IMPACT OF INPUTS COSTS ON FARM PROFITABILITY: AN EVALUATION OF PEARL MILLET PRODUCTION IN NORTH-WESTERN NIGERIA

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ABSTRACT

The current study was carried out to estimate cost, returns and the profitability level of pearl millet production in north-western Nigeria. The study made use of primary data collected from a cross section of 430 pearl millet farmers and analysed using descriptive statistics, budgetary technique, profitability ratio, and Ordinary Least Square regression analysis. The study reveals that an average gross margin and net farm income across all the sampled pearl millet farms were $233.89 and $200.89 respectively, while average total cost was $ 229.35 per cultivation season. The profitability index, rate of return on investment and capital turnover were $ 0.43, 0.77 and $ 1.77, respectively. This is an indication that pearl millet production is profitable in the study area. It is also established that the coefficients of costs of renting land, fertilizer, labour, seed, agrochemicals and price of pearl millet output have significantly impact on gross margin of pearl millet production. Based on the above findings, the study concludes that profit level of the pearl millet can be significantly increased with policies that guarantee better farmer price and lower inputs costs.

Contribution/ Originality: Very few studies are available on profitability of pearl millet; but none of the studies has gone far to determine the effect of inputs costs on its profitability. Therefore, this study contributes to a literature pool of the study of pearl millet production which can be best described as scanty.

1. INTRODUCTION

Pearl millet is a warm-weather cereal crop believed to have originated from western tropical Africa more than 3000 years ago and spread throughout eastern and southern Africa [1]. Pearl millet is reported to be one of the four most essential cereal crops (millets, rice, maize and sorghum) globally, which is normally grown for its grain on 26 million hectares in over 40 countries. It is mostly grown in arid and semi-arid tropical (SAT) areas of Africa and a few other countries in Asia, where rainfall is not sufficient (200-600 mm).

In Africa, it is predominantly grown in Burkina Faso, Chad, Kenya, Mali, Niger, Nigeria, Senegal, Sudan and Uganda, while the major producers in Asia include China, India and Yemen. The cereal crop is also grown in some

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parts of America and Australia, mainly as a forage and/or mulch component of minimum tillage-based cropping systems [2]. According to USADA [3] the world total production of millet grains as at last count was 29.9 million tons to which 55% contributed by Africa, 43.5% Asian and 1.5% by the other four continents.

FAOSTAT (Food and Agriculture Organization Statistics) [4] records showed that the top five (5) world millet producers with an annual mean production between the years 1999 to 2010 were India topping with 10,910,000 tons (36.49%), followed by Nigeria 5,000,000 tons (16.72%), Niger 2,862,155 tons (9.57%), China 1,746,500 tons (5.84%) and Mali 1,152,331 tons (3.85%).

About 500 million people of the world depend on pearl millet for their livelihood and 90-95% of quantity produced and the acreage cultivated in the world are accounted for by developing countries of Africa and Asia [5-7]. Nearly 78% of the quantity produced in these countries is primarily produced as staple food for human consumption and less than 20% is normally produced for other uses [8]. While in other countries especially, United State of America, Australia, Mexico and the Canada pearl millet is cultivated solely as a feed for livestock consumption. Nambiar, et al. [9] and Manga and Kumar [10] described millet as a crop that has resistance to high temperatures, with a high nutritive value, short growing period, adaptable to poor soils and needs very little water for their production compared to major cereals.

In Nigeria, pearl millet is a traditional crop, which is grown in many parts of the country especially in the North-eastern and North-western regions of the country where it is considered as staple cereal for over 40% of the populace. However, Ojediran, et al. [11] ranked pearl millet as the most important cereal in the dry sub-humid and semi-arid areas of the country

Within the last two decades, Nigeria was one of the most important millet producing countries in the world. It has become increasingly more important in the production of the crop, where it accounted for about 14% of average annual world production during the period 1992 to 1994 as compared to only 9% within the 1979 to 1981 periods. FAO (Food and Agriculture Organization) [12] reported that almost half (40%) of the total millets grown in Africa is produced by Nigeria alone.

