

Evaluation of Vegetable Production and Sales: Analysis of Covid-19 Lockdown in Kwara State, Nigeria.

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Abstract

The study examines the effect of covid-19 lockdown on vegetable production in Kwara State Nigeria. Sampling randomly, a total of 120 vegetable farmers were sampled and interviewed. Needed information for this study were collected and analysed using econometric tools. The findings showed that the average age of the respondents is about 46 years with 45% of them having 6-10 family members. About 72% acknowledged that vegetable farming is their major source of income. Furthermore, 63.33% attested to radio jingles as source of information about Covid-19 epidemic, while 17.50%, 9.16%, 5.83%, 3.51% and 0.67% claimed they were informed through SMS, community meetings, family and friends, television jingles and extension agents respectively. The farmers incurred loss to the sum of ₦648,608 during lockdown. Adjusted R² of 0.6242 indicating that 62% alteration in vegetable production during lockdown is propelled by the explanatory variables. It is imperative to ameliorate the performance ability of vegetable farmers in order to boost food security giving the significance of vegetables in the human diet. This research puts forward and suggests that unconditional cash support programmes should be provided to vegetable farmers in general to lessen the impact of low revenue in subsequent circumstances in post-Covid-19-era to save them from the risk of production loss and poverty.

Key words: Covid-19, Income, lockdown, vegetable production, Safety

Introduction

Coronavirus disease 2019, which is generally known as COVID-19 attributable to SARS coronavirus 2 (SARS-CoV-2), a respiratory infection which emanated from China in 2019 was proclaimed as a universal contagious epidemic by the world health organization (Cucinotta, 2020). By early March in the year 2020, numerous infection and deaths have been recorded globally; this warranted the need to steer clear of large gatherings in schools, markets, offices and worship centres. In the light of this, countries had to enforce restrictions on the movement of their citizens, this response led to the global isolation strategies to reduce infection and unnecessary deaths, principally among vulnerable persons and individuals with underlying medical conditions (Stein 2020; Thomson 2020; Yap 2020).

Nigeria reported her first case in Lagos state on the 27th of February 2020 before the spread to adjoining states and regions in the country (Ojediran *et al.*, 2021). In line with the worldwide governmental reactions, the Nigerian government equally advised the citizenry to stay indoors in the month of March year 2020 as a preventive measure to curtail spread of the virus, thus home isolation became obligatory for the Kwara state citizens and the Nigerian population at large with the exception of individuals on special duties like security agents and medical personnel.

The home isolation lasted for five months and this affected the income of artisans, petty traders, daily workers, hawkers of various items, the peasant farmers (farmers with limited land ownership) and smallholder farmers because all had to adapt to the modification in their work plan by the government. This brought about an extensive interference with agricultural output and food circulation.

In developing economies, the livelihood of citizens and the general populace is interrelated and coupled with agriculture, thus translating to the significance of agriculture in developing countries (Evaluation Cooperation Group (ECG, 2011; Mozumdar, 2012). Agriculture is a principal sector of the Nigerian economy; it furnishes 40% of the country's GDP (FMARD, 2000). In addition, it is the anchor of most families for employment and staple food (Udoh 2000; Nwaiwu *et al.*, 2022). During the nationwide lockdown there was instability in the supply chain of all essential and non-essential items. Perishable items particularly vegetables were mostly affected, vegetables are important parts of the human diet, they are good sources of natural antioxidants, minerals, dietary fibre, iron and phosphorus (Lola, 2009; Fabiyi 2022a,b). It often serves as compensation for the absence of animal proteins in diet, and are produced mostly by the peasant and smallholder farmers in Nigeria as a key source of revenue (Ajibola 2015; Fabiyi *et al.*, 2022). In view of the foregoing, this research was set to evaluate primarily the impact of lockdown on the income of farmers who produces *Corchorus olitorius* (ewedu), *Abelmoscous esculentus* (okro), tomatoes, amaranthus, *Celosia argentea* and peppers in the study area, source of information and measures taken by the farmers to curtail the spread of the virus. Secondly, the socio-economic factors and the constraints facing vegetable production in the study area were equally assessed.

Materials and Methods

Kwara state is made up of sixteen local government areas with an area of land of about 36,825 km², within latitudes 7° 45'N and 9° 30'E and 6° 25'E out of which 75.3% is fit for cultivation. It is situated in the Sudan savannah agro-ecological zone. Temperature is between 31-35°C with an annual rainfall of 1000-1500mm (Ajibola *et al.*, 2015). Climate in the study area is defined by dry and raining seasons. Dry periods span through the months of November to Mid-April, while the rains commence from Mid-April to October. Relative humidity fluctuates between 75-88% and 35-80% in the wet and dry seasons correspondingly (Ajibade, 2004; Ajadi *et al.*, 2016).

