IMPACTS OF TRANSPORTATION ON THE PROFITABILITY OF SWEET POTATO PRODUCTION IN SELECTED LOCAL GOVERNMENT AREAS OF KWARA STATE, NIGERIA

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Abstract

Transportation is an essential aspect of agricultural production. However, in many parts of Nigeria, bad transport system is still a problem of rural farmers. Therefore, this study seeks to examine the impacts of transportation on the profitability of sweet potato production in Kwara State. The sampling techniques involved the purposive selection of two local government areas (LGAs). Two communities were randomly selected from each of the two LGAs. Then, twenty six sweet potato farmers were finally selected from each of the four communities giving a total of 120 respondents. Data were analyzed using descriptive statistics, multinomial logit model and gross margin. The study showed that head porterage, motor cycle, motor vehicle and pick up van of less than 3 tons were the most prominent means of transporting sweet potato in the study area. Also, the size of the farm, cost of transportation, quantity of sweet potato produced, and average distance from the farm to the market are the factors that significantly affected the choice of transportation means used by the farmers in the study area. The results also showed that the farmers who sell their produce at the market earn more profit than those that sell at the farm gate. Therefore, in other to encourage the farmers to produce more sweet potatoes it is recommended that adequate transportation system be provided.

Keywords: Sweet Potatoes, Transportation, Logit, Profitability, Impact

Introduction

Agricultural production is very important to the economy of developing nations, Nigeria in particular. This is because it contributes about 43.64% of the total Gross Domestic Product to the economy of Nigeria. It provides food for people, raw materials for the agro-allied industries and earns foreign exchange for the economy. Also, 51.7 % of Nigerians live in the rural sector (Falola and Heaton, 2008) and are mostly engaged in agriculture either directly or indirectly. They are small scale subsistence farmers who are responsible for over 70% of the food that is made available to consumers.

Moreover, Nigeria has an expanding urban population which is making greater demands on agricultural production and marketing system. The expansion of urban

demand for food stuffs has stimulated the direct sales to urban consumers by some rural producers. Nigerian urban inhabitants, as large as they are, and like their counterparts in many places depend mostly, if not entirely, on farmers in the rural areas for their requirements of agricultural food products. The towns therefore constitute best-price markets for rural agricultural products and the farmers are keen to benefit from the situation.

Fatulu (2007), Tunde (2007) and Yahaya (2009) indicated that transportation, poor credit accessibility, insecurity and high cost of human labour represent the most serious constraints to agricultural development in Nigeria and with the ever growing population, food scarcity was not far-fetched. Aloba (2004) said that the rural areas (production centers) are not well linked with the marketing centers and as such severe constraints are imposed on the market of farm produce, which results in unpleasant consequence of wastage, low productivity and high production and market cost. Hence, if food production is to keep pace with rapid population growth and demand for food, a new and creative approach to agricultural development must be developed. In a country like Nigeria where millions of people are not adequately fed, unexploited food resources must be unearthed and utilized.

Sweet potato (*Ipomea batata* L) is widely grown as a staple food in many parts of the tropic and subtropics, which includes many developing countries where it accounts for about 107 million/tons in production per year. It is extensively grown in the tropical zone, accounting for about 81% of total world production (Chandra, 1974). Also, sweet potato is one of the important root crops in Nigeria that could also be developed as a food security crop (i.e. food crop, which the farm household can eat as food and also sell to get cash income to meet other needs (Tewe *et al.*, 2003). Sweet potato like other agricultural produce has a significant role to play in the economy of a developing country like Nigeria. Its production, transportation and marketing offer job opportunity for the farmers, transporters as well as the marketers thus raising their income.

Sweet potato is an important food security crop in Nigeria (Odebode, 2004). It is a short-term crop consumed boiled and mashed. It is mono-cropped or intercropped or intercropped in complex cropping systems with some staple crops such as yam and maize. It has also been identified as the least expensive, year round source of dietary, vitamin A, especially the orange-fleshed type (Low et al, 1997). The crop is cheap, can be purchased in affordable units and is easily cultivated, yet it is facing a lot of production and post-harvest challenges.