The average annual pearl millet production in Nigeria during 2005-2010 is estimated at 6.28 million tons representing about 13.4% of total world production which ranks Nigeria as the second World largest producer after India and made it the third important cereal after maize and sorghum at national level. Despite its role in food provision, economic gains and long history as one of the northern people's staple food in the northern region of Nigeria, pearl millet production is still at subsistence level. This could be attributed to the dearth of studies that empirically present the profitability of this vital crop which would serve as a means of providing information for prospective investors in pearl millet production in Nigeria. This study would therefore inform farmers on how to increase returns in pearl millet production and improve both productivity and their standard of living thereby having positive implications on food security and economic growth in the country.

2. MATERIALS AND METHODS

2.1. The Study Area

The study was undertaken in Kano and Jigawa states of Northwestern Nigeria. Kano State is considered as an agricultural and commercial state, and it is located on 12°37' N, 9°29' E, 9°33' S, and 7°43' W [13]. It has a daily mean temperature of 30 °C to 33 °C during March to May and has a lowest temperature of 10 °C during the months of September to February. The states are characterized by uni-modal rainfall pattern with a mean annual rainfall of 600mm [14]. Kano State has an estimated total land mass of 20,760 Square meters with 1,754,200 hectares of agricultural land and 75,000 hectares of grazing land and forest vegetation. The state has a total of 44 Local Government Areas (L.G.As) and projected population of 13,383,682 people [15]. Kano is the most widely irrigated state in the country and has cultivable land over 3 million hectares [16].

Jigawa state is situated in between latitudes11.00°N to 13.00°N and longitudes 8.00°E to 10.15°E. About 4,361 ,002 people inhibit the state [15]. Over 80% of the population

is involved in peasant farming and livestock husbandry. The State has a total estimated land area of nearly 25,000 square kilometres: over 80 per cent of the land is confirmed as arable and put to cultivation of crops during the limited raining period. Almost 14 per cent (approximately 54,000 hectares) merely comprised of irrigable wet lands apt for agricultural production throughout the year. Jigawa state produce value of crops estimated at ₦ 644.41 ($3.95) Billion positioning the state as the 7th largest crop producer in the country Jigawa State Investors' Handbook [17].

2.2. Sources and Method of Data Collection

The study made use of primary data. Primary data was collected with the aid of structured questionnaire from cross sections of independent pearl millet farmers in the study area. A structured questionnaire study was conducted during 2013/2014 production season to collect data from a cross-section of pearl millet farmers in Kano and Jigawa States of the North-eastern, Nigeria.

2.3. Sampling Technique and Sample Size

Kano and Jigawa states were purposively selected based on the high concentration of pearl millet farmers in the northwest region. Random sampling technique was used to obtain data from a cross-section of 430 households that grew pearl millet in the 2013/2014 cultivation season. A total of 500 questionnaires were distributed (300 in Kano state and 200 in Jigawa state with 20 in each randomly selected Local Government Areas). Even though 285 questionnaires from Kano and 190 Jigawa states were successfully returned, comprehensive information was obtainable in only 256 and 174 questionnaires from these two states, respectively. Therefore the final sample size for the study stands at 430 farmers.

2.4. Analytical Techniques

The analytical tools that were employed for data analysis this study include budgetary technique, production and cost functions.

2.4.1. Budgetary Technique

The basis for profitability analysis is cost and returns analysis. Profitability is the ability of a given investment to earn a return from its use. It forms the basis of the whole decision-making process under resources constraints, which are put into alternative uses. Cost is the monetary value of inputs used in production, while returns refer to income realized from the sale of output.

Budgetary technique such as gross margin (GM) and net farm income (NFI) were used to estimate the cost and returns associated with pearl millet production. Olukosi and Erhabor [18] described a farm budget as the detailed physical and financial plan for the operation of a farm for a certain period. They defined the NFI as the difference between the gross income (GI) and total (fixed and variable) cost of production. The gross margin will be used under the assumption that fixed cost of production is negligible. NFI measures the strength and weakness of the farm. The NFI equation is given by:

$$TC = TFC + TVC \tag{1}$$

Where:

TC= Total cost of pearl millet production $/ha.