The State is divided into four zones for ease of administrative service, these are Zone A (Baruteen and Kaima LGAs); Zone B (Edu and Patigi LGAs); Zone C (Asa, Ilorin East, Moro, Ilorin South and Ilorin West LGAs); Zone D (Ekiti, Ifelodun, Irepodun, Isin, Offa, Oke-Ero and Oyun LGAs). Three local governments (Asa, Ilorin East, and Ilorin West LGAs) were carefully selected from Zone C because of the generality and superiority of vegetable farming in the local government areas. Then four farming communities were picked randomly namely, Odota (Asa Local Government Area), Sawmill (Ilorin West Local Government Area), Amoyo and Sentu (Ilorin East Local Government Areas). Thirty vegetable farmers were then selected arbitrarily from each of the farming communities. Primarily data was collected through the use of structured questionnaire. Interview was also organized with the farmers between the month of July and October 2021 to augment the questionnaires. The data gathered from questionnaires were analysed using descriptive statistics, inferential statistics, Likert scale rating, cost and return analysis and multiple regression model.

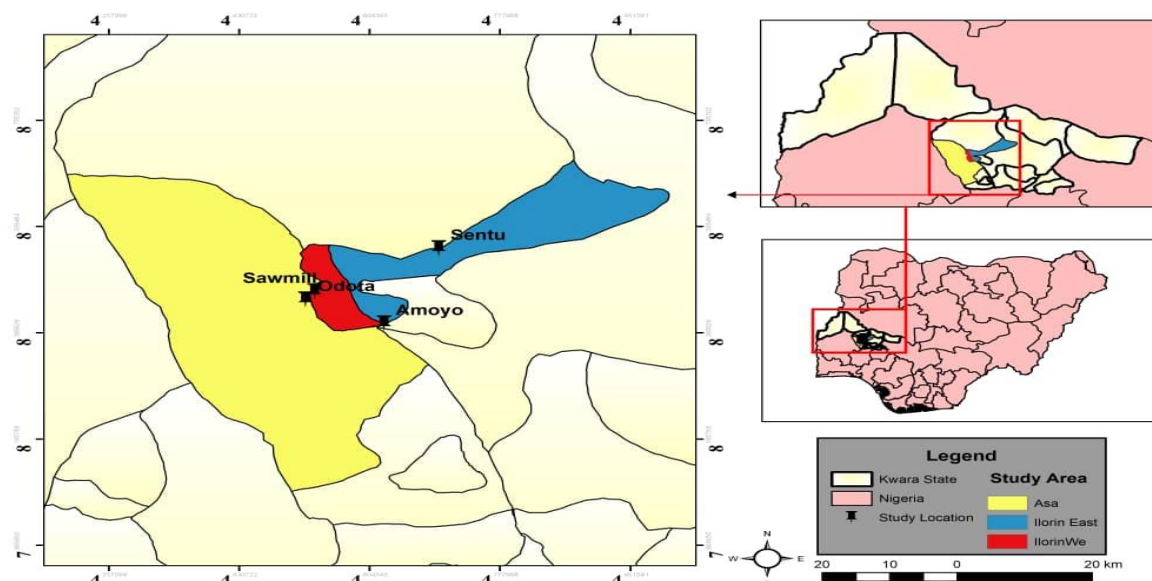


Figure 1: Map of Nigeria Showing Kwara State, Local Government and Communities Sampled

Costs and Return Analysis

Cost and return analysis approach was adopted in the calculation of the gross margin (GM). Costs incurred on vegetable production before, during and after the novel Covid-19 lockdown were noted. So also, the corresponding returns from sales of vegetables were equally taken. GM was calculated as difference between Total Revenue (TR) and Total variable cost (TVC)

$$GM = TR - TVC \dots\dots\dots (1)$$

Where GM = gross margin, TR = total revenue and TVC = total variable cost. Total revenue is derived from the product of quantity of vegetable sold and unit price

$$TR = p * q \dots\dots\dots (2)$$

Where TR is the total revenue; p = price per unit and q = quantity of vegetable sold. The total variable cost (TVC) is quantified as total cost of all variable inputs used in vegetable production such as items purchased, transportation, hired labour, fertilizer, pesticides and seeds. Also, the fixed cost of equipment and machineries was depreciated in accordance to the useful life. Hence the total fixed cost (TFC) was calculated.