In Nigeria, sweet potato production, marketing and utilisation have expanded beyond the traditional areas of the central and riverine zones to the humid, sub-humid and semi-arid regions in the last two-and-a-half decades (Tewe *et al*, 2003). Therefore, the poor accessibility in the rural areas perpetuates the deprivation trap by denying communities access to their most basic needs. In the past the exact nature of rural people's transport needs were not fully understood and, as a result, transport interventions were mainly in the form of new road building. There is now considerable doubt as to whether new road building necessarily stimulates economic growth and, if it does, do the benefits "trickle down" to the poorest members of the community. As a

result, some transport planners are now taking a basic needs approach to development and the provision of transport services.

In many parts of Nigeria today, bad transport system is still a problem of rural farmers. This has exposed the farmers to various types of exploitation especially by middlemen who end up claiming a greater share of the consumers' expenditure and leaving the farmer and his household in abject poverty. The poor state of transportation has hindered the exploitation of the optimum production potential of the rural areas in Nigeria. This is because often times, farmers are compelled to sell their products at very low prices due to some of the following factors: inelastic demand, danger of bad weather, pest and disease, long distance from the farm to market and seasonality of the products. In other to reduce these losses and exploitation by middlemen, effective transportation and marketing structure must be employed.

In view of the foregoing, the study tends to determine the impacts of transportation on the profitability of sweet potato farmers in Kwara State and the specific objectives are:

1.   To identify the available transportation means or facilities in the study area;
2.   To determine the factors affecting the choice of transportation means used by sweet potato farmers in the study area; and,
3.   To evaluate the costs and return to sweet potato farmers in the study area.

Methodology

This study was carried out in Kwara state in the north central zone of Nigeria. More than 90 percent of the rural population in Kwara State are involved in farming. The main stay of the state`s economy is agriculture (Kwara State Diary, 2004). Two local government areas namely, Offa and Oyun local government areas were selected purposively for the study. These local government areas were selected based on the fact that they are the major producers and together, they account for over 80% of the output of sweet potato in the state (KWADP, 1996).

Road transport is the most predominant mode of transportation in Offa and Oyun LGAs. This is a confirmation of the crucial role transport plays in the socio-economic development of a nation, be it developed or developing, rural and urban especially in the movement of people, goods and services. The main crops grown are sweet potato, sorghum, maize, yam, cassava, groundnut and rice.

The sources of data for this study were both primary and secondary sources. The primary data were collected through the use of questionnaires which were employed to solicit response from sweet potato farmers in Offa and Oyun Local Government of Kwara State, Nigeria. The secondary data were obtained from textbooks, journals, and the internet.

Offa and Oyun Local Government Areas were purposively selected because they are the major sweet potato producing areas in Kwara state accounting for over 80% of the output (KWADP, 1996). A two stage random sampling technique was then used for

the study. Two communities were randomly selected from each of the two local government areas. Then, twenty six sweet potato farmers were finally selected from each of the four communities giving a total of 120 respondents. However, 104 questionnaires were found useful.

Descriptive statistical tools such as mean, mode, frequency distribution, and coefficient of variation were used to examine the socio economic characteristics of the sweet potato farmers and to determine the available transportation means used for sweet potato production in the study area. The multinomial logit model was used to determine the factors that influence the choice of transportation means used by the sweet potato farmers. Based on the survey results that revealed that the choice of transport means (dependent variable) used by the farmer was a categorical variable which can take four categories or level. These categories were assigned thus:

0 = Head porterage; 1 = Motor cycle; 2 = Motor vehicle and 3 = Pick up van < 3 tons

The farmers that used head porterage as their means of transport were taken as the reference group. The multinomial logit model was therefore used to identify the variables that make farmers belong to any of these categories as follows;

The probability that the ith sweet potato farmer belongs to the jth transport means group P_{ij} reduces. The model makes the choice of probabilities on individual characteristics of agents. Following Maddala (1990) and Babcock et al (1995), The basic model is written as;

$$\Pr ob\left(Y_{i=j}\right)=\sum^{2} \frac{e^{\beta jXi}}{e^{\beta kNi}} \quad k = 0 \text{ or } 1$$

Where i = 1,2,……n variables; k = 0,1,……j groups and β_j is vector of parameters that relates x_i to the probability of being in group j where there are j +1 groups.

