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ANALYSIS OF PROFITABILITY OF IRRIGATED VEGETABLE PRODUCTION: CASE OF BORNO STATE, NIGERIA

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ABSTRACT

This study analysed the profitability of irrigated vegetable production among farmers in Borno State, Nigeria. Multistage sampling techniques were used to sample the respondents. Structured survey questionnaires were used and administered to 300 respondents to obtained primary data. Gross margin analysis was used to analyze the profitability of the studied vegetable enterprises respectively. The results revealed that sole onion, sole tomato, and sole pepper enterprises had a gross margin per hectare of ₦78,031.99, ₦93,300.50 and ₦56,110.00 respectively. Also onion/tomato, onion/pepper, tomato/pepper and onion/tomato/pepper enterprises had a gross margin per hectare of ₦127,534.91, ₦109,661.50, ₦154,252.70 and ₦59,380.00 respectively. The positive gross margins imply that irrigated vegetables production was profitable and mixed vegetable enterprises were more profitable. It was also concluded that irrigated vegetable production is profitable despite some identified constraints. It is recommended that extension education on the benefit of women in agriculture should be provided in the study area to break norms and cultural practices that prevent female from participating in the vegetable production. There is also a need for the concerned agencies to promote both formal and non-formal education. It is recommended that the government should provide support in respect to price stability, good market facilities and market information to enhance efficient vegetable production in the study area.

1. Introduction

Vegetables are herbaceous plants and plant parts which sometimes can be consumed raw or with minimal cooking (Raman, 2011). Vegetables can be bulb (Gallic, Onion, Chives and Letch); fruity (Pepper, Okra, Egg-plant, Cucumbers and Tomatoes); inflorescent (Cauliflower, Broccoli and Cirticholces); leafy (Cabbage, Sorrel, Spinach, Lettuce and Eudived); root (Carrot, Malanga and Beets) and stalk (Asparagus, Baomboo and Chard). Vegetables can be grown in different climatic conditions as reported by Babalola et al. (2007) and Gambo, (2008). Climates with extreme heat, cold, excessive rainfall or drought (Babalola et al., 2007; Gambo, 2008).

Consumption of vegetable is very important in the dietry intakes. It help in protecting the body against diseases and improved digestion as it contained fibre, low fat and calories (AVRDC, 2006)Vegetables form an important part of our daily food. They help in protecting the body against diseases. Almost all

vegetables are low in fat and calories, and many of them are good sources of fibre. The high level of fibre in vegetable keeps the digestive system healthy and prevents constipation The Production of vegetable provide income to the farmers especially small-scale farmers and employment and the population (Oladoja et al. (2006) and shettima et al. (2016). The vVegetable production also serves as sources of livelihood for small-scale farmers, create employment opportunities for the populace, generate income and reduce poverty (AVRDC, 2006; Oladoja et al., 2006).

Nigeria is one of the vegetable producing nations in Africa. In the past, it was found to be producing below major African producing nations, but currently, there is an improvement in the production level. As ofat 2008, production records were put at 532,201 million metric tonnes, which is highest compared to other African vegetable producing nations (CBN, 2009).

Borno State is one of the States where vegetable production is highly practised. The State is also blessed with lakes and rivers such as Lake Chad, Lake Alau, Lake Tilla, River Ngada, River Yazaram, and River Yare just to mention few, where irrigation farming is carried out especially during dry season. The vegetable mostly grown in the state are onion, tomato, pepper,okra, sorrel, lettuce , carot and eggplant. As a result of common agronomic practices these vegetable are mostly cultivated as mixed crop especially tomato and pepper, onion tomato, onion pepper and sorrel and cabba ge-lettuce. They are mostly cultivated during dry season under irrigation (Shettima et al., 2015). According to NAERLS, (2009) BOSADP, (1993), NFRA, (2008), Lawan et al. (2010) Shettima et al. (2016) reported that in Borno State the area of land put under cultivation for vegetable production was about 10, 000 hectares of land that produced a yield of about 15.25 tonnes per hectatre of onion 6.09 tonnes per hectatre of tomato and 9.65 tonnes per hectatre Production of vegetable is largely carried out during dry season under irrigation condition, although it is also grown under rain- fed agriculture. About 10,000 hectares of land is devoted to vegetable cultivation in the State. The vegetable crops commonly grown in Borno State include onion , tomato, pepper, okra, egg-plant, sorrel, lettuce, cabbage and carrot. Most of these are grown as mixed crops especially onion, tomato and pepper, amaranthus and sorrel, cabbage and lettuce and so on. An average yield of about 15.25 tonnes per hectare, 6.09 tonnes per hectare and 9.65 tonnes per hectare of onion, tomato and pepper respectively are reported to be produced in the State (NAERLS, 2009; BOSADP, 1993; NFRA, 2008; Lawan et al., 2010). Production of vegetables in the State is still at small-scale level, in spite of its economic growth potentials. Studies involving farmers' profitability of irrigated vegetable production measure could be a sound basis for harnessing the growth potentials in vegetables farming.