TVC= Total variable cost of pearl millet production $/ha; which includes cost of seed, cost of fertilizer, hired labour and family labour.

TFC= Total fixed cost of pearl millet production $/ha, which comprises production cost of fixed assets used (cutlass, hoes, rake, wheel barrow, spade and opportunity costs of land.

$$TR = Q \ x \ P_Q \qquad\qquad (2)$$

Where:

Q= Quantity of pearl millet harvested (kg)

P_Q = Price of pearl millet ($)

TR = Total revenue of millet ($).

$$GM = TR - TVC \qquad\qquad (3)$$

Where: GM= Gross margin of pearl millet $/ha

$$NFI = GM - TFC \qquad\qquad (4)$$

NFI= Net farm income of millet $/ha.

In many previous studies, the benefits of NFI as a measure of profitability has been exhaustibly discussed and documented. The survival of any farm business is determined by positive value of its NFI. However, Ronald, et al. [19] argued that "NFI should be considered more as a preliminary point for analyzing profitability than a good measure of profitability itself." They explained that profitability is concerned with the size of the profit in relation to the size of the farm enterprise. Size is measured by the value of the inputs used to produce the profit; an enterprise can indicate a profit but have a poor profitability rating if this profit is trivial in relation to the size of the farm business. Two farms with the same NFI, for instance, are not equally profitable if one used two times as much input (capital, labour, land, and fertilizer) as the other to produce that profit. Thus, they described profitability as a measure of the efficiency of the enterprise in using its resource inputs to yield profit or NFI. Therefore, in order to conclude whether the enterprise is profitable or not, it is imperative to compute the profitability measures as follows;

i). Profitability Index (PI)–This is the Net Farm Income (NFI) per unit of Gross Revenue (GR). That is;

$$PI = \frac{NFI}{GR} \qquad\qquad (5)$$

PI indicates the level of return per dollar gross income. For a farm to be profitable based on this measure, the PI should greater than zero (PI>0). If PI=0, then farm has breakeven and negative PI implies that the farm is operating at loss.

ii). Rate of Returns on Investment (%)

$$RRI = \frac{NFI}{TC} \times 100\% \qquad\qquad (6)$$

Equation (6) shows the ratio of the accounting profit to the investment (total cost of production) in the farm, expressed as a percentage. The return on assets ratio is a measure of return on investment; it reflects earning per dollar of both owned and borrowed capital. The higher the ratio, the greater is the return on assets. The RRI should be greater than the cost of capital for the investment to be worthwhile. Annual rates of return on both equity capital and total assets also can be calculated and compared to interest rates for loans or rates of return from alternative investments. The RRI should also be greater than or equal to the interest/hurdle rate.

iii). Capital Turnover (CTO):

$$CTO = TR/TC \qquad\qquad (7)$$

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CTO is defined as the total revenue (TR) divided by total costs of production. It roughly depicts how much dollar ($) in revenue the farm can generate for each dollar investment over a given period. For an investment to be considered profitable, this ratio should be greater than one (i.e. CTO>1). CTO indicates the extent to which a farm efficiently utilizes its assets to generate revenue. Hence, the higher the ratio, the more efficiently assets are being used to generate revenue.

2.4.2. Effects of Inputs Cost On Profitability of Pearl Millet Production

Multiple regression analysis was used to capture the influence of farm's inputs cost and output on profitability of pearl millet production. The basic econometric model used to estimate pearl millet profitability was expressed as a Cobb-Douglas production function type [20, 21] and it is expressed as follows:

$$LnY_i = lna_0 + a_1 lnX_1 + a_2 lnX_2 + a_3 lnX_3 + a_4 lnX_4 + a_5 lnX5_5 + a_6 lnX_6 + a_7 lnX_7 + e_i \qquad (8)$$

Where;

Y_i profitability measure as proxy by the Gross Margin (GM)

X_1 = Cost of Agrochemicals ($)

X_2 = Cost of Fertilizer ($)

X_3 = Cost of Labour ($)

X_4 = Cost of renting land ($)

X_5 = Cost of Manure ($)

X_6 = Cost of seed ($)

X_7 = Price of output ($/Kg)

a_0 = constant

a_1- a_7 = estimated coefficients of the explanatory variables

e_i = Stochastic Error term.