For this study, the X_i variables range from X_1– X_6 where:

 X_1 = Family size; X_2 = Farm size (ha); X_3 = Transportation cost (₦); X_4 = Quantity produced (kg); X_5 = Income from farming (₦) and X_6 = Average distance from farm to market (km)

The gross margin analysis was carried out to determine cost and returns to the cropping system. The model which captures objective 3 of the study is outlined thus;

GM= TR – TVC

Where, GM= Gross Margin per hectare, TR= Total Revenue (₦) and TVC= Total Variable Costs (₦).

The value of family labour was obtained by assuming its opportunity cost as equal to the prevailing wage rate since family labour and hired labour were assumed to be perfect substitutes. In this regard, family labour is imputed as if it was hired out in order to know the return to family labour.

Results and Discussion

Table 1 shows the socio-economic characteristics of the respondents

Table 1: Socio Economic Characteristics of the Respondents

Variables	Frequency	Percentage
Age		
≤ 30 years	6	5.8
31 -40 years	12	11.5
41 - 50 years	45	43.3
≥ 51 years	41	39.4
Total	104	100
Sex		
Male	99	95.2
Female	5	4.8
Total	104	100
Marital status		
Married	94	90.4
Single	3	2.9
Widowed	7	6.7
Total	104	100
Major occupation		
Farming	95	91.3
Civil servant	9	8.7
Total	104	100
Educational status of the respondents		
Non formal education	9	8.7
Primary education	57	54.8
Secondary education	20	19.2
Tertiary education	3	2.9
Adult education	15	14.4
Total	104	100
Respondents Farming Experience		
1-10 years	12	11.5
11-20 years	32	30.8
21 - 30 years	50	48.1

>30 years	10	9.6
Total	**104**	**100**
Mode of land acquisition		
Inheritance	90	86.5
Purchased	3	2.9
Leased	11	10.6
Total	104	100
Farm size of respondents (ha)		
< 1.0	48	46.2
1 – 1.9	46	44.2
2.0 – 2.9	8	7.7
≥ 3.0	2	1.9
Total	104	100
Cropping pattern		
Mixed	71	68.3
Mono	33	31.7
Total	104	100
Crop planted with sweet potatoes		
Cassava	68	65.4
Maize	3	2.9
Not applicable	33	31.7
Total	104	100
Reasons for cultivating sweet potatoes		
Commercial purpose	3	2.9
Commercial and consumption	101	97.1
Total	104	100
Primary source of fund		
Personal savings	86	82.7
Cooperative society	13	12.5
Friends and relatives	5	4.8
Total	104	100
Means of transporting inputs		
Head Porterage	25	24
Motorcycle	47	45.2

Motor vehicle	32	30.8
Total	104	100
Means of transport from farm to farm		
Head Porterage	35	33.7
Not applicable	69	66.3
Total	104	100
Means of transport from farmstead to village		
Head Porterage	23	22.1
Motor cycle	45	43.3
Motor vehicle	33	31.7
Not applicable	3	2.9
Total	104	100
Means of transport: farmstead to market		
Motor cycle	20	19.2
Motor vehicle (panel van, bus)	56	53.8
Pick up <3tons	9	8.7
Not applicable	19	18.3
Total	104	100
Farm to village distance		
< 1km	12	11.6
1 – 4km	52	50
5 – 7km	33	31.7
≥ 7km	7	6.7
Total	104	100
Farm to motorable road distance		
< 1km	41	39.4
1 – 2km	54	51.9
3 – 4km	9	8.7
Total	104	100
Farm to market distance		
1 - 2km	14	13.5
3 – 6km	78	75
≥ 7km	12	11.5
Total	104	100

Output market

Farm gate	45	43.3
Village market	25	24
Urban market	34	32.7
Total	104	100

Benefits of improvement on road to farmers

Easier access to farm	15	14.4
Easier access to market	48	46.2
Reduction in spoilage of crops	3	2.9
Product to attract higher price	20	19.2
All of the above	18	17.3
Total	104	100

Source: Field Survey 2012

The modal age group for the sweet potato farmers in the study area was 41-50 years with a mean age of 49 years. About 82.7% of the farmers are between 41 and above years of age while the remaining 17.3% are below 40 years. This means that majority of the young adult are not involved actively in sweet potato production. Also, sweet potato production in the study area is mainly carried out by males. This is due to the fact that the men were actually the farm owners and heads of households and are involved in more strenuous operation such as cultivation and weeding etc while their female counterparts are involved in activities like fertilizer application and transportation of harvested sweet potatoes from farm to the road sides.

