Covid-19 Pandemic and Profit Values among the Wet Season Watermelon Producers in Kano State, Nigeria

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Abstract:

The study was carried out to find out the effects of the Covid-19 Pandemic on the Profit values of watermelon (Citrullus lanatus) production across wet seasons in Kano State, Nigeria. Multistage sampling procedures were used for the selection of the respondents. A total of 125 producers, and 20 key informants were interviewed. Primary data were collected using structured questionnaires and checklist. The data collected was analyzed using descriptive statistics and Net return Income model. The results revealed that average Watermelon yield of 24,473.64kg/ha and 19,378.55kg/ha was obtained during the dry season enterprise before and during the Covid-19 Pandemic in the study area, respectively. The result further revealed that Watermelon production enterprise was a profitable venture with Net farm income of ₦469,717.68/ha & ₦355,839.26/ in dry seasons before and during the Pandemic, respectively. However, findings also revealed that farmers obtained higher yield (24,473.64kg/ha) and profit (₦469,717.68/ha) respectively, in the study area before the Covid-19 Pandemic. Most important constrains to Watermelon production during the Pandemic was the restrictions of human and vehicular movements which lead to rising cost of labour and material inputs as well as Glut. The study finally recommends immediate credit and loan intervention by governments and donor

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agencies as well as the establishment of processing firms, to address the flight of the farmers

Keywords: Covid-19 Pandemic, Watermelon, Costs, Profit, Kano.

1. INTRODUCTION

Over the years, farmers in Nigeria have been actively engaged in the production of some cash crops like cocoa, rubber, palm kernel, cotton and ground nut for export as their means of livelihood. However, this trend has gradually changed after independence of the country form the British Government in 1960. Farmers thereafter have the liberty to produce crops of their own choice. This is particularly common in northern Nigeria where farmers shift to the production of cereals like maize, guinea corn, rice, and some vegetable crops like tomato, pepper and onions on which they have comparative advantage over their counterparts in the south. Recently, another fruit vegetable, 'watermelon' has gain acceptance among small scale farmers in the region. Watermelon (*Citrullus lanatus*) is an important horticultural crop, mostly known for its sweet and juicy fruit, grown in warm climates all over the world (Robinson and Decker-Walters, 1997; Jeffrey, 2011, Harry et al, 2015). Several studies have discussed on the controversy relating to the origin of watermelon. However, the Sahel region in North Africa and the Kalahari desert in Southern Africa where many wild species of the crop are found are believed to be the major centers of origin (Wasylikowa & vander Voseen, 2004). The production and distribution of the crop, therefore started from Africa and thereafter speared to other continents like Asia and Europe since 961 AD and later to United states in 17th century (Wehner, 2008). It is ereported that the global production of the crop has increased by 89.9 million mega grams (FAO, 2012). Similarly, production of watermelon in African nations has been intensified in both dry, low altitudes as well as the equatorial regions (De Lannoy, 2001). In Nigeria, cultivation and production of watermelon has upsurge significantly in the last decades with higher production in Sahel, Sudan and Guinea regions of country (NIHORT, 2016). Watermelon consist 92 percent of water and 8 percent sugar. It also

has higher content of lycopene and antioxidant. Juice products and oil rich Vitamin D from the seeds are among its benefits. Similarly, the crop produces energy, clean human organs, Vitamin C, Vitamin B, and mineral content include proteins, zinc, iron, magnesium as well as calcium (Ignjatovic, 2005; HonCod, 2008; Kim, 2008). According to Saleh (2012) Watermelon production in Northern Nigeria Particularly North west and North Eastern parts of the country has over the years gradually became a viable enterprise providing small scale farmers in the region with alternative commercial crop successfully competing with already over plugged fruits and vegetables like Tomatoes, Onions, and Peppers etc. that are being produced in the area. This provides the teeming population with not only a means of livelihood but also the required micro nutrients deficient in the diet of the people of the region as reported by FOA (2012).

Studies revealed that watermelon production has gain acceptance among smallholder producers in Kano States due to its huge economic potentials as a profit giving enterprises which is facilitated by the availability of irrigation facilities across the state. The high demand of the commodity from across the country and beyond makes farmers in the area to extend the production of the fruit to cover both dry and wet seasons, thereby ensuring all year round production and supply of the commodity (Muhammad, 2014, Saleh, 2012 & Saleh 2021). However, preliminary survey suggests that watermelon production in the study area under both irrigation (dry season) and rain-fed (wet season) systems poses similar and also varied problems. Producers have serious concerns over fluctuations in volume and value of output from both dry and wet season production. Variations in the amount and prices of inputs used for both wet and dry season production of watermelon leads to differences in efficiency, costs, returns and quality of the watermelon produced. These differences could also vary across locations. Glut and low prices of the commodity is apparently another serious source of concern to producers. Managing production of a vegetable crop such as watermelon requires detailed and accurate information on the most profitable production system (irrigation or rain-fed) combination(s) of inputs and glut handling. This information is not common among watermelon producers in the study area. Other researchers have looked at production of watermelon in a general manner as in the case