3. RESULTS AND DISCUSSION

3.1. Profitability Analysis of Pearl Millet Production

Agricultural inputs as well as their costs play a critical role in output, returns and hence profitability from pearl millet production. The contributions of most essential inputs in pearl millet production as well as their economic significance in yield and profitability are provided by detailed study of the cost of pearl millet production. Costs of pearl millet production are made up of land, fertilizer, manure, labour, seed, agrochemicals, sacks, transportation, storage and tax.

3.1.1. Cost of Pearl Millet Production

The production cost analysis in this study is presented in Table 1. The results of the study revealed that the average variable cost (AVC) per season per hectare as $229.35, representing 87.42% of the total costs of pearl millet production in north-western Nigeria. The average fixed cost (AFC) per season per hectare was $33.00, constituting about 12.58% of the total cost.

The average total cost (ATC) per season per hectare for pearl millet production in the study area was estimated as $262.35. It can be deduced from the results presented in Table 1 that labour constitutes the highest percentage of the costs, accounting for 32.14%. This is followed by costs of fertilizer and storage constituted the least in the cost of pearl millet production. This implies that pearl millet production is a labour intensive. The result supports the findings of Kudi and Abdulsalam [22] who found that labour and fertilizer inputs accounted for a greater proportion of total variable costs of 36.65% and 37.96 % in the production of striga tolerance and farmers maize

varieties in Kaduna state, Nigeria. The result also agrees with Yakasai [23] and Chidiebere-Mark, et al. [24] findings.

Table-1. Production costs of pearl millet per hectare per season

Production Inputs (variables)	Costs ($/HA)	Percentage
i. Variable Costs:		
Seed	27.30	10.45
Labour	84.33	32.14
Fertilizer	75.52	28.79
Agrochemicals	8.41	3.21
Manure	18.37	7.00
Sacks	6.83	2.60
Transportation	6.56	2.50
Storage	0.72	0.27
Tax	1.31	0.50
Total Variable Costs (TVC):	**229.35**	**87.42**
Fixed Cost (TFC):		
Depreciation on:		
Land	29.80	11.36
Implements	3.20	1.22
Total Fixed Costs (TFC):	**33.00**	**12.58**
Total Costs (TC)= (TVC + TFC):	**262.35**	**100.00**

Source: Survey result (2015)

3.1.2. Returns from Pearl Millet Production

From the table 2, total revenue per season per hectare with regard to pearl production in the study area was on average $463.24. The gross margin (GM) is an important tool used to evaluate the economic viability of a business. Gross margin per season per hectare was estimated at $233.89, while the net farm income (NFI) which represents the return to management and labour was calculated at $200.89. Considering these two measures of GM and NFI, we can conclude that pearl millet farming is generally profitable in the study area. The estimated total revenue and net farm income obtained in this study further indicates that pearl millet cultivation in the study areas is still small scale and largely for domestic consumption [25].

Measure of profitability ratios indicate that profitability index (PI) for pearl millet production was 0.43. This means that for every dollar ($) earned as revenue from the pearl millet production in the study area, $0.43 returned to the producers as net income. In other words, 43% of the total revenue earned from pearl millet business constituted the net income. By implication, an appreciable profit level can be made from this enterprise. PI of 0.35 and 0.43 had been observed by Mohammed, et al. [26] and Ibekwe, et al. [27] respectively. The rate of return on investment (RRI) in this study was estimated to be 0.77, implying that for every one dollar spent or invested in pearl millet production by farmers in the study area, the farmers earned on average 77% profit. Similarly, on the same table, results of capital turnover (CTO) value of 1.77 showed that for every one dollar cost incurred in pearl millet business, $1.77 was returned to the farmers as revenue. These results indicate the positivity of profitability and hence the return to investment.