It was also observed that about 90.4% of the farmers were married while 2.9% and 6.7% were single and widowed respectively. Sweet potato production cuts across different occupational background. Thus, high percentage of the respondents (91.3%) had farming as their major occupation. The proportions of the farmers with secondary and tertiary education were 19.2% and 2.9% respectively. The average years of farming experience of the farmers was 27 years. It was observed that over 80% of the respondents have been planting sweet potato for the past 11 years and above. This shows that majority of the sweet potato farmers had spent quite long years in sweet potato production and as such had gained good level of expertise in sweet potato production and better means of transporting sweet potato inputs and outputs.

Furthermore, access to land is not a constraint in the study area, as the respondents claimed not having problems with acquiring land for sweet potato production. Hence majority of the farmers acquire their land through inheritance (86.5%). Also, about 46.2% of the farmers cultivate less than 1.0ha of land. This implies that they grow sweet potato on a small scale basis and the result of this could be low output. Typically, most of the farmers (68.3%) adopt mixed cropping pattern.

This is to ensure food security and guard against crop failure. The purpose of going into sweet potato cultivation among the farmers ranges from personal consumption to commercial production as about 18.3% of the farmers cultivate sweet potato solely for commercial purpose, while the rest 81.7% cultivate sweet potato both for personal consumption and commercial purpose.

About 82.7% of the farmers sourced funds invested in agriculture from personal savings while the rest 12.5% sourced their funds from cooperative societies and 4.8% claimed that they obtained their capital from friends and relatives. Analysis of the means of transporting input used for sweet potatoes production shows that about 24.0% of the farmers used head porterage for transporting input used in sweet potatoes production while 45.2% and 30.8% of the farmers used motor cycle and motor vehicle respectively. Of great importance to this study is the various means of transportation used by the sweet potatoes farmers in the study area. The only means of transportation used by the farmers to transport sweet potatoes from one farm to another was head porterage. About 33.7% of the farmers used this means on their farm while about 66.3% of the farmers do not transport their produce from one farm to another farm. Also, for the means of transportation of sweet potatoes used from the farmstead to the village, 22.1% of the respondents used head porterage, while about 43.3% use motor cycle to transport sweet potatoes from farmstead to the village. Moreover about 31.7% used motor vehicle (panel van, bus). The remaining 2.9% of the farmers do not transport their produce from farmstead to the village.

Table 1 also showed the respondents that transport their produce to the market before selling; about 53.8% of them used motor vehicle (bus, panel van). Also, 61.6% of the farmers have their farms within the radius of 0 – 4km. This may be due to the fact that by the time they trekked to their various farms, they would have become exhausted as explained by the respondents while more precious time and energy are wasted and lost which could have been used for meaningful activities. For the various points of sale of the sweet potatoes produced by the farmers, about 43.3% of the respondents said they sell through the middlemen that come around and visit the farmers at their farms and homes. The farmers gave their opinion on the issue that inadequate transportation facilities have a negative effect on the production and price charged on sweet potato. Some 72% of the respondents believed that an improvement on the road condition among other factors can motivate them to grow more sweet potatoes and this in essence will mean more improvement in transport services and will also attract more buyers into the region as well as possible higher profit margins for the sweet potato produce.

Table 2 shows the parameter estimates of the determinant of the choice of transportation means