The objectives of this study are to examine the profitability and constraints in irrigated vegetable production among farmers in Borno State, Nigeria. The study covers the single production season of 2012/2013 season. The enterprises considered under this study are onion, tomato and pepper, which are known to be of high economic value in the study area and can be produced under similar production conditions.

2. Methodology

The Study Area

The study was conducted in Borno State, Nigeria. The State lies between latitudes 10002′N and 13004′N and longitudes 11004′ E and 14004′E (Agboola, 1987). The State shares borders with Adamawa State to the south, Yobe State to the west and Gombe State to the southwest. It also shares international borders with the Cameroon Republic to the east, the Chad Republic to the north-east and

Republic of Niger to the north. The State has a land mass of about 69,434 square kilometreers (Borno State Diary, 2013). Administratively, it has 27 Local Government Areas (LGAs) with a projected population of about 4.8 million people based on 2.8 growth rate (NPC, 2006).

The State is divided into three agro-ecological zones; the Sahel to the north, Sudan Savannah in the central and southern parts of the State and Guinea Savannah in the southern part. The average rainfall is 300mm in the north and about 1000mm in the south (Agboola, 1987). The rainy season in the State usually starts in April and ends in October. The temperature ranges from 250C - 470C but instantaneous temperature might reach up to 470C during the hottest months of March-May (BOSADP, 2010).

The major occupation of the inhabitants is farming. Food crops commonly cultivated include millet, sorghum, maize, groundnut, cowpea, rice and wheat. Fruits and vegetables grown include mango, orange, guava, tomatoes, onion, pepper, carrot and garden-egg. The State is known for its vegetables production, produced throughout the year, which can be grown both under irrigation and during the raining season. Most of the vegetables can be grown as sole or mixed crops. The vegetable production is carried out during dry seasons under irrigation around November to January.

Sampling Procedure

Multistage sampling techniques were used to select respondents for this study. The first stage involved selection of three Local Government Areas (LGAs) known for the production of vegetables, one from each of the three main agro-ecological zones of the State. This is because vegetables are produced in all the agro-ecological region of the state and to cover the whole State the selection was done based on the agro-ecological composition of the State. What tThe LGAs selected were Hawul in Guinea Savannah, Mobbar in Sahel Savannah and Bama in Sudan Savannah.

The second stage involved purposive selection of four villages each from the selected local Government areas. They were selected because of their prominence in vegetable production. This was based on the list of major vegetables producing villages obtained from the Borno State Agricultural Development Programme (BOSADP). The third and final stage involved the random selection of 300 respondents based on a 25% proportion of vegetable farmers in each of the selected villages. However, 296 questionnaires (about 98.6%) were retrieved and used for analysis. The sampling frame was a list of registered vegetable farmers in the selected communities obtained from vegetable farmers associations' offices.

Sources of Data

Primary data and secondary information were used for this study. The relevant cross-sectional/primary data were collected through the administration of structured questionnaires. Trained enumerators were used to administer the questionnaires. Primary data were collected on inputs quantities, cost of inputs, output quantities and prices of the output of irrigated vegetable producers in the study area. The secondary information was obtained from published materials such as government publications, BOSADP, CBN bulletins, annual statistical data and journals.

Analytical Techniques

Inferential statistics whereas used for the analyses of data obtained. The inferential statistics was gross margin was used to determine the profitability of the observed enterprises. Gross margin per enterprise bases was employed to analyze the profitability of the irrigated vegetable production in the study area. Gross margin of an enterprise was determined by subtracting the variable cost of production from returns from the sale of the produce. A profitable enterprise has higher total revenue than the total cost of production (Omonona, 2012). This was expressed as:

$$GM = \sum PiQi - \sum Cj\ Xj$$

Where:

GM = Gross Margin per hectare (₦)
Pi = Unit price of produce i (₦/kg/ha)
Qi = Quantity produced of producinge i (kg/ha)
Cj = Unit Cost of input j (₦/kg/ha)
Xj =Quantity of inputs j used (kgha)

PA production is said to be profitable when the total revenue derived from the production of irrigated vegetable is higher than the total cost of its production.