The results showed that average total cost incurred is less than the average total revenue, which means that farmers in the study area were able to recuperate all their total cost (variable and fixed costs). This is an implication that pearl millet production is a profitable venture in the study area. The study therefore, suggested further that investing in pearl millet enterprise would generate higher returns to the farmers in north-western Nigeria.

Table-2. Estimated returns/cropping season/ha from Pearl Millet Production

iii). Returns	Value ($/h)	Percentage
Millet Grain (kg) =1263.41		
Price per Kg	0.35	
iv).Sales of millet	442.19	95.45
v). Sales of residues (straws/husks)	21.05	4.55
Total Revenue (iv+v)	**463.24**	**100.00**
Gross Margin (GM)=(TR-TVC)	233.89	
VI). Net Farm Income(NFI)=(TR-TC)	200.89	
Measure of Profitability Efficiency		
PI= $\frac{NFI}{GR}$	0.43	
ROI = $\frac{NFI}{TC}$	0.77	
Capital Turnover (CTO): = TR/TC	1.77	

Source: Survey result (2015)

3.2. Model Diagnostics for Regression

When fitting a regression model, prior to performing any statistical inference it is imperative to check whether all necessary model assumptions are valid. Model diagnostics were therefore carried out for the linear model to ensure that the collected data have met the assumption underlying OLS regression and results are presented in Table 3. Firstly, the Ramsey reset test for functional form specification was conducted and the result showed insignificant values of t-statistic and F-statistic with p=0.971 (p>0.05) and p=0.971 (p>0.05), respectively, which means that the null hypothesis that the model is appropriately specified is failed to be rejected. Heteroscedasticity is a violation of one of the requirements of OLS in which errors variance is not constant [28]. The Breusch-Pagan-Godfrey test for heteroscedasticity was applied. The test was insignificant with p-value of 0.159 (p>0.05), suggesting that the null hypothesis that there is no heteroscedasticity (random terms have constant variance) is failed to be rejected. Another assumption of OLS which is optional is the normality of error terms or residuals. This assumption states that, conditional upon the explanatory variables, the errors are normally distributed. The normality assumption was checked using a Jaque-bera test, and result produces insignificant p-value of 1.453, indicating that the residuals exhibit normal pattern.

The data was also tested for the presence of multicollinearity. It is expected that no single regressor should be linearly correlated with another regressor. Tolerance value (1/VIF) and variance inflation factor (VIF) were used to assess the incidence of multicollinearity. The tests showed that none of the VIF or tolerance value illustrates any serious multicollinearity. In fact, according to Greene [29] and Gujarati and Porter [28] VIF value greater than 10 or tolerance value (1/VIF) of less than 0.1 indicate serious multicollinearity. Hence, average VIF and 1/VIF values of 1.418 and 0.741 (Tables 3), implies the absence of multicollinearity problem in the data set. In the light of the above results, it is concluded that the data met all the underlying OLS assumptions and hence fit for further analysis.

Table-3. Results of Diagnostic tests for the OLS regression model

Diagnostic test statistics	Test-Statistics	P-value	Decision Rule
Normality Test	Jaque-Bera	1.453	Fail to reject H_0
Functional Form Specification	Ramsey RESET Test	0.971	Fail to reject H_0
Heteroscedasticity test	Breusch-Pagan-Godfrey	0.159	Fail to reject H_0
Multicollinearity test	Variance Inflation Factor (VIF)=1.418	-	Fail to reject H_0
	Tolerance Value (1/VIF)=0.741	-	Fail to reject H_0

Source: Field Survey, 2015

3.2.1. Results of Effects of Farm Inputs Costs on Profitability of Pearl Millet Production

The relationship between profitability of pearl millet production and output and inputs costs are explained based on the multiple regression results as presented in Table 4. Economic, econometric and statistical criteria such as coefficient of multiple determinations (R^2), F-Statistic, statistical significance and the signs of the estimated regression parameters were employed to select Cobb-Douglas profit function as the lead equation; therefore, the estimated equation is:

$$Y = -46.303 - 0.256X_1 - 0.875X_2 - 0.211X_3 - 1.334X_4 - 0.536X_5 - 1.418X_6 + 0.345X_7$$

The coefficient of multiple regressions (R^2) was found to be 0.71, implying that about 71% of the total variation in pearl millet profit is jointly explained by the regressors included in the model. The F-ratio (148.37) is significant at 1% level, meaning that the regression model is of good fit.

