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Economics Of Waterleaf (*Talinum Triangulare*) Production In Akwa Ibom State, Nigeria

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Abstract. This study analyzed the profitability level of waterleaf production in three selected agricultural zones of Akwa Ibom State, Nigeria. The study was based on primary data obtained from a random sample of 60 waterleaf farmers and analyzed using descriptive statistics, profitability ratios and regression analysis. The result of the analysis shows that the majority (90%) of the farmers had some level of formal education. Labour had the highest percentage (58%) of total cost of production, suggesting that waterleaf production was labour intensive in the area. The average net income per hectare per waterleaf production cycle was N322,413 while the average total cost was N89,307,18. Labour cost constituted the highest percentage of total variable cost. The profitability index (0.78), rate of returns on investment (361%), rate of returns on variable cost (482%), and operating ratio (0.21) suggest that waterleaf production was profitable in the study area. The identified major factors that enhance the output of waterleaf were the application of poultry manure, bigger household size (cheap labour), level of education of the farmer and level of capital. These observations underscore the need for the provision of credit facilities and some kind of adult education programme for the farmers. These will respectively ensure that they apply the right quantity of purchased inputs (like fertilizers, hired labour and capital) in their production process and improve their human capital.

Keywords. Waterleaf, Production, Income, Profitability, Nigeria, Sustainable Development, Agriculture, Economics, Education

1 Introduction

The last two decades have witnessed the increasing importance of vegetable production and consumption in southern Nigeria. It has become a major occupation of many small scale producers in both rural and urban communities of Akwa Ibom State, for instance.

Agriculture in Nigeria is, however, characterized by a large number of these small-scale farmers, scattered over wide expanses of land, with holdings ranging from 0.05-3.0 hectares per farmer, low capitalization and a low yield per hectare (Olayemi, 1994). The smallholder farmers have also been characterized by a low level of resource utilization, low levels of productivity, low returns to labour and a low level of capital investment (Olayide and Heady, 1982), although they control a vast proportion of the productive agricultural resources in Nigeria (Abang and Agom 2004).

Waterleaf (*Talinum triangulare*) is a non-conventional vegetable crop of the portulacaceae family which originated from tropical Africa and is widely grown in West Africa, Asia, and South America (Schippers, 2000). Waterleaf as a vegetable has some inherent characteristics which makes it attractive to small-holder farmers and consumers. Firstly, it is a short

duration crop which is due for harvest between 35-45 days after planting (Rice et. al, 1986). Secondly, in the study area it is used as a “softener” when cooking fibrous vegetables such as *Afang* (*Gnetum africanum*), *Atama* (*Heinsia crinata*), and fluted pumpkin (*Telferia occidentalis*). Ibeawuchi et al. (2007) noted that the leaves and young shoots are used to thicken sauce and it is consumed in large quantities in the Southern part of Nigeria. Nutritionally, waterleaf has been proven to be high in crude-protein (22.1%), ash (33.98%), and crude fiber (11.12%). It also has some medicinal values in humans and acts as green forage for rabbit feed management (Ekpenyong, 1986; Aduku and Olukosi, 1990). In addition, waterleaf production provides a complementary source of income to small-scale farming households (Udoh, 2005).

The demand for waterleaf is therefore increasing among the inhabitants of the country, thus widening the domestic demand and supply gap of the product. Most research efforts on waterleaf production in the study area have focused on resource utilization (Udoh 2005, Umoh 2006, Udoh and Etim 2008). There has been a paucity of information on the profitability of the waterleaf enterprise. This paper therefore examines costs/returns and hence profitability of the waterleaf enterprise in Akwa Ibom State.

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1.1 Methodology

Study area: The study was conducted in Akwa Ibom State, which is located at latitude 4°33' and 5°33' North and Longitudes 7°25' and 8°25' East. It occupies a total land area of 7,246 square kilometers, with a population of 3,920,208 million people (NPC, 2006). The state has 6 agricultural zones Viz: Oron, Abak, Ikot Ekpene, Etinan, Eket, and Uyo, and has very high potential for agriculture. It is suitable for food crops, tree crops, fish and livestock farming. Crops widely grown are leafy vegetables like, waterleaf, fluted pumpkin, and garden egg. Others are yam, swamp rice, cassava, etc.