3. Result and Discussion

Profitability of Vegetables Production

Gross margin analysis was used to estimate the profitability of the different vegetable enterprises studied. The gross margin from production activities is the gross value of the enterprise output less all the variables cost incurred on the same enterprise during a production season. Table 1 provides the average distribution of the average gross margins of the enterprises. The enterprises considered were sole onion, sole tomato, sole pepper, onion/tomato, onion/pepper, tomato/pepper and onion/tomato/pepper. The results showed that the number of respondents that participated in each of the enterprises studied varied. Sole enterprises had the higher (51 per cent) number of respondents than the mixed vegetable enterprises (49 per cent) as indicated in Table 1.

The result revealed that gross revenue for sole onion was N218, 487.01 per hectare, (14.49 per cent of the total revenue). This means that sole onion production had about 14.49 per cent of the revenue accrued in vegetable production. The result also showed that sole tomato and sole pepper accounts for N211, 070.20 (14 per cent) and N122, 440.00 (8.09 per cent) respectively. The results indicate that sole vegetable had lower revenue as compared to mixed vegetable production. This may be because due to the fact that turn over received by farmers was high in mixed cropping than sole cropping as different vegetables are sold at the same time.

The results further revealed that onion/tomato had N250, 830 (16.63 percent), onion/pepper N 227, 055.56 (15.03 percent), tomato/ pepper N270, 400.00(17.93 percent) and onion/tomato/pepper N208, 000.00 (13 percent) revenue respectively. This indicates that the tomato/ pepper enterprise had the highest gross revenue. This might be becausedue to the fact that tomato and pepper are in high demand and consumed on a daily basis which yields high turnover, hence, provided more revenue to the respondents.

The Table 1 also shows total variable costs for vegetable production under different enterprises. The result revealed that total variable cost of vegetable production among the enterprises wasere sole onion had N140, 455.02 (16.92 per cent), sole tomato had N117, 777.70 (14.19 per cent), sole pepper had N66, 330.00 (7.99 per cent), onion/tomato had 123,295.09 (14.85 per cent), onion/pepper had N 117, 394.11(14.14 per cent), tomato/pepper had N116, 147.30 (13.99 per cent) and onion/tomato/pepper N 148, 620.00 (17.91 per cent). The result indicates that the costs of production for the enterprises varied. This may be as a result of differences in labour requirements, handling and other production activities. In the cost structure, labour constitutes the highest cost then followed by fertilizer then seed for all the variables. This may be because due to the fact that these inputs are the most important inputs in vegetable production and are highly scarce during the production season.

Table 1: Average Enterprise Gross Margin of Vegetables Producers (₦/ha)

Items	Sole Onion (n=58)	Sole Tomato (n=48)	Sole Pepper (n=44)	Onion/ Tomato (n=74)	Onion/ Pepper (n=40)	Tomato/ Pepper (n=18)	Onion/ Tomato /Pepper (n=14)
Gross Revenue	**218,487.01**	**211,078.20**	**122,440.00**	**250,830.00**	**227,055.56**	**270,400.00**	**208,000.00**
Variable Costs:							
Seed	5,962.84	10,256.80	2,340.00	20,951.00	7,534.67	6,220.00	14,680.00
Fertilizer	77,122.49	11,470.00	18,440.00	13,925.00	20,111.78	31,080.00	26,360.00
Herbicide/insecticide	6,780.25	17,664.00	9,040.00	12,520.30	4,958.94	6,681.80	8,400.00
Labour	38,588.45	68,132.60	22,370.00	68,897.80	74,076.22	61,916.00	86,184.00
Planting material	6,176.98	5,896.65	6,795.00	4,537.99	5,365.00	5,560.00	5,765.00
Irrigation water expenses	5,824.00	4,357.75	7,345.00	6,547.00	5,347.50	4,689.50	7,231.00
Total Variable Cost	**140,455.02**	**117,777.70**	**66,330.00**	**123,295.09**	**117,394.11**	**116,147.30**	**148,620.00**
Gross Margin	**78,031.99**	**93,300.50**	**56110.00**	**127,534.91**	**109,661.45**	**154,252.70**	**59,380.00**

Source: Computed from Survey Data, 2013.