According to theory, cost is negatively related with profit, whereas the relationship between price of output and the profit is positive [30]. In pearl millet production, costs are expected to have a negative association with profit (gross margin). This is because more revenue is used to cover costs than to add to profit as the production costs increase. The statement was supported by Delgado, et al. [31] who emphasized that costs are inversely related with net revenue. In contrary, output price is directly related to profit, because economically proven that as the total revenue increase with the increase in price there is profit for producer [32].

It can be seen that the signs of the entire coefficients have the appropriate signs and conform to the priori expectation. These results imply that these seven variables are important factors influencing profit of pearl millet production in the study area. The coefficient for cost of land renting was -1.418 suggesting that all things being equal, a 1% decrease in the cost of renting a land meant for pearl millet cultivation would increase profit by 1.418%. The inverse relationship between cost of land renting and profit under pearl millet production in this study is in conformity with results reported by Onyango, et al. [33] and Hazell, et al. [34] that higher cost of land renting has a predisposition to produce low revenue per hectare compared to farm size with lower renting cost. This could be ascribed to the fact that increasing cost of land area under pearl millet production must go along with increase in costs of production since more inputs are required. The coefficient for labour cost was -1.334 means that 1% decrease in the labour cost would increase farm profit by 1.334%. The findings correspond to those of Okam, et al. [35] and Islam, et al. [36]. The elasticity for fertilizer cost was -0.875, implies that *ceteris paribus*, a 1% decrease in fertilizer cost would lead to an increase of 0.875% in total profit. This support the findings by Tatsvarei, et al. [37] and Mahmood, et al. [38] while Okam, et al. [35] and Hassan, et al. [39] found contracting results of fertilizer costs to have negative but insignificant relationship with profit.

Table-4. Multiple Regression estimates showing the impact of Farm's input Costs on profitability of pearl millet production in north-western Nigeria

Independent variables	Regression coefficients (b values)	Standard Error	Level of significance (p-value)
Constant	46.303	27.090	0.088*
Cost of renting land	-1.418	0.705	0.045**
Cost Fertilizer	-0.875	0.112	0.000***
Cost of manure	-0.211	0.197	0.285NS
Cost of Labour	-1.334	0.138	0.000***
Cost of Seed	-0.536	0.257	0.038**
Cost of Agrochemicals	-0.256	0.131	0.051*
Price of output	0.345	0.012	0.000***
R^2	0.71		
F –Statistic	148.37		0.000***

NS=Not Significant. ***, ** and * denote for significant at 1%, 5% and 10% at levels, respectively.

The coefficient for cost of seed (-0.536) indicates that 1% decrease in cost of seed with cost of other factors remaining fixed would increase profit by 0.536%. Similar results were presented by Hassan, et al. [39] and

Mahmood, et al. [38]. The results further revealed that -1.418 elasticities for cost of agrochemicals imply that a 1% decrease in the costs of agrochemicals would lead to 1.418% increase in the magnitude of pearl millet profit. This is in accordance with *a prior* expectation, because the drudgery of farm operations such as land clearing and weeding can be reduced by application of agrochemicals. Also, the control of pests and diseases by using agrochemicals results in increased output quantity. Studies by Basera, et al. [40] and Okam, et al. [35] showed similar results that coefficients for cost of agrochemicals were negative and significant at 5% level. But opposite result was echoed by Hassan, et al. [39] where they found coefficient for cost of agrochemicals to be negative and insignificant.