of value chain analysis (Saleh, 2012 & Saleh, 2021), resource use and profitability analysis under separate production systems (irrigation or wet season). An integrated study to look at both irrigated and rain-fed production across locations with demand and supply relationship is an important gap that needs to be filled. Interestingly, production and marketing constitute a continuum hence lack of development in one retards progress in the other (Abba 2009). Hence the study examines the effect of Covid-19 Pandemic on the Profitability of dry season watermelon production in Kano state.

2. REVIEW OF LITERATURE

The linkage among agricultural output (fruits and vegetables) and COVID-19 pandemic have analyze in the literature. For instance, Farias and Araújo (2020) examine the influence of COVID-19 pandemic on fruits and vegetables prices in Brazil. The estimated outcome reveals that COVID-19 pandemic deteriorates agricultural products prices. Similarly, Chaudhary and Kumar (2020) studied the effect of COVID-19 pandemic on agricultural production in India. The result illustrates that COVID-19 pandemic negatively influence agricultural output and reduce contribution of agricultural sector. Ridley and Devadoss (2021) argued that fruits and vegetables production is negatively affected by COVID-19 pandemic in USA. Rasul (2021) investigates the influence of COVID-19 pandemic on agricultural production and food supply in Asia. The study outcome illustrates that COVID-19 pandemic reduce agricultural output production and food supply. Moreover, Ali and Khan (2021) examines the influence of COVID-19 pandemic on agricultural product prices in India. The outcome shows that COVID-19 pandemic deteriorates agricultural product prices especially fruits and vegetables. Several studies have examines the link among COVID-19 pandemic and agricultural output. However, the influence of COVID-19 pandemic on watermelon production specifically in Northern Nigerian has not been analyzed. Hence, the study examines the influence of COVID-19 pandemic on profits of watermelon famers in Kano state.

3.1 Methodology

3.2 Study area

The study was conducted in the North-West zone of Nigeria, specifically targeting Kano. All the state fall under the Sudan Savannah agro-ecological zone of the country.
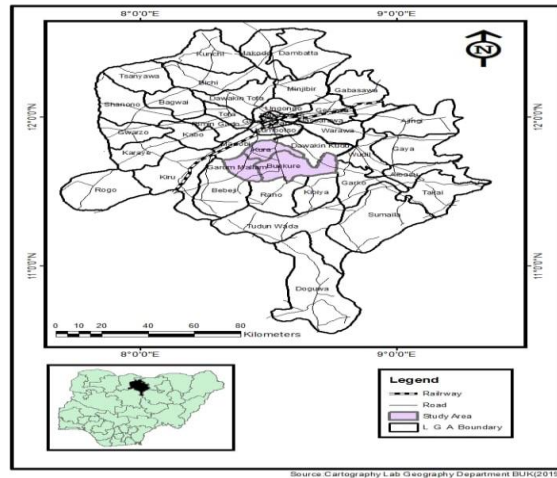

Figure 1: Map of Nigeria showing Kano State.

3.3 Sampling procedure

Multistage sampling technique was employed in the selection of the producers for the study. In the first stage, Kano state was selected purposively as a result of the high concentration of watermelon producers in the state. The second stage involved the selection of production clusters according to the concentration of the Watermelon farmers in the State; specifically, Bunkure, Kura and Garum-malam Local Government areas were selected. These Local Government areas were selected because of the prevalence of the wet and dry season watermelon production in the areas which was facilitated by the presence of Irrigation facilities in the area. In the third stage, a total of 125 producers will be selected from the list of 358 farmers obtained from the Water Users Association (WUA) in Kano and Jigawa States. (at a 95% level of confidence)

This will be determined using the formula:

$$X = Z(^c/_{100})^2 r(100\text{-}r)$$

$$N = {}^{Nx}/_{((N\text{-}1)E^2 + x)}$$

$$E = \text{Sqrt}[^{(N\,-\,n)x}/_{n(N\text{-}1)}]$$

the sample size n and margin of error E are given by
Where N is the population size,
n = the sample size
r = the fraction of responses that you are interested in,
And $Z(c/100)$ = the critical value for the confidence level c.

125 samples size was used in the study locations based on proportions of wet and dry season watermelon farmers in the selected production clusters. Microsoft Excel program will be used to randomize lists of producers to enable random sampling (Table1).