The values of gross margin obtained from the table shows that tomato/pepper enterprise had the highest gross margin of N 154, 252.70 per hectare. This is followed by onion/tomato and onion/pepper enterprises, with a gross margin of N 127, 534.45 and 109, N 661.45 respectively. This may be because of turnover received by the producers on the different products and the demand for these products also supported the high gross margin. The result further revealed that sole tomato, sole onion, sole pepper and onion/tomato/pepper enterprises had gross margin per hectare of N 93, 330.00, N 78, 031.00, N 59, 380.00 and N 56,110.00 respectively. The result implies that though there was variation in gross margins, vegetable production is profitable as the farmers are making a profit.

Constraints Associated with Vegetables

The vegetable farmers sampled faced somea number of constraints in their farming activities. The constraints associated with vegetables production in the study area is presented in Table 2. The result in Table 2 revealed that most pertinent (ranked first) constraint of vegetable production in the study area was poor (low) price of the products. About 97.97 per cent of the respondents complained of the low price of their products, especially during the harvest period. This may be becausedue to the fact that most agricultural product associated with the low price especially during the harvest period. The implication is that poor price affects the revenue from sales.

The constraint of lack of government support ranked second and constitutes about 96.96 per cent. This means that almost all the respondents complained of lack of support from government especially regardingin terms of subsidizinge production inputs and enabling environment among others. The implication of this result is that lack of provision of adequate inputs at right quantities and at the right time affects the productivity of vegetable farmers.

Table 2: Constraints Associated with Vegetables Production

Constraints	Frequency	Percentage (%)*	Rank
poor price	290	97.7	1st
Lack of Government support	287	96.96	2nd
Lack of adequate market	286	96.62	3rd
Lack of adequate fertilizer	278	93.39	4th
Inadequate storage facilities	269	90.88	5th
Pest and diseases	177	59.89	6th
Inadequate technology	157	53.04	7th
Inadequate credit facilities	123	41.55	8th
Inadequate transportation	112	37.84	9th
Inadequate farm tools	101	34.12	10th
Thievery	95	32.10	11th
Total	**2175**	**734.27**	

Source: Field survey, 2013

* Multiple Response Exist

Lack of a good market for vegetable was ranked the third constraint (96.62 per cent) among the respondents in the study area. Due to the delicate and perishable nature of vegetables especially tomato there is the tendency of post- harvest losses to be high, bringing great losses to the farmers regardingin terms of profit and revenue.

Storage facilities are another constraint faced by a vegetable farmer in the study area. Ninety per cent of the respondents indicated that lack of storage facilities as one of the constraint encounter during the production of vegetable. Storage facilities such as cold store will go a long way reducing losses from post-harvest spoilage. This implies that storage facilities affect vegetable production in term of profitability because of spoilage.

Other constraints encountered in vegetable production in the study area were inadequate, and high cost of fertilizer ranked fourth (93.39 per cent), inadequate storage facilities ranked fifth (90.88 per cent), pests and diseases ranked sixth (59.80 per cent), inadequate improve technology ranked seventh (53.04 per cent), inadequate credit facilities ranked eighth (41.51 percent), poor and high cost of transportation ninth (37.80 percent), inadequate proper farm tools ranked tenth (34.12 and thievery was the last ranked (32.10 per cent). This implies that these constraints affect outputs in vegetable production. A similar result was found by Mbanaso and Kalu (2012) and Sanwal et al. (2000) that vegetable farmers faces a lot of challenges that reduces output in production.

Conclusion

The study concluded that the production of vegetables in the study area was profitable. This was justified by the positive gross margins obtained for the different vegetable enterprises studied. It was observed that irrigated vegetable production was constrained by lack of storage facilities, unavailability of ready market, low price and lack of government assistance regardingin terms of provision of inputs, poor price and transportation facilities. These challenges happened despite positive gross margins and high levels of efficiencies.

Recommendations

Based on the findings of the study the following recommendations were made:

i) Vegetable farmers should be mobilized and encouraged to strengthen the activities farmers' clubs and associations. This could help the vegetable farmers to acquire professional advice, inputs and credit facilities and use them efficiently, giving rise to efficiencies in vegetable production. i) There is to encourage the vegetable farmers in the study area to form association for eassy access to production inputs. This would enable them to aquire inputs at less cost through the cooperative and leads to profitable vegetable production.

ii) Fertilizer should be made available to farmers at affordable and cheaper rate to supplement the contribution of organic fertilizer to increase output and profit of the vegetable farmers.

iii) It is recommended that the Government should provide financial and material supports to farmers to improve the efficiency of vegetable production by making the soft loan available and accessible to vegetable farmers in the study area.

iv) An improvement should also be made on the provision of market facilities to established good price for vegetables produces to sustained production.

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