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Economic Analysis of Irrigated Irish Potato Production in Plateau State

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Abstract
The study examined the economics of irrigated Irish potato production in Plateau State. A multistage sampling technique using purposive and systematic random sampling was used to obtain data from a sample size of 120 respondents using structured questionnaires. Data were analyzed using Descriptive Statistics, Gross Margin Analysis, Benefit –Cost Analysis and Sensitivity Analysis. Results reveals that majority of the farmers were educated (64.17%) adults (58.33%) with long years (97%) of experience in Irish potato irrigation farming, and owned an average of 0.7 hectares of irrigated farm land each. Cost and Return analysis revealed that costs of seeds, labor and chemical fertilizers made up the highest (89.40%) portion of the average total variable cost of production. Results also revealed that irrigated Irish potato production in Plateau State is a profitably lucrative enterprise with a robust economic viability as shown by values of Gross Margin (₦655,637.88), benefit–Cost Ratio (2.64) and Sensitivity Analysis ratio (2.16). The study recommends expansion in irrigated Irish potato farm lands in addition to adoption of technologies that will minimize cost of seeds, labor and chemical fertilizers.
Keywords: Gross Margin, Benefit, Cost, Sensitivity, Profitability.

Introduction

Irish potato (solamun tubersun L.) belongs to the solanaceae family. It is a native of Western Hemisphere and is believed to have originated somewhere between Mexico and Chile, possibly in Andes highlands of Bolivia and Peru. It later spread to other places like England and Ireland. The planting stock has been received from Ireland, hence the name Irish potato. Irish potato was introduced into Nigeria in the later part of the 19th century and early 20th century by the Europeans notably the tin miners in the Jos Plateau (Okonkwo et al., 1995). Irish potato is grown for food as well as a commercial crop. It is a major source of income among the rural farmers in many African communities.

Irish potato is by far the most fruitful and efficient tuber crop in the world in terms of tuber yields and days to maturity. The crop matures in about 60 to 90 days as compared to 9 and 12 months for yam and cassava, respectively (NRCRI,2005). Kudi et al., (2008), maintain that the Irish potato gives the highest yield per unit area among roots and tuber crops in Nigeria and that it brings more income to farmers than other roots and tuber crops.

The production and marketing of Irish potato in the highland zones of Plateau State has become an integral part of the rural economy, both at the rainy and dry season as it is cultivated as a rain-fed and dry season crop (Okunade and Ibrahim, 2011). According to Okonkwo et al.,(1995), planting of rain-fed potato takes place from late March to August depending on local conditions while harvest occurs three to four months later, from July to November. Irrigated production starts from late October through January with harvest in January, February, March and April.

The attitude of farmers towards the production or adoption of any crop or technology is influenced by their expectation of economic benefits. Vabi and William, (1991) maintain that farmers who adopted a particular production method of crop do so in anticipation of economic benefits. With regards to the above, this paper presence the economics of irrigated Irish potato production in Plateau State with the view of exploring the profitability and economic viability of the enterprise.

Methodology

The study was conducted in the two major Irish potato producing Local Government Areas (LGAs) of Plateau State: Bokkos and Mangu. Plateau State is located in the centre of Nigeria, in the middle belt region of the country. It lies between latitude 80^0 24 N and Longitudes 80^0 32 and 100 38 East. The state has a land area of 30,913 km^2 with an estimated population of 3,553,440 (NPC 2006). The climate of the State is ideal for Irish potato production as well as vegetables, fruits and other exotic crops.

A multistage sampling technique was used in the selection of the respondents. The selection of the two LGAs was purposive due to their high participation in irrigated Irish potato production. From each of the LGAs, three villages were selected, and a list of irrigated Irish potato farmers was compiled in each of the village. From the compiled list of the farmers in each village, twenty (20) irrigated Irish potato farmers were selected using a systematic random samplings technique. A total of sixty (60) respondents were selected from each LGA given a sample size of 120. Data were collected through administration of pre-tested structured questionnaires to the 120

randomly selected farmers. Primary data were collected based on 2012 cropping season on the respondents socio-economic and production variables.

Descriptive statistics in addition to Gross Margin was employed in analyzing the data. Benefit-Cost and Sensitivity Analysis were employed to further assess the economic viabilities of the enterprise in the face of uncertainties inherent in agriculture, particularly, with Irish potato production in the study area. Gross Margin Analysis, according to Olukosi and Erhabor (1988), is a useful tool in situations where fixed capital is a negligible portion of the farm enterprise as is the case in Irish potato irrigation farming. The Gross Margin model is of the form:

GM = GI – TVC.