Table 2: Parameter Estimates

Means of transport	B	Std Error	Wald	Df	Sig.	Exp(B)
Pick up van < 3ton Intercept	-0.28	0.051	5.519	1	0.019	
Family size	-0.224	0.317	0.502	1	0.479	0.799
Farm size	0.398	0.091	4.369	1	0.04	0.247
Cost of transportation	-0.497	0.099	5.026	1	0.025	1
Income from farming	0	0	1.368	1	0.242	1
Quantity produced	0.045	0.001	4.5	1	0.034	1
Average distance	0.519	0.11	4.713	1	0.03	4.569
Motor vehicle , panel van, bus						
Family size	0.064	0.107	0.363	1	0.547	1.067
Farm size	0.026	0.006	4.434	1	0.035	0.358
Cost of transportation	-0.216	0.057	3.797	1	0.051	1
Income from farming	0	0	0.508	1	0.476	1
Quantity produced	0.372	0.091	4.088	1	0.038	1
Average distance	0.625	0.343	3.324	1	0.068	1.868
Motor cycle Intercept	-130.196	0	.	1	.	.
Family size	6.851	15224.7	0	1	1	721.296
Farm size	62.909	45193.6	0	1	0.999	2.09E+27
Cost of transportation	-0.003	7.947	0	1	1	0.997
Income from farming	0	0.562	0	1	0.999	0.999
Quantity produced	0.012	7.149	0	1	0.999	1.012
Average distance	27.487	31994.9	0	1	0.999	1.16E-12

Source: Field Survey 2012

The reference category is: Head porterage, Nagelkerke R^2 = 0.733

Table 2 summarizes the effect of each predictor. The ratio of the coefficient to its standard error, squared, equals the Wald statistic. If the significance level of the Wald statistic is small (less than 0.05) then the parameter is different from 0. Parameters with significant negative coefficients decrease the likelihood of that response category with respect to the reference category; while the parameters with positive coefficients increase the likelihood of that response category.

The choice of pick up van < 3tons over the use of head porterage were significantly affected by farm size under sweet potato cultivation, cost of transportation, quantity produced, and average distance from farm to market. If the farm size under sweet potato cultivation increased by 1ha, the likelihood of choosing pick up van over head porterage would increase by about 39.8% at 5% level of significance, while the likelihood would increase by 4.5% and 51.9% if the quantity produced increased by 1kg and average distance increase by 1km respectively. On the other hand, the likelihood that a farmer would choose pick up van over head porterage would decrease by about 49.7% if the cost of transportation increases.

The size of farm under sweet potato cultivation has positive significant effect on the choice of motor vehicle over head porterage as shown in table 2. This implies that increase in the farm size by 1ha will increase the likelihood of choosing panel van or bus over head porterage by about 2.6% for transporting sweet potato. This could be due to the fact that an increase in farm size correlate with increase in output. Therefore, a large production cannot be transported with head porterage for a very long distance.

This is further supported by the positive significant coefficient of the quantity produced. This shows that the likelihood that a farmer would use motor vehicle (panel van or bus) instead of head porterage for transporting sweet potato would increase by about 37.2% if the quantity produced increased by 1kg. Two other variables that are likely to affect the choice of motor vehicle over head porterage for transporting sweet potato are cost of transportation and average distance from farm to market (in km). At 10%, the cost of transportation has a negative significant effect on the choice of transportation used. This implies that as the cost of transportation increases the farmer's likelihood of choosing motor vehicle over head porterage would decrease by about 21.6% while the choice is likely to increase by 62.5% if the average distance from farm to market increased by 1km.

None of the independent variables have significant effect on the choice of motor cycle over head porterage. However, the negative value of the coefficient for transportation cost shows that an increase in the transportation cost would reduce the likelihood of choosing motor cycle over head porterage by about 0.3%.

Table 3 shows the costs and returns to the farmers based on the choice of the means of transportation.

Table 3: Costs and Return Analysis/ha

	Value (₦/ha)
Head Porterage	
Gross income	80,368.49
Less Variable Cost	
Cost of fertilizer/ha	9,049.28
Cost of stem cutting /ha	3,637.71
Cost of herbicides/ha	4,226.00
Cost of hired labour	27,417.41
Imputed cost of family labour	12,325.20
Total Variable Cost	56,655.60
Gross Margin	**23,712.89**
Motor Cycle	
Gross income	82,250.43
Less Variable Cost	
Cost of fertilizer/ha	9050.28
Cost of stem cutting /ha	3,426.32
Cost of herbicides/ha	4,225.02
Cost of hired labour	27,102.23

