contemporary technological and networking forums that could capacitate their resilience to potential crisis effects.

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