Where:

GM = Gross Margin of the irrigated potato enterprise.

GI = Gross Farm income of the irrigated potato enterprise.

TVC = Total Variable Cost of the irrigated Irish potato enterprise.

Similarly, the Gross farm income was determined as:

$GI = \Sigma Yi * pYi$

Where:

Yi = various units of harvested irrigated Irish potato.

pYi = unit price of the various components of harvested irrigated Irish potato.

Explicitly, the gross income is expressed as:

GI = Y1i * pY1i + Y2i * pY2i+ Y3i *pY3i + Y4i * PY4i

Where:

Y1i = Quantity of Irish Potato sold immediately after harvest.

Y2i = Quantity of Irish potato reserved for next planting.

Y3i = Quantity of Irish potato consumed at home

Y4i =Quantity of Irish potato given out as gifts or alms.

pY1i - pY4i = Average unit price per unit of the varios Irish potato output Y1i, Y2i, Y3i, and Y4i accordingly.

The benefits cost ratio was obtained by dividing the Present Worth Benefit (Gross Margin) by the Present Worth Cost (Total Variable Cost) (Abankwah and Abebe, 2011).

$B/C = \Sigma^{n}_{i=1} (PWB/PWC)$

The Present Worth of Cost (PWC) stream was obtained as the sum of variable costs of production since the analysis was done over one production period while the Present Worth Benefit was the Gross Margin. Sensitivity Analysis was used to determine how much the Benefit–Cost Ratio would change in response to uncertainties and price fluctuations in output and cost of farm inputs inherent in agricultural farm enterprises. Where the ratio is at least one (1) after the sensitivity analysis then the farm enterprise is considered viable, that is, the higher the ratio the more robust the enterprise.

The Sensitivity Analysis was done at 10% to determine the effect of uncertainties and price fluctuations on the economic viability of the irrigated Irish potato production enterprise. The 10 % was chosen based on seasonal price fluctuation in primary farm products and resources in the study area. The knowledge of the sensitivity of an enterprise, according to Gittinger (1982), places entrepreneurs in a better position to know whether their enterprises can withstand shock from uncertainties or sudden changes in cost of inputs or prices of outputs.

Results and Discussions

Socio-economic Characteristics of Irrigated Irish Potato Farmers in Plateau State

Results in Tabled 1, shows that 58.33% of the respondents were adults who have had several years of experience in Irish potato irrigation farming. Their long years of experience coupled with their age, according to Alabi et al., (2005) helps in enhancing efficiency and productivity. Table 1 also revealed that 84.17% of the respondents were men. This agrees with the findings of Onuk et al., (2010) that men always have right to land as a productive resource than women in most African societies.

Tables 1 revealed that 34.17% and 30% of the farmers have had secondary and higher education, respectively. Education, according to Murtala et al., (2004) plays an important role in farmers' adoption of improved technologies and decision making and also improves their ability in evaluating and managing risk that determines success of their farm enterprises. Results in table 1 also shows that 97% of the farmers had over ten years of experience in Irish potato irrigation which implies that the farmers were aware of all the nitty-gritty's involved in the enterprise which according to Alabi et al., (2005) enhances efficiency and productivity in business.

Table 1 also revealed that 90% of the farmers had high family size ranging from six to above ten household members, the large family size implies availability of free family labor, thus, the reason for the lower

cost of labor as compared to cost of seeds and fertilizers in the business. Results also revealed that the average farm size per farmer in the study area was 0.7 Ha which implies either an unavailability of capital or management ability of the farmers to control large farm size or the existence of a stiff land ownership system that hinders farmers from acquiring larger irrigation farm lands. Results in table 1 also showed that hired labor was the major (60.83%) source of labor in the study area and the Table also revealed that a higher number 68 (56.67%) of civil servants were involved in Irish potato irrigation farming in the area. Their dependency on hired labor was meant to allow them attain to their primary occupation since majority of them were civil servants.

Table 1: Socio-economic Characteristics of Irrigated Irish Potato Farmers in Plateau State.