1.2 Sampling and data collection procedure

Three agricultural zones were randomly selected from the six agricultural zones in the state for the study. These were Eket, Uyo and Ikot-Ekpene. Intensive waterleaf production takes place only in the cities in the area. Hence, the major cities in the three selected agricultural zones were purposively selected for the study, namely, Eket, Uyo and Ikot-Ekpene. With the assistance of key informants, a list of waterleaf farmers in each of the selected cities was compiled. Twenty farmers were randomly selected from each city to make a total of 60 farmers for the study.

The data, which were mainly from primary sources, were obtained in the 2008 planting season using structured questionnaires. The focus was on socio-economic characteristics of the farmers, output of waterleaf in kilograms, production system, labour cost per day and other input prices, land area cultivated (ha) (determined by measuring with a tape in square meters and then converted to hectares), among many others.

1.3 Analytical procedures

The data collected were analyzed using budgetary technique, emphasizing the costs and returns to waterleaf production. The economic viability of the enterprise was estimated using gross margin and profitability ratios (Kay, 1981). Regression analysis measured the influence of socio-economic characteristics on output of waterleaf.

From the results of the budgetary analysis, the following ratios were obtained.

- Profitability Index (PI) or Return on sale = NI/TR
- The rate of return on Investment (RRI) = $NI/TC * 100$
- Rate of return on variable cost (RRVC) = $(TR - TFC) / TVC * 100$
- Operating Ratio (OR) = TVC/TR

Where,

TVC = Total Variable Cost

TC = Total Cost

TR = Total Revenue

NI = Net Income

TFC = Total Fixed Cost.

The following is the implicit form of the regression analysis

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, U)$$

Where Y = Output of vegetable (kg)

X_1 = Land size (in hectares)

X_2 = Labour (in man days/ha)

X_3 = Manure/organic waste (kg)

X_4 = Frequency of harvest (no. of times/month)

X_5 = Age of farmers (in years)

X_6 = Educational level (years of formal schooling)

X_7 = Household size (number)

X_8 = Quantity of planting materials (kg)

X_9 = Capital (value of depreciated farm tools)

X_{10} = Farming experience (in years)

U = Error term.

2 Results and Discussion

2.1 Socio-economic characteristics of the respondents

The age range of farmers in the study area was from 20 years to above 50 years with the majority (42%) of the farmers being between 31-40 years of age. The predominance of younger people in waterleaf production could be because of the labour intensive nature of its production, which requires young and energetic farmers. This is in line with the findings of Ubokudom et al. (forthcoming) who worked on the technical efficiency of garden egg production in Uyo Metropolis, Akwa Ibom State, Nigeria. The authors also found that garden egg production in the area was labour intensive. Waterleaf producers in the study area were all female. Maduka (1998) and Umoh (2006) also had similar findings in assessing the technical efficiency of waterleaf farmers in the same area. About 60% of the farmers had households whose sizes range from 5-8 people. Thirty-five % had household sizes of 9-12 people while only 5% had households whose sizes ranged from 1-4 people. These household sizes were above the recommended average of four per family in Nigeria. Ubokudom et al. (forthcoming) also observed an average household size of about 6 persons with a range of 2-11 persons. About 65% of the farmers had primary education, 20% had secondary education and 5% had tertiary education; thus showing that the majority (90%) of the farmers were literate (only 10% had no formal education). Umoh (2006), and Adebayo and Adeola (2005) made similar observations while assessing socio-economic factors affecting poultry farmers in the Ejigbo Local Government Area of Osun State, Nigeria. This is against the often reported illiteracy status of farmers in developing countries. This could auger well for extension services in transferring research results for sustainable food production. About 70% of the farmers had 1-10 years of experience. The mean farming experience was 8.5 years, indicating that the majority of the farmers have been in the business for long, and are therefore conversant with the problems of the area.

