PROFITABILITY ANALYSIS OF VEGETABLE AMARANTH (*Amaranthus cruentus*) PRODUCTION ALONG METROPOLITAN JAKARA RIVER IN KANO, NIGERIA.

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Abstract
The study determined the profitability of vegetable amaranth production along Jakara River in Kano Metropolis, Kano State, Nigeria. Multistage sampling technique was employed for the selection of one hundred and eighty (180) producers of Amaranth. Data were collected with the aid of questionnaire. The data collected were analysed using mean, standard deviation, coefficient of variability, net farm income and some financial ratios. The results of the study revealed that the producers of amaranth had a mean age of 38 years; mean household size of 7 individuals, mean years of education of 5; mean years of experience of 19 and mean income level of N460,567 per annum. Furthermore, Net farm income of N213,965 per hectare; Return to naira invested of 0.71; Gross ratio of 0.58 and operating ratio of 0.50 were all indicating that Amaranth production was a profitable venture. The study recommends that the producers should be patronizing input marketers that supply at relatively cheaper prices, through market survey, to enhance the profit level; and should also enrol in formal adult classes.

Key words: Profitability, Amaranth production, *Jakara* River, Kano

Introduction
Urban and peri-urban agriculture is growing fast around all major countries in Africa with the increase of the urban population and consequent rising demand for fruits and vegetables. Irrigated agriculture will need to expand rapidly in future in order to cope with this rising demands (Ojo et al., 2011). However, water resources are limited and irrigation is very labour demanding because in many urban and peri-urban farming, irrigation water is carried by hand from the well, reservoir or river to the field (Leeuwan, 2001).

According to Adeyemo and Kuhlmann (2009) the fact remains that urban agriculture will complement rural supplies and food will need to continue to be produced in and around cities where there were more people. Urban agriculture will come with the additional benefit of substantially reducing some economically wasteful and environmentally unfriendly costs associated with transportation and packing of agricultural products, as is especially the case when such goods are produced far from their consumers.
In many developing areas, however, non-built up urban lands, especially those lying along the routes of urban drainage systems, are sometimes seen as locations for the production of some agricultural products that are in high demand by urban dwellers, such as vegetables, and several researches have shown that a significant proportion of a city’s food requirements in developing countries are supplied from within the urban boundaries, because within those areas, substantial amount of waste water mainly from houses and industries, is available in urban drains for irrigating lands along the urban drainage routes. (Ruma and Sheikh, 2010).

Amaranth (*Amaranthus cruentus*) is a leafy vegetable produced in almost all the states in Nigeria especially in the urban and peri-urban centres of the country (Ojo *et al*., 2011 and Owombo *et al*., 2012). It is an annual, herbaceous plant that is produced all the year round, depending on the availability of water, and is produced and consumed all over Nigeria to supplement the nutritional requirements of Nigerian households. In terms of origin, Amaranth originated from South America (Law-Ogbomo and Ajayi, 2009). It is one of the leafy vegetables often relied upon as cheap and affordable source of protein, vitamin A and minerals to combat the menace of malnutrition and maintenance of good health and prevention of diseases (Owombo *et al*., 2012).

Amaranth is produced along River *Jakara* which is used for the irrigation of vegetables and fruits which are consumed by the inhabitants of the area and the environs. It receives untreated metropolitan water through networks of drainages system. Urban waste water contains large quantities of nutrients such as nitrogen and phosphorus (Dike *et al*., 2010 and Mustapha *et al*., 2013); and recent report (Adeoye *et al*., 2011) indicated that exotic vegetables production generates higher profits, generates more employment and income to the farmers than those indigenous vegetables.

It is against this background that this paper aims at providing answer to why do people still undertake amaranth production in the area by describing their socio-economic characteristics and determining the profitability of its production along metropolitan Jakara river in Kano, Nigeria.