Variable	Frequency	Percentage
Gender		
Male	101	84.17
Female	19	15.83
Total	120	100
Marital status		
Married	199	82.50
Single	21	17.50
Total	120	100
Educational level		
No formal Education	13	10.83
Primary Education	30	25.00
Secondary Education	41	34.17
Higher Education	36	30.00
Total	120	100
Age		
21-30	10	8.33
31-40	30	25.00
41-50	70	58.33
> 50	10	8.33
Total	120	100
Years of experience		
1-10	23	19.17
11-20	16	13.33
21-30	70	58.33
>30	11	9.17
Total	120	100
Family size		
>1	17	14.17
1-5	13	10.83
6-10	83	69.17
11-15	6	5.00
>15	1	0.83
Total	**120**	**100**
Farm size (Ha)		
0.1 -0.5	50	41.67
0.6 – 1.0	38	31.67
1.1 -.15	25	20.83
1.5	7	5.83
Total	120	100
Primary occupation		
Farming	40	33.33
Civil servant	68	56.67
Business	12	10.00
Total	120	100
Labour		
Family	19	15.83
Hired	73	60.83
Family and Hired	28	23.33
Total	120	100

Costs and Returns Analysis of Irrigated Irish Potato Production in Plateau State

Results in Tables 2 showed that the average Gross farm income per hectare of the farmers was ₦903, 918.66. The Table also showed that the farmers' average total variables cost of production per hectare was ₦248, 280.78 which covers 27.47% of the averages gross farm income of the farmers. The Gross Margin per hectare of

the irrigated Irish potato farmers was ₦655, 638.88 which accounted for 72.53% of the gross farm income, implying a profitable enterprise. Results in Table 2 further revealed that the average seed cost per hectare of the farmers, ₦ 40,481.07(56.58%), chemical fertilizer cost per hectares, ₦41,749.70(16.91%) and labor cost per hectare, ₦39,492.31(15.91%) accounted for the highest portion (89.30%) of the total variable cost of production of the farmers, this agrees with the findings of Kakuongo et al., (2008), that high cost of seeds, fertilizer and labor are the major challenges in Irish potato industry in most developing African countries.

Table 2: Costs and Returns per Hectare of Irrigated Irish Potato Production in Plateau State.

Variable	Values (N)	Percentage (%)
Returns		
Farm gates Sales	614,915.21	68.03
Seeds sold	263,535.09	29.16
Home consumption	7,640.51	0.85
Gifts/alms	17,827.85	0.85
Gross farm income	**903,918.66**	**100.00**
Variables cost		
Seeds	140,481.07	56.58
Labour	39,492.31	15.91
Chemical fertilizers	41,749.70	16.91
Organic fertilizers	9,008.28	3.61
Transportation	4,221.42	1.70
Fuel for irrigation	7,023.61	2.82
Water pump hiring	514.80	0.12
Pesticide for storage	689.59	0.28
Packaging backs	5,100.00	2.05
Total valuable cost	**248,280.78**	**100**
Gross Margin	**655,637.88**	

Economic Viability of Irrigated Irish Potato Production in Plateau State

Result of the Benefit–Cost Analysis in Tables 3 revealed a Benefit-Cost ratio that is above one (2.64), this implies that irrigated Irish potato production in Plateau State is a profitably lucrative business venture. After the sensitivity analysis, as shown in table 4, the 10% decrease in prices of output (₦590,073.99) and 10% increase in cost of farm input (₦273,108.83) has a neglible effect on the Benefit-Cost ratio. The changes reduced the Benefit-Cost ratio from 2.64 to 2.16, a difference of 0.48, which implies that irrigated Irish potato production in Plateau State is a profitable enterprise that has a robust economic viability.

Table 3: Benefit–Cost and Sensitivity Analysis of Irrigated Irish Potato production in Plateau State.

Actual Benefit Cost Analysis			Sensitivity Analysis (If prices decrease by 10% and costs increase by 10%)		
PWC	PWB	PWB/PWC	PWC	PWB	$\frac{PWB}{PWC}$
₦248,280.78	₦ 655,637.88	**2.64**	₦ 273,108.85	₦ 590,074.09	**2.16**

Conclusion and Recommendation

The study examined the economics of irrigated Irish potato production in Bokkos and Mangu Local Government Areas of Plateau State, Nigeria. Data were collected from 120 randomly selected Irish potato farmers using structured questionnaires. The data were analyzed using descriptive statistics, Gross Margin Analysis, Benefit–Cost and Sensitivity Analysis. Results showed that the cost of seeds, labor and chemical fertilizers covered the largest part of the total average variable cost of production. Results also revealed that irrigated Irish potato production is a profitably lucrative enterprise with high Gross Margin and high Benefit–Cost ratio. Sensitivity Analysis showed that irrigated Irish potato production is a profitable enterprise with a robust economic viability. The study recommends the expansion of Irish potato farmlands in additions to adoption of technologies that will help reduce cost of seeds, labor and chemical fertilizers.

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