Only the coefficient of manure (X_3) was found to be negative but not significant even at 10% level. Having the expected sign means that although this variable could not be considered as one of the major determinants of total production cost, it is associated with total cost of production of pearl millet in the area. Hence, an increase in the quantity of manure may not cause any increase in the total cost of pearl millet production. The negative sign and insignificance associated with cost of manure is inconsistent with findings of Hassan, et al. [39] and Islam, et al. [36] who discovered that manure cost was significant at 5% level. The coefficient for price of output was 0.345, suggesting that holding all other things constant, profit from pearl millet production would increase by 0.345% for any 1% increase in price of output. This implies that the higher the price farmers receive from sales of their output, the higher the profit realize. This is in conformity with literature because according [41] price of a product is considered as one of the most important factors affecting its profitability. This substantiates the findings by Awal [42] and Ebiowei [43] that price is directly correlated with farm's net returns, because the higher the price of a commodity, the greater will be the returns to producers.

4. CONCLUSION AND RECOMMENDATION

Net farm income and gross margin from pearl millet in north-western Nigeria were found to be $233.89 and $200.89 respectively. Also, profitability index, rate of return on investment and capital turnover for pearl millet production were $0.44, 0.77 and $1.77, respectively. All of these profitability measures indicated that pearl millet production is a profitable venture in the study area. The study also established that overall profit level of pearl millet production in the north-western was influenced by both inputs (land, fertilizer, manure, labour, seed and agrochemicals) costs and price of output. It can therefore, be concluded that profit level of the pearl millet can be significantly increased with policies that guarantee better farmer price and lower inputs costs. This would provide farmers with higher profit and encourage them to stay in the business which means increased incomes, hence improved livelihood for the agrarian community. Furthermore, the farm size holdings and capital investments of the farmers reflect the subsistence feature that describes the production pattern in the area. This means it is all for consumption and an additional source of income not mainly for commercial purpose. The findings of the research could propel policies that would support and entice farmers to upscale production of to commercial scale to enable them reap the economics of scales benefit in production, which means higher profit margin can be anticipated. This signifies a significant contribution to the national gross domestic product (GDP), thereby uplifting the general standard of living in the northern regions and the country at large. Finally, the result is relevant to poverty alleviation and overall development. Hence, has contributed to scarce literature of potentials of pearl millet farming and also can provide basis for action.

REFERENCES

[1]   FAO, "Food and agriculture organization, FAOSTAT." Retrieved http://www.fao.org/faostat/en/#data/QC. [Accessed 17/11/2013], 2008.

[2]   FAOSTAT (Food and Agriculture Organization Statistics), "Crops, area and production of pearl millet." Retrieved from http://faostat.fao.org/StatisticalDatabaseonAgriculture. [Accessed 2015-05-19], 2005.

[3]   USADA, "United State department of agriculture." Retrieved www.nal.usda.gov. [Accessed 02/05/2015], 2014.

[4]   FAOSTAT (Food and Agriculture Organization Statistics), "Crops, area and production of pearl millet." Retrieved from http://faostat.fao.org/StatisticalDatabaseonAgriculture. [Accessed 2015-05-19], 2015.

[5]   G. Basavaraj, R. P. Parthasarathy, S. Bhagavatula, and W. Ahmed, "Availability and utilization of pearl millet in India," *Journal of SAT Agricultural Research*, vol. 8, 2010. *View at Google Scholar*

[6]   S. Shaktawat, I. P. Singh, N. Nagaraj, and S. Sharma, "Resource use efficiency and returns to investment in research of pearl millet in Rajasthan," *Indian Journal of Economic Development*, vol. 8, pp. 1-11, 2012. *View at Google Scholar*

[7]   Factfish, "Nigeria: Millet, production quantity (Tons) for Nigeria." Retrieved from www.factfish.com. [Accessed Sept. 21, 2015], 2014.