This study recognizes that the estimates of population parameters from a large sample (n>30) are satisfactory estimates of the true population (Koutsoyiannis, 2003). Based on this, the study utilized large sample size (n > 30) but not so large beyond the capabilities of resource available to conduct the study.

Table 1: Sample size of the watermelon Producers

Production Cluster	Dry Season	
	Sampling Frame	**Sample size**
Kano:		
Bunkure	148	84
Kura	59	24
Garum-malam	46	17
Total	253	125

Source (water users association)

In addition, a total of 20 key informant producers of the commodity were identified across the state for qualitative interview to further augment the data on the effects of Covid-19 Pandemic profitability of watermelon production in the area.

3.4 Method of data collection

Structured questionnaire was administered by trained enumerators to obtain primary data from dry and wet season watermelon producers across the state during the 2020 and 2021 growing seasons. Data

collected covered information on the socio-economic characteristics of the watermelon producers such as age, sex, marital status, household size, educational status, years of experience in the enterprise, extension contact, and access to credit and membership of cooperative societies etc. Data on production inputs including quantities of seeds, fertilizer, chemicals, irrigation water (for dry season enterprise) as well as quantity of labour used by the farmers for both dry and wet season enterprises will all be captured for analysis.

3.5 Analytical technique

The Net Farm Income (NFI) was utilized to evaluate the profitability of both Dry and wet seasons Watermelon producers. Net Farm Income measure returns to naira invested in the enterprise, according to Sanni and Ogundipe (2003) and Balogun *et al.*, (2006). NFI is the income generated from the enterprise, which can be drawn without affecting the future rate of production operation. It measures returns to unpaid factor inputs such as family labour. NFI is expressed as follows:

$$NFI_D = GFI – TVC+TFC \tag{1}$$

Where:

NFI_D = Net income from dry season watermelon production (₦).

GFI = Value of total Watermelon output (₦)

TVC = Total variable cost of watermelon production (₦) expressed as:

$$\sum_{i=1}^{n} P_{i.} X_{.j} = \left(P_{x1} X_1 + P_{x2} X_2 + P_n X_n \right) \tag{2}$$

Where,

P_{X1}= Rental value of farmland dedicated to watermelon (₦/Ha)

X_1 = Size of farmland dedicated to watermelon production (Ha)

P_{X2}= Unit cost of seed used in Watermelon production (₦/kg)

X_2 = Quantity of seed used in watermelon production (kg/ha)

P_{X3}= Unit cost of fertilizer used in watermelon production (₦/kg)

X_3 = Quantity of fertilizer used in watermelon production (kg/ha)

P_{X4}= Unit cost of herbicide used in watermelon production (₦/litre)

X_4 = Quantity of herbicide used in watermelon production (litre/ha)

P_{X5} = Unit cost of pesticide used in watermelon production (₦/litre)

X_5 = Quantity of herbicide used in watermelon production (litre/ha)

P_{X6}= Unit cost of labour used in watermelon production (₦/man- day)

X_6 = Amount of labour utilized in watermelon production (man-day)

P_{X7} = Unit cost of Irrigation water used in watermelon production (₦/day)

X$_{7=}$ Amount of Irrigation water utilized in watermelon production (litres/day)
TFC= Depreciated value of equipment used in watermelon production.

The depreciation method used is the straight-line method where equal periodic charges are estimated over the calculated life span of the asset. This method was used because of uniform annual charges. It is expressed as:

$$D = \frac{P - S}{N}$$

(3)

Where;
D = Depreciation on production asset
P = Original cost of production assets
N = Number of years of production asset's life.
S = Salvage value of the asset.

4. RESULT

Profit analysis of the Watermelon producers
The results of the profitability analysis (Table 1) presents the costs and returns associated with dry season's watermelon production before and during the Covid-19 pandemic in the study area. Generally, revealed that, the variable cost components alone constitute 69% and 77% of the total cost of production before and during the Covid-19 pandemic, respectively. Among the variable components, cost of labour alone took up to 51% & 55% before and during the Pandemic respectively. This implied that variable cost components constitute the major production cost in the watermelon production enterprise dry the season. The result is in agreement with the findings of Adeoye *et al.* (2011) in Oyo State, Saleh (2012) and Muhammad (2014) in Kano State.