2.2 Production environment of the farmers

Waterleaf was grown as a sole crop by all the respondents, essentially because, according to them, they obtain

Table 1. Average costs and returns per ha of waterleaf production in the study area

Items	Units	Quantity/ha	Std dev.	Price/Unit (N)	Value (N)
Revenue					
Output	Kg	13724.02	5,642.75	30	411,720.06
Total revenue (TR)					411,720.06
Costs					
(i) Variable costs					
(a) Labour	Man-days	115.87	6.26	450	52,141.5
(b) Planting material	Kg	1467.83	138.58	20	29,356
(c) Manure	Kg	270	21.56	11	2,970
Total variable cost (TVC)					84,467.50
(ii) Fixed costs					
(a) Land	Hectare	0.065	0.0058	40,000	2,600
(b) Capital	Naira				2,239.68
Total fixed cost (TFC)					4,839.68
Total cost (TFC +TVC)					89,307.18
GM (TR – TVC)					327,252.56
Net Income (NI) (GM-TFC)					322,412.88

Source: Field survey, 2008

the highest output that way. About 92% of the respondents rented land for waterleaf production, and family labour was the major source of labour used by the respondents. Poultry manure, purchased from the market, was the major source of manure used by the respondents. None of the farmers had a farm size up to one hectare in size, the average farm size was 0.065 ha and the range was from 0.012 to 0.33. This is an indication that they were basically small-holder farmers and also shows the acute problem of the shortage of farm land in the cities.

2.3 Average costs and returns in waterleaf production

Table 1 below shows the average cost and returns of waterleaf farmers in the study area. The average revenue from waterleaf output was found to be N 411,721 per ha. The total cost incurred per ha was N 89,307. Labour had the highest percentage of total cost of production with 58%, followed by planting materials with 33%. The total variable cost constituted 95% while the fixed cost constituted just 5% of the total cost of production. The enterprise had an average net income of N322,413 per farmer per ha, in a production cycle of 14 months.

Table 2. Profitability analysis of waterleaf farmers in the study area

Profitability Index (PI)	Rate of returns on Investment (RRI%)	Rate of returns on variable cost (RRVC%)	Operating Ratio (OR) Revenue
0.78	361.02	481.70	0.21

Source: Field survey, 2008.

The profitability ratios calculated to establish profitability levels of the enterprise are presented in Table 2. These are

Profitability Index (PI), Rate of returns on Investment (RRI), Rate of Returns on Variable Cost (RRVC) and Operating Ratio (OR). The average PI for all farms was 0.78, indicating that out of every naira earned, about 78 kobo accrue to the farmer as net income. Also, with an RRI of 361 percent, a farmer therefore earns N361 profit on every naira spent on waterleaf production. RRVC was estimated to be about 482% per production season. In other words, every N1 cost incurred on variable inputs generates about N482. This suggests that improvement in the profitability of waterleaf production in the area will require increasing the efficiency of use of these variable inputs. Moreover, the OR of 0.21 indicates greater total revenue over total variable cost. It can therefore be concluded that waterleaf production in the area is profitable. During the field work component of this study, most of the farmers expressed a high level of satisfaction with the profit level of the business. Ayoola et al. (2009) reported that dry season vegetable production in Oyo state of Nigeria was profitable with a net return on investment of about 126%.

2.4 Factors affecting output of waterleaf

In assessing the factors affecting the output of waterleaf in the area, four functional forms were estimated: linear, semi-log, double-log and exponential functions. The result of the analysis shows that the linear function had the best fit and was therefore chosen as the lead equation. This was due to the R² (0.86) value, the significance level of the explanatory variables and their signs. Table 3 below shows the results. The coefficient of land size was negative and not significant. The inverse relationship might be attributed to intense use of labour, thus confirming the results of Thapa (2007) and Feder (1985), who noted that small farms have a high labour to land ratio. The coefficient of labour was positive and significant at 10 % level. This shows the importance of labour in

Table 3. Results of the multiple regression analysis/Production function estimates.