[8]   D. J. Andrews and K. A. Kumar, "Pearl millet for food, feed and forage," *Advance Agronomy*, vol. 48, pp. 89-139, 1992. *View at Google Scholar | View at Publisher*

[9]   V. S. Nambiar, J. J. Dhaduk, N. Sareen, T. Shahu, and R. Desai, "Potential functional implications of pearl millet (Pennisetum glaucum) in health and disease," *Journal of Applied Pharmaceutical Science*, vol. 1, pp. 62-67, 2011. *View at Google Scholar*

[10]   V. K. Manga and A. Kumar, "Cultivar options for increasing pearl millet productivity in arid regions," *Indian Journal of Fundamental and Applied Life Sciences*, vol. 1, pp. 200-208, 2011. *View at Google Scholar*

[11]   J. O. Ojediran, M. A. Adamu, and D. L. Jim-George, "Some physical properties of Pearl millet (Pennisetum Glaucum) seeds as a function of moisture content," *African Journal of General Agriculture*, vol. 6, pp. 39-46, 2010. *View at Google Scholar*

[12]   FAO (Food and Agriculture Organization), *The world sorghum and millet economies: Facts, trends and outlook*. Rome: FAO, 1996.

[13]   D. Olofin, H. P. John, and T. Hopekins, *Map of Nigeria showing vegetation belt and irrigation sites*: Macmillan Press, 2008.

[14]   B. D. Mignouna, T. Abdoulaye, A. Kamara, and M. Oluoch, *Baseline study of smallholder farmers in Striga infested maize and cowpea growing areas of Northern Nigeria* vol. 60. International Institute for Tropical Agriculture, 2013.

[15]   NPC, "National population commission," Population Census of the Federal Republic of Nigeria; Draft Report2006.

[16]   S. O. Oyewole and O. A. Ojeleye, "Factors influencing the use of improved farm practices among small-scale farmers in Kano State of Nigeria," *Net Journal of Agricultural Science*, vol. 3, pp. 1-4, 2015. *View at Google Scholar*

[17]   Jigawa State Investors' Handbook, "A guide to business and investment in Jigawa State," vol. 1, pp. 1-49, 2013.

[18]   J. O. Olukosi and P. O. Erhabor, *Introduction to farm management: Principles and applications.* Zaria, Nigeria: Agitab Publishers Ltd, 1988.

[19]   D. K. Ronald, M. E. William, and A. D. Patricia, *Farm management.* New York: McGraw-Hill, 2008.

[20]   A. S. Leahy, "The determinants of profitability in the pharmaceutical industry," *American Journal of Health Sciences*, vol. 3, pp. 37-42, 2012. *View at Google Scholar | View at Publisher*

[21]   I. M. Okwo and D. O. Ugwunta, "Impact of firm's input costs on firm profitability: Evaluation of The Nigerian brewery industry," *Research Journal of Finance and Accounting*, vol. 3, pp. 78-89, 2012. *View at Google Scholar*

[22]   T. M. Kudi and Z. Abdulsalam, "Costs and returns analysis of striga tolerant maize variety in Southern Guinea Savanna of Nigeria," *Journal of Applied Sciences Research*, vol. 4, pp. 649-651, 2008. *View at Google Scholar*

[23]   M. T. Yakasai, "Economic contribution of cassava production (A Case Study of Kuje Area Council Federal Capital Territory, Abuja, Nigeria)," *Bayero Journal of Pure and Applied Science*, vol. 3, pp. 215-219, 2010. *View at Google Scholar | View at Publisher*

[24]   N. M. Chidiebere-Mark, C. S. Nwosu, O. O. Nwankwo, C. Chikezie, H. U. Oduofor, and R. D. Ejike, "Profitability of cassava based crop farmers in owerri agricultural zone of Imo State, Nigeria," *Journal of Agricultural Research*, vol. 3, pp. 10-15, 2014.

[25]   N. N. Oguoma and O. F. Nwosu, "Resource management of cassava-based cropping systems in Imo State, Nigeria," *Journal of Economic Theory*, vol. 3, pp. 33-40, 2009. *View at Google Scholar*

[26]   A. B. Mohammed, A. Apata, T. Peter, and D. Fidelis, "Factors declining cassava production in Ogori – Magongo L.G.A. of Kogi State, Nigeria," *ARPN Journal of Agricultural and Biological Sciences*, vol. 5, pp. 16-18, 2010. *View at Google Scholar*

[27]   U. C. Ibekwe, C. Chikezie, P. C. Obasi, C. C. Eze, and A. Henri-Ukoha, "