The result further revealed that the enterprise is a labour intensive venture as the costs of labour across the study area constituted over 50% of the total variable costs before and during the Pandemic. In general, the result also shows that the total variable costs (TVC) was higher than the total fix costs (TFC) during the season. Since labour was the major cost component among the TVC, its higher value may be as a result of the high demand for labour and hence higher prices in the season because of competing needs from

other crops as a result of the lockdown and associated restrictions and protocols of the Pandemic. This is in agreement with the findings of Adeoye *et al.* (2011) in Oyo State, Saleh (2012) and Muhammad (2014) in Kano State. The total yield obtained in the season before and during the Pandemic was estimated at 24,473.64kg and 19,378.55 kg respectively. This revealed that there was a decrease in yield of the Watermelon by 21% as a result of the Pandemic and subsequent luck down in the study area. This also implied that the restrictions during the lockdown lead to the decrease in yield of Watermelon as a result some difficulties experienced by the farmers in terms of timely acquisition and rising costs of material inputs like seeds which increase by 33%, Agro-chemicals (30%) and labour (25%) as indicated in the cost components. This result conforms with the *a priori* expectations and opinion of the key informants during the period of the survey, that lower watermelon yield will be obtained during the Pandemic and its associated human and vehicular restrictions which lead to difficulties in access to and rising costs of inputs resulting in delay and untimely farm operations. The results also revealed that the average net farm income for the dry season enterprise was ₦469,717.68 /ha and ₦355,839.26 /ha before and during the Pandemic, respectively. This means that watermelon farmers in the state realized profit, and that higher profit to the tune of ₦113,878.42 /ha was realized before the advent of the Covid-19 over that obtained during the Pandemic. In addition, this further implied that the profit level of the watermelon farmers has been reduced by 24% in the study area as a result of the Covid-19 Pandemic. The finding closely agrees with the findings of Adeoye *et al.* (2011) who reported a net margin of ₦288,448.96 k/ha in Oyo State and Saleh (2012 & 2021) also reported a net income ₦321,654.43 k/ha but strongly disagrees with that of Baba *et el.* (2014) who reported a comparatively meager amount of ₦30,946 k/ha in Kebbi State.

Furthermore, this monetary loss by the farmers as a result of the Pandemic is more pronounced when an aggregate loss for several hectares is considered. For example since farmers loose an average of ₦113,878.42 /ha (representing 24%) of their profit as a result of the Pandemic in dry season, it implies that when 100ha are to be considered, farmers in the area must have lost a whooping sum of ₦11,387,842 of their capital investment in only100 ha of Watermelon

.The effect of this loss is likely to be more severe when other vegetable crops that are more perishable like Tomatoes, Pepper, and Onions are considered. Beside, this quantum of money that was lost by the farmers in form of profit is greatly required for re- investment in the production of other crops including the staple crops like rice, maize and guinea corn thereby posing serious danger to their production in the next coming year.

Table 1 Estimated result of Covid-19 pandemic and profit value among the Dry season Watermelon Producers in Kano State

Variable	Quantity	Before Covid-19 Price/₦	During Covid-19 Price/₦	% Change
Seeds	0.67	16,188.44	21,554.24	+33.14
Fertilizer	313.11	41,441.97	45,684.72	+9.28
Pesticides	1.97	3,575.61	4,650.22	+23.11
Herbicides	0.51	1,062.83	1,520.00	+30.10
Labour (Mds)	45	65,718.80	88,524.65	+25.76
TVC		127,987.65	161,933.99	+20.93
Fixed Inputs				
Farm size	0.88	37,324.51	37,324.51	-
Water pump	01	14,236.48	14,236.48	-
Siphon	02	2,997.02	2,997.02	-
Sprayers	02	2,436.89	2,436.89	-
TFC		56,994.54	56,994.54	-
Total Cost (TC)		184,982.19	218,928.53	+15.50
Returns				
Average yield (Kg/ha)		24,473.64	19,378.55	-20.81
Average Price (₦/Kg)		26.75	29.66	+9.81
Total Revenue (₦/ha)		654,669.87	574,767.79	-12.20
Net Farm Income (₦/ha)		469,687.68	355,839.26	-24.23

Source: Field survey, 2021

5. CONCLUSION

Watermelon production enterprise has grown to be an important venture in terms of income generation and provision of employment for the teaming population in the study area. The enterprise is a profitable venture with varying degrees of profits between the wet and dry seasons. However, the Covid-19 Pandemic and its associated protocols of lockdown along with restrictions of human and vehicular movements has negatively affects the yield, and profit values of the farmers in addition to an alarming Glut situation. The study recommends for immediate credit and loan interventions by Governments and donor agencies in order to alleviate the farmers'

condition and to keep them in business after the devastating loss as result of the Pandemic. It is also recommended that farmers devote more of their land and other resources to dry season enterprise in order to generate more profit. This is because consumption of the commodity is higher during dry season as compared to the rainy season. In addition, the dry season enterprise is characterized by less incidences of pests and diseases and also enjoys less competition of resources with other crops (cereals) usually grown during wet season in the study area.

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