Coefficient/ Variables	Linear {a}	Semi-log	Double-log	Exponential
Intercept	2626.721 (-3082.8838)	8.127232*** (0.26175725)	3.73872525 (1.844351)	-56096.38 (23382.35)
Land size	-3323.55897 (20546.59) b=0.050	-2.058462* (2.04750314)	0.0477908 (0.133425)	1205.65 (1691.53)
Labour	15.0017601* (7.045282) b=0.126	0.001459** (0.00070207)	0.13129** (0.5972)	1288.72* (757.1231)
Poultry Manure	7.83709494*** (4.009107) b=0.166	0.000501*** (0.00039951)	0.54900869*** (0.128248)	6575.571*** (1625.9027)
Frequency	-340.350021 (591.2795) b=-0.070	-0.022663 (0.05892203)	0.1416219 (0.078894)	-271.3076 (1000.20276)
Age	-3.21920227 (62.52048) b=-0.205	-0.002498 (0.00623027)	0.06455297 (0.205621)	1874.016 (2606.82599)
Education	759.213242*** (93.9424) b=0.408	0.05837*** (0.00936153)	0.1277377*** (0.045456)	1853.968*** (576.282293)
House size	402.7044** (160.5386) b=0.244	0.024451 (0.01599795)	0.08422371 (0.099658)	2259.402* (1263.45026)
Planting material	0.05292421 (0.742667) b=0.083	6.96E-05 (7.4008E-05)	0.02521943 (0.071125)	-439.4471 (901.716633)
Capital	2.95427946** (0.998036) b=0.531	0.000262 (9.9456E-05)	0.19874275 (0.187041)	3124.89 (2371.27509)
Farming Experience	-196.675 (128.0218) B=-0.002	-0.004507 (0.01275759)	-0.06395641 (0.082195)	-2111.528** (1042.528)
R ²	0.86659431	0.757471	0.83936865	0.844746
Adj.R ²	0.83573291	0.728732	0.80220901	0.813062
Observations	60	60	60	60

Source: field survey, 2008

Note: figures in brackets are standard errors. *** = Significant at 1%, ** = significant at 5% and * = significant at 10%.

The bs are elasticity coefficients, {a} is the lead equation.

small-scale farming, especially in developing countries where mechanization is only common in big commercial farms. Umoh (2006) noted that this situation has variously been attributed to small and scattered land holdings and lack of affordable equipment. Elasticity of production suggests that if labour is increased by 10%, output of waterleaf will be increased by 1.26%. The application of poultry manure (the respondents do not use fertilizers because of high price) had a positive relationship with output and was significant at 1% level. Under intensive agriculture, as applicable in this case, soil fertility maintenance is very crucial for the sustenance of production. Frequency of harvest and the age of farmers were negative but not significant.

The educational level was positive and significant at 5% level. Educated farmers may better understand and

process information provided by different sources regarding new farm technologies, thereby increasing their allocative and technical efficiency (Panin and Brummer 2000). Adebayo and Adeola (2005) also had similar findings. Household size was positive and significant at 1% level. We earlier noted that family was the major source of labour for the farmers. Larger households could therefore mean more available labour for intensive waterleaf production. The results compares favourably with the findings of Babatunde et al. (2007). Planting materials had a positive relationship with output and was not significant. The coefficient of capital was positive and significant at 5% level of probability. Elasticity of production suggests that a 10% increase in capital will increase production by 5.31%. This suggests that capital is very important in waterleaf production. This result is in apparent contraction with

the results of Umoh (2006), Udoh (2005), and Udoh and Etim (2008), who reported that capital is not important in small scale waterleaf production. This could be because of the intensive nature of production in this case.

3 Conclusion

Waterleaf farmers in the study area are within the economically active labour force with a high level of education. The farmers made an average net farm income of N322,413 per hectare per production cycle. This is considered high because in fourteen months, those under paid employment and earning the minimum wage received N 105,000. The average PI, RRI, RRVC and OR were found to be 0.78, 361, 482 and 0.21 respectively, all of which establish the fact that waterleaf production in the area is profitable, though labour intensive. The identified major factors that enhance the output of waterleaf in the area were the application of poultry manure, large households (cheap labour), level of education of the farmer, and level of capital. These observations underscore the need for the provision of credit facilities and some kind of adult education programme for the farmers. These will respectively ensure that they apply the right quantity of purchased inputs (like fertilizers, hired labour and capital) in their production process and improve their human capital.

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