To calculate the profit margin; total fixed cost was deducted from the gross margin

$$\pi = GM - TFC \dots\dots\dots (3)$$

Multiple Linear Regression Model

The multiple linear regression model comprises of two predictors by bringing together the terms β_1X_1 and β_2X_2 . This model states that the conditional mean of y at given values of X_1 and X_2 is $\beta_0 + \beta_1X_1 + \beta_2X_2$, for regression parameters β_0 , β_1 , and β_2 . Connoting that, on the average, the relationship between y and X_1 and X_2 is represented by a plane in three dimensions. That is, the conditional means of y fall on a plane given by the equation $y = \beta_0 + \beta_1X_1 + \beta_2X_2$. The parameter β_0 is they-intercept for the plane. The parameter β_1 gives the change in the conditional mean of y for a unit change in X_1 , while X_2 is fixed. Additionally, the parameter β_2 gives the change in the conditional mean of y for a unit change in X_2 , while X_1 is fixed. The parameters β_1 and β_2 are occasionally referred to as the partial regression coefficients since they are like the partial slopes for linear equations. The equation $y = \beta_0 + \beta_1X_1 + \beta_2X_2$ is called the population multiple linear regression equation or the population regression equation. In this study, some selected socioeconomic

characteristics, institutional factors and some farm specific factors were incorporated in the model to analyse the determinant of vegetable production in the sampled community. The explicit model was stated below;

$$Y = \beta_0 + \beta_1x_1 + \beta_2x_2 + \beta_3x_3 + \beta_4x_4 + \dots + \beta_{11}x_{11} + u_i \dots \dots \dots (4)$$

Where Xs = the explanatory variables and Y = dependent variables, that is, vegetable output (kg). X_1 = age, X_2 = gender (1 if female, otherwise 0), X_3 = level of education, X_4 = household size (number of household member), X_5 = farming experience (number of years in vegetable farming), X_6 = extension contact (dummy), X_7 = farm accessibility (dummy), X_8 = access to credit (dummy), X_9 = poor marketing (dummy), X_{10} = inadequate access to labour (dummy), X_{11} = inadequate access to inputs (dummy).

Results and Discussion

Table 1: Origin of Virus Information for the Farmers

Origin of information	Frequency	Percentage
Phone Device (SMS)	21	17.50
Community Meetings	11	9.16
Family and Friends	7	5.83
Radio Jingles	76	63.33
Extension Agents	0.8	0.67
Television Jingles	4.2	3.51
Total	120	100.00

Source: Field Survey, 2021

Table 1 above depicts the origin of information about the Covid-19 epidemic among vegetable farmers in the communities evaluated. The primary source of information is through radio jingles. 63.33% of the farmers got information through radio sets. 17.50% relied on SMS messages on their phone device, while 9.16% were informed about the epidemic at community meetings. Information dissemination from friends and families, television sets and through extension agents are 5.83, 3.51 and 0.67% respectively.

Table 2: Farmer's Safety Measures to Curb Virus Spread

Measures		Frequency	Percentage
Physical Distancing	No	21	17.50
	Yes	99	82.50
	Total	120	100.00
Nose Mask	No	0	0.00
	Yes	120	100
	Total	120	100.00
Good Dietary Habits	No	94	78.33
	Yes	26	21.67
	Total	120	100.00
No Handshake	No	13	10.83
	Yes	107	89.17
	Total	120	100.00

Source: Field Survey, 2021

The various activities of the vegetable farmers in trying to curb the spread of virus is presented in Table 2. 82.50% were compliant with the rules by practicing physical distancing, 100% of respondents used nose masks as a preventive measure from contacting the virus. Only 21.67% of the farmers could afford good

diets and 89.17% avoided handshake. Healthy eating is a key measure against viral infection (Calder, 2020). The inference here is that the sampled population lacked healthy diets which could boost their immune system and assist to avert viral disease infections.