Imputed cost of family labour	12,526.21
Cost of transportation	1,650.27
Total Variable Cost	57,980.33
Gross Margin	**24,270.10**
Motor Vehicle	
Gross income	91,247.35
Less Variable Cost	
Cost of fertilizer/ha	9049.25
Cost of stem cutting /ha	4037.29
Cost of herbicides/ha	4212.45
Cost of hired labour	27,256.23
Imputed cost of family labour	12,324.00
Cost of transportation	8,461.72
Total Variable Cost	65,340.94
Gross Margin	**25,906.41**
Pick up< 3tons	
Average income from sweet potato/ha	94,426.88
Gross income	94,426.88
Less Variable Cost	
Cost of fertilizer/ha	9,108.35
Cost of stem cutting /ha	3,940.22
Cost of herbicides/ha	4,420.63
Cost of hired labour	27,820.00
Imputed cost of family labour	12,480.68
Cost of transportation	10,204.72
Total Variable Cost	67,974.60
Gross Margin	**26,452.28**

Source: Field Survey 2012

The average income received from sweet potatoes cultivation was estimated at ₦80,368.49 for farmers who used head porterage for their produce. This is the average revenue expected per farmer per cropping season. The analysis of variable cost incurred by the farmers in sweet potato production showed that the average cost of herbicides was ₦4, 226.00. The average cost of fertilizer was ₦9, 094.28 while about ₦3, ₦637.71 was spent on stem cuttings used for planting. Labour cost was the single highest cost among the various costs. On the average, ₦27,417.41 was spent on hired labour. The opportunity cost of family labour was imputed at ₦12,325.20 based on the current market wage rate. The total variable cost was put at ₦ 56,655.60. The analysis of gross margin showed that an average of ₦23,712.89 was realized above the variable cost by the sweet potato farmers.

The average income received from sweet potatoes cultivation was estimated at ₦82,250.43 for farmers who used motor cycle for their produce with a gross margin of ₦24270.10. The average income received from sweet potatoes cultivation was estimated at ₦91247.35 and a total variable cost was put at ₦65340.94. Also, the analysis of gross margin showed that an average of ₦25906.41 was realized above the variable cost by the sweet potato farmers. The average income received from sweet potatoes cultivation was estimated at ₦94,426.88 for farmers who used pick up van with a gross margin of ₦26452.28 was realized above the variable cost by the sweet potato farmers.

Figure 1 shows the graphical representation of the gross margin of the farmers based on the means of transportation.
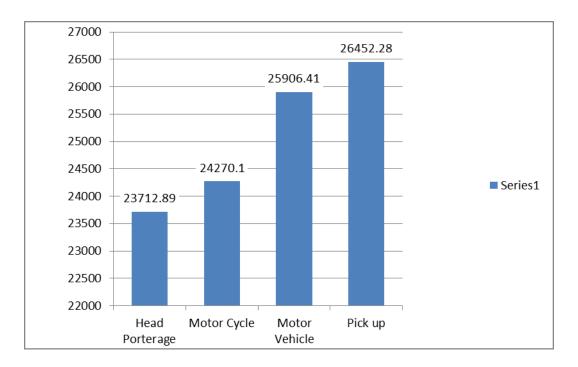

Figure 1: Distribution of Gross Margin based on Means of Transportation

Source: Field Survey 2012

Figure 1 shows that the farmers who use pick up van as a means of transportation earned the highest profit. This probably may be because of the higher price that the produce gain at the urban market compared to the price at the local or village market. However, on the average the return to sweet potato production per hectare is ₦25085.42.

Conclusion

Transport plays a significant role in the structure of food production and marketing and that easy transport to market can make all the difference in the level of

rural incomes. From the analysis, it could be deduced that an improved transportation will encourage farmers to work harder in the rural areas for increased production, add value to their products, reduce spoilage and wastage, empower the farmers as well as having positive impact on the productivity, income, employment level and reduce poverty level in the rural areas. The study therefore emphasizes need to improve transport scheme in order to reduce output wastage or spoilage, reduce the exploitative tendency of the middle men who claimed greater percentage of the farmers produce at the farm gate and also raise their profit.

Recommendations

The government should provide adequate road network in the study area so as to encourage the farmers to increase sweet potato production. Famers should also be provided with adequate information on the use of agro chemicals, fertilizer, improved varieties of stem cutting and available markets. The rural areas should also be provided with the necessary infrastructure and utilities to discourage rural urban migration. This can help to retain young people including extension agents in the rural places where they are mostly needed.

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