**Methodology**

The study was conducted in three Metropolitan Local Governments of Kano, Nigeria, which record the highest intensity of Amaranth production along *Jakara* River, comprising of Fagge, Nassarawa and Ungogo. The population of these Local Governments estimated using the annual growth rate of 3.3% provided by National Population Commission (NPC, 2006) was put at 2,335,848 people by the year 2013. Kano metropolis covers an area of 499Km$^2$ lying within latitude $11^\circ 58'37"$N to $12^\circ 05'26"$N and longitude $8^\circ 29'48"$E and $8^\circ 33'45"$E (NIPOST, 2009). Majority of the inhabitants are traders, with civil servants, transporters and those engaged in vegetable crops production, poultry, seedling production and land developers. A large number of people within the metropolitan area are engaged in marketing of agricultural foodstuff, including vegetables (Baba, Bello and Aminu, 2008).
Three (3) production sites each from these Local Government Areas were selected due to intensity of Amaranth production. These areas include Kwakwachi, Nomansland and Jaba from Fagge; Gama Kwari, PRP and Kwarin Ganga from Nassarawa and Gayawa, Rimaye and Dankunkuru from Ungoggo. The lists of registered Vegetable Crop Producers Associations in these areas were collected from Apex Fadama Users Association through the Departments of Agriculture and Natural Resources of these Local Government Areas. These lists served as sampling frame for the selection of the Amaranth producers. A Random sampling technique, using the random number generated using Microsoft Excel worksheet was used to select 180 Amaranth producers representing 9.5% of 1,897 members in the list. Data for the study were generated through the use of questionnaire administered to the selected Amaranth producers. Data collected include information on the socio-economic characteristics such as age, years of education, household size, years of experience and level of income, costs of variable and fixed inputs; and returns of the Amaranth producers. The techniques used for achieving the objectives of this study were range (minimum and maximum), mean, standard deviation, coefficient of variability and net farm income. Financial ratios such as Return to naira invested, gross ratio and operating ratio were also computed in the study. The relations for the computations were given as:

\[ CV = \frac{SD}{\text{mean}} \times 100 \]  

\[ \text{NFI} = \text{GFI} - \text{TC} \]  

\[ \text{RNI} = \frac{\text{TFI}}{\text{TC}} \]  

\[ \text{GR} = \frac{\text{TR}}{\text{TVC}} \]  

\[ \text{OR} = \frac{\text{TR}}{\text{TR}} \]

Where:
- CV = Coefficient of variability
- SD = Standard deviation of the socio-economic characteristic in question.
- Mean = Mean value of the socio-economic characteristic in question.
- NFI = Net Farm Income (₦/ha/year) for Amaranth production.
- GFI = Gross Farm Income (₦/ha/year) for Amaranth production.
- TC = Total Cost (₦/ha/year) for Amaranth production.
- RNI = Return to Naira (capital) invested for Amaranth production.
- TFI = Total Farm Income for Amaranth production.
- TC = Total cost of Amaranth production.
- GR = Gross Ratio for Amaranth production.
- TC = Total Cost for Amaranth production.
- OR = Operating Ratio for Amaranth production.
- TVC = Total Variable Cost for Amaranth production.
- TR = Total Revenue for Amaranth production.
Results and Discussion

Socio-economic Characteristics of Amaranth Producers

The socio-economic variables identified include the age, household size, level of education, years of experience and income level of the Amaranth producers. These variables are presented in Table 1. The results of the study in Table 1 revealed that Amaranth producers had minimum and maximum ages of 18 to 67 years respectively with a mean of 38 years. The coefficient of variability of 29% indicated that there was no wide variability in terms of age among the producers. Impliedly, having an average age of 38 is an indicator that the producers fall within the active age capable of undertaking all the mental and physical activities needed for producing the crop. Younger and middle aged individuals are known to be active and innovative (Adeoye et al., 2011). Furthermore, they fall within the age that would enhance accurate, prompt and effective decision making. They are also expected to be in the position to effectively utilize available resources to them (Nwaiwu et al., 2012). Household size refers to the total number of individuals who live within and feed from the same pot. According to NPC, 2006, these individuals think of themselves as a unit. The results in Table 1 revealed that the household size of Amaranth producers ranged from 1 to 19 with a mean of 7. The coefficient of variability of 55% is indicating that there was relatively wide variability in terms of number of individuals in the household among the Amaranth producers, However, the mean household size of 7 individuals was beyond the national average of 5 reported by National Bureau of Statistics (NBS) (2010). High number of household size could be due to the fact that Amaranth producers in the study area practice polygamy and having large household size is a source of pride and a compelling force to produce more output by the household head in the farms. Ogunniyi and Oladejo (2011) reported that production efficiency increases with increase in household size.