Table 3: Budgetary Analysis of the Farmers

Variables	Before Lockdown	During Lockdown	After Lockdown
Total Revenue (TR) (₦)	107,765.8	55,414.4	155,974.2
Total Variable cost (₦)	63,530.9	46,335.3	66,485.6
Total Fixed cost (₦)	9,727.708	9,727.708	9,727.708
Total cost (TC)	73,258.608	56,063.008	76,213.308
Gross margin (TR – TVC)	44,234.9	9079.1	89488.6
Profit (π) = GM – TFC	34,507.192	-648.608	79,760.892

Source: Field Survey, 2021

Table 3 above presents the value of farmer's income before lockdown, during lockdown and after lockdown. The total revenue in this succession was documented as ₦107,765.8, ₦55,414.4 and ₦155,974.2 individually, while the total variable cost was ₦63,530.9, ₦46,335.3 and ₦66,485.6 correspondingly and the fixed cost which is mainly on water pump was ₦9727.708 for the three period considered. The result showed that loss was incurred by the vegetable farmers during the Covid-19-lockdown to the sum of ₦648,608. This result is validated by the findings of (Ridley and Devadoss 2021) who reported \$48million loss in fruits and vegetables during lockdown. In the same vein, (Ruan *et al.* 2021) deduced that there was a significant change in the price of Chinese cabbage and farmer's revenue while the lockdown lasted. In addition, (Martin *et al.* 2020) reiterated the extensive and severe losses during the lockdown.

The multiple regression analysis result of variables determining production of vegetables in the communities evaluated is presented in Table 4. Socio-economic factors, institutional factors and farm specific factors were considered. Eleven explanatory variables were regressed against output (measured in kilogramme). The adjusted R² (coefficient of determination) of 0.6242 explains that there was 62% disparity in vegetable production as illustrated by the joint effect of the explanatory variables. F-value of 17.47 which was significant at 1 percent level suggested the suitability of the model in appraising the determinants of vegetable production in the sampled community. The coefficient of extension contact and inadequate access to labour revealed negative sign and they are significantly influenced vegetable production. This indicated an inverse relationship between these explanatory variables and the outcome variable. Dissemination of agricultural information through extension personnel influences vegetable production. The coefficient of extension contact was statistically significant at 5% level of confidence; is an indication of decline in vegetable production in the study area by 0.1343, whenever there is a unit increase in extension contact. Although this result negated the a-priori expectation but it might largely be influenced by shortage of extension service and or innovative knowledge resistance from the farmer's end. The result was in accordance with the findings of (Akamin *et al.* 2017). In the same vein, inadequate access to labour will reduce vegetable production by 0.0005. Most vegetables have short production cycle and it demands intensive and timely attention to obtain optimum output. By implication, inadequate access and utilization of labour will significantly reduce

output. Furthermore, the result showed household size, gender, and access to credit having direct and significant relationship with vegetable production. The coefficient of household size was positive and statistically significant at 5% level -implying that an increase in household size will lead to increase in vegetable production by 0.0164. Authors (Nwaiwu *et al.*, 2022; Obinaju and Asa, 2013) posited the engagement of family labour as a source of unpaid labour and an important asset in small-scale farming activities. In fact, family labour constitutes larger percentage of labour used by most smallholder farmers. In addition, credit being one of the productive resources was found to influence vegetable production. The result shows that increasing access to credit will induce rise in vegetable production by 0.2770. Extra credit will enable farmers to spend more money to access production inputs, and expand production scale.

Table 4: Determinants of Vegetable Production in the Sampled Communities

Output	Coefficient	Std. Err.	t	P> t
Age	0.0029	0.0037	0.80	0.427
Gender	0.1969	0.0888	2.22	0.029**
Level of education	-0.0258	0.0353	-0.73	0.466
Household Size	0.0164	0.0083	1.98	0.051**
Farming Experience	0.0087	0.0080	1.08	0.281
Extension contact	-0.1343	0.0656	-2.05	0.043**
Farm Accessibility	0.0100	0.0311	0.32	0.748
Access to credit	0.2770	0.0930	2.98	0.004***
Poor Marketing	-0.0502	0.0442	-1.14	0.259
Inadequate access to labour	-0.0005	0.0001	-9.47	0.000***
Inadequate access to inputs	0.0000	0.0000	-0.57	0.569
Constant	5.5151	0.2557	21.56	0.000***

Diagnostics:

Number of respondents =120

F (12, 107) = 17.47

Prob> F = 0.0000

Adjusted R²= 0.6242

Source: Field Survey 2021

Table 5 shows farmer's distribution on the difficulties encountered in vegetable production. Results revealed that high cost of transportation (35.83%), price fluctuation (28.33%), high cost of inputs (15.83%) and perishability of vegetables are the primary limitations of the farmers in the sampled community. The production of vegetables is beset with constrains even before the confinement period and farmers are intimidated by poverty because they lack basic things which often times influence production (Adebiyi *et al.*, 2020). The report of (Ibeawuchi *et al.*, 2015) supports the findings in this study. They reported that transportation issues and perishability of vegetables are primary challenges faced by the farmers, while (Adelani *et al.* 2011) remarked that high cost of inputs is a big constraint in production of vegetables. Similarly, high cost of inputs was also the submission of (Adeoye 2020).