The educational status of the Amaranth producers allows them to easily understand and apply new practices, objects and techniques in the production processes. The higher the level of one’s education, the faster the rate of apprehension and application of an innovation. The results in Table 1 indicated that the formal educational attainment of Amaranth producers ranged from minimum of 0 to maximum of 15. The mean of their educational attainment was 5 and a coefficient of variability of 85%, indicating that there was very wide variability among the producers in terms of formal educational attainment. Since the level of formal education attainment of the Amaranth producers was low, then definitely they might not apply and utilize new technologies properly. They may so much rely on the local or indigenous education for the production of these enterprise. Recently, Osuji, Ben-Chendo and Nwosu (2014) got average years of education of 7 among irrigated vegetable producers in Imo State, Nigeria.

Years of experience refers to the period over which the Amaranth producer spends in the production of the enterprise. Expectedly, the longer the years of experience, the more the producer acquires managerial skills and subsequently improves on the efficiency of production. The results
in Table 1 revealed that the years of experience of the producers ranged between 1 and 48 years with an average of 19 years. The coefficient of variability of 56% showed that there was wide variability among the producers with respect to the years of experience. The average years of experience of 19 implies that some of the Amaranth producers in the study area have relatively high years of experience. Ideally, they are expected to adjust to changing economic conditions and adopt new ideas to warrant efficient activity. Income level refers to the amount of money obtained from Amaranth production in a year. The results in Table 1 revealed that the producers recorded a minimum and maximum level of income of N268,710 and N1,636,570, with an average of N460,567. The coefficient of variability of 76% is implying that there was a very wide variability in terms of income earned by Amaranth producers. The average income of N460,567 was quite greater than the values obtained by Babatunde (2008) and Dam (2012) who got lower amount among farming households in rural Nigeria of N30,245 and N35,000 respectively.

Amaranth production utilizes variable cost items such as labour, seed, fertilizer, insecticides, fuel and lubricants; while the fixed cost items include pump, water hose, sprayers, seed containers, hoe, sickles, knives and rent they pay for the use of land. The costs, returns and profitability ratios of Amaranth are presented in Table 2.

Labour use was found to be 214.80 mandays per hectare amounting to 67.27% of the Total Variable Cost equivalent to 57% of the Total Cost for amaranth production. Amount of seed needed per hectare for Amaranth production as revealed in Table 2 was 70.52Kg. The cost of seed was N21,156, covering about 8.28 of the total variable cost of production; equivalent to 7% of the total cost of producing Amaranth. The price of seed was put at N300 per kilogram. The amount of fertilizer used in the production of Amaranth stood at 81.66Kg per hectare. The amount may seem low when compared to the nutrients need of these crop, but the producers believed that they need not much of inorganic fertilizers as the soil and the water supply in the area were rich in organic manure supply, especially from the abattoir. This is further substantiated by Ibrahim and Sa’id (2010) that blood and animal excreta (manure) from the Kano Abattoir were discharged into the river.

The insecticides were applied for the control of destructive insects. The cost of insecticide was N21,156 per hectare per year. The price of pesticide was put at N1,000 per litre. The cost of insecticide covered 8 percent of the total variable cost equivalent to 7% of the total cost for Amaranth production.

Amount of fuel used in Amaranth production was 250 litres, covering 10 percent of the total variable cost, equivalent to 9% of the Total Cost; amounting to N25,767 per hectare per year. The supply of lubricant to the pumping machine to improve on its efficiency and longevity is a practice adopted by all the producers of Amaranth in the study area. The amount of lubricant supplied by the producers as presented in Table 2 were 8 litres per hectare per year, with an average market price of N600 per litre amounting to N5,034, covering 2 percent of the total variable cost: 68% of
the Total Cost of producing Amaranth. Water pumping machines are very important essential fixed capital items used by the producers of Amaranth. Majority of the producers own at least one water pumping machine with a capacity of 36m$^3$ per hour. The depreciated amount of water pumping machine was presented in Table 2, covering about N17,680 per hectare, covering about 39% of the total fixed cost, equivalent to 6% of the Total Cost of production. The result implies that depreciation of water pumping machine covers a substantial amount of the total fixed cost. Water is the most important determinant of Amaranth all the year round (Ruma and Sheikh, 2010).

The amount of the depreciation of water hose and pipes was N2,100 covering 5 percent of the total fixed cost, equivalent to 0.71% of the total cost. Sprayers were used for applying insecticides and it was observed that majority of the producers owned at least one sprayer. The seed containers were plastic or metal buckets and plates of varying sizes for carrying the seeds for keep or for application. Containers like buckets and plates were used during seeds and fertilizer application.

It could be deduced from Table 2 that total variable cost amounted to N255,432 per hectare per year, covering 85 percent of the total cost of producing Amaranth. It could be portrayed here that total variable cost covers major amount of total cost in the production. The total fixed cost of N44,582 accounting for 15% was relatively large and could not be neglected. The Total Cost of producing Amaranth was N300,015 per hectare per year.

The depreciation with respect to containers was N583 amounting to 1.31 percent of the total fixed cost and 0.19% of the total cost. Other fixed cost items used in the production of Amaranth were hoes, sickles and knives. The results in Table 2 indicated that the depreciation of these items amounted to N1,667. These items were used during land clearing, bed preparation, weeding and harvesting. The amount covered 3.74 percent of the total fixed cost, equivalent to 0.56% of the total cost of producing Amaranth.

The use of land in the production of Amaranth was inevitable. It was the first and foremost crucial factor of production whose reward is rent (Abdullahi, 2007). The result in Table 2 revealed that the amount of rent paid per hectare use among producers was N21,314 covering 48% of the total fixed cost, amounting to 7% of the total cost respectively. This amount was the highest contributor to the total fixed cost for the producers.

Revenues are returns earned from the sales of the outputs (Tsoho and Salau, 2012). Total Revenue was obtained from the average output of 30,594 kilograms of the crop obtained per hectare per year. Prices of these product were obtained for different periods and their arithmetic mean was determined. The average price of N17 per Kilogramme and total revenue of N513,979 were obtained.

The results further indicated that the Amaranth producers realized a Net Farm Income of N213,965 per hectare per year implying that production of the crop was profitable. Owombo et al. (2012)
earlier reported that production of Amaranth was profitable. Return to Naira Invested of 0.71 implies that for every one naira expended by the producers, ₦0.71 would return to the investment. This value was lower than that obtained by Tsoho and Salau (2012) who obtained a return of ₦0.97 among dry season vegetable producers in Sokoto State, Nigeria.

The result further revealed gross ratio (GR) of 0.58 and less than one ratio is preferred for any farm business. Olukosi and Erhabor (2008) posited that the lower the ratio, the higher the profit. In similar vein, the operating ratio (OR) of 0.50 obtained was lower than unity. Olukosi and Erhabor (2008) also posited that a ratio less than one indicates that the producers are making profit.

Conclusion and Recommendations
This study described some socio-economic variables and determined the profitability of Amaranth production along metropolitan Jakara River in Kano, Nigeria. The study showed that the producers fall within the active age capable of undertaking all the mental and physical activities needed for producing the crop, with a large, household size, low level of education; relatively high years of experience and a wide variability in terms of income earned by the producers. It also portrayed that production of Amaranth was profitable as indicated by the net farm income and other financial ratios. The study therefore recommends that the producers should be patronizing input marketers that supply at relatively cheaper prices, through market survey and enroll in adult formal education classes to further their education.

References


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<th>Variable</th>
<th>Min.</th>
<th>Max.</th>
<th>Mean</th>
<th>SD</th>
<th>CV (%)</th>
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<td>37.45</td>
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<td>Income Level/ annum</td>
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<td>1,636,570</td>
<td>460,567</td>
<td>350,315</td>
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Table 2: Costs and Returns Structure for Amaranth (₦/ha/yr).

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<tr>
<th>Items</th>
<th>Average item</th>
<th>Unit price (₦)</th>
<th>Amount (₦)</th>
<th>%TVC</th>
<th>%TC</th>
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<td>Labour (M/day)</td>
<td>214.80</td>
<td>800</td>
<td>171,840.00</td>
<td>67.27</td>
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<td>Seed (kg)</td>
<td>70.52</td>
<td>300</td>
<td>21,156.00</td>
<td>8.28</td>
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<td>Fertilizer (kg)</td>
<td>81.66</td>
<td>130</td>
<td>10,615.80</td>
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<td>Insecticide (ltr)</td>
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<td>1,000</td>
<td>21,020.00</td>
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<td>7.01</td>
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<td>Fuel (ltr.)</td>
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<td>25,766.48</td>
<td>10.09</td>
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<td>Lubricant (ltr.)</td>
<td>8.39</td>
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<td>5,034.00</td>
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<td>Rent</td>
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<td>300,014.45</td>
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<td><strong>Total revenue</strong></td>
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<td>NFI</td>
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<td>213,964.75</td>
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<td>RNI</td>
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<td>GR</td>
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Source: Field Survey Data