Table 5: Constraints Faced by Farmers in the Study Area

Variables/Statement	Very serious	Serious	Moderately serious	Less serious	Not serious	Weighted score	Mean score	Rank
High cost of transportation	43 (35.83)	32 (26.67)	45 (37.50)	0 (0.00)	0 (0.00)	478	31.87	1 st
Price fluctuation	34 (28.33)	37 (30.83)	41 (34.17)	8 (6.67)	0 (0.00)	457	30.46	2 nd
Inadequate credit facilities	3 (2.50)	43 (35.83)	60 (50.00)	14 (11.67)	0 (0.00)	395	26.33	6 th
Poor marketing information	3 (2.50)	50 (41.67)	46 (38.33)	21 (17.50)	0 (0.00)	395	26.33	7 th
Perishability of produce	11 (9.17)	43 (35.83)	47 (39.17)	19 (15.83)	0 (0.00)	406	27.07	4 th
Storage problem	11 (9.17)	32 (26.67)	50 (41.67)	24 (20.00)	3 (2.50)	384	25.6	8 th
Low patronage	17 (14.17)	17 (14.17)	26 (21.67)	56 (46.67)	4 (3.33)	347	23.13	10 th
Inadequate supply	2 (1.67)	20 (16.67)	60 (50.00)	31 (25.83)	7 (5.83)	339	22.60	11 th
Pests and diseases	5 (4.17)	25 (20.83)	70 (58.33)	18 (15.00)	2 (1.67)	373	24.86	9 th
Lack of improved seeds	6 (5.00)	41 (34.17)	62 (51.67)	9 (7.50)	2 (1.67)	400	26.67	5 th
High cost of inputs	19 (15.83)	55 (45.83)	44 (36.67)	2 (1.67)	0 (0.00)	451	30.07	3 rd

Source: Field Survey, 2021 (Percentage in parenthesis)

There was a clear negative impact on the relationship between production, labour, supply, demand and revenue during the lockdown. This disproportionate correlation led to global financial losses on several commodities, including vegetables in Kwara state Nigeria. The absence of buyers plunged Ethiopian vegetable farmers into debts (Tamru *et al.*, 2020). The correlation between agricultural productivity and Covid-19 outbreak was appraised by (Okolie and Ogundeji, 2022), they deduced that there was significant interference in the agricultural food supply chain. Equivalently, (Buheji *et al.* 2020) concluded that individuals in poor communities were pushed into poverty owing to the Covid-19 pandemic movement restrictions. There was breakdown in traffic flow which brought about disruptions in vegetable marketing. Generally, vegetable production was adversely affected by the confinement during the Covid-19 outbreak in Kwara state Nigeria, owing to the limitation in mobility of the farmers, labourers and all producers in the vegetable production value chain, which eventually aggravated into reduction in the orderliness of vegetable production and distribution thus culminating into decay of the vegetables. It is imperative to ameliorate the performance ability of vegetable farmers in order to boost food security giving the significance of vegetables in the human diet.

Conclusion

Vegetable production is plagued by several challenges. Food insecurity and poverty are more pervasive among farming communities. Provision of credit facilities will go a long way in addressing the key issues hindering vegetable production in the post Covid-19 era giving the significance of vegetables in the human diet. It is pertinent for extension workers to provide information to the rural farming communities. The results in this research revealed that the extension system in

Nigeria has disregarded the vegetable farmers in the farming community sampled. It is imperative to convey modernization of management exercise to vegetable farmers in the sampled communities. It also important to prioritize storage of perishable items, Government should support the vegetable farmers with capacity building to preserve the vegetables with cold-storage facilities. This will improve production output, sustain production and raise their income considerably and by such means, their quality of life will be ameliorated. This research puts forward and suggests that unconditional cash support programmes should be provided to vegetable farmers in general to lessen the impact of low revenue in subsequent circumstances in post-Covid-19-era to save them from the risk of production loss and poverty. Provision of cold-storage amenities would guide against losses of vegetables

Competing interest statements:

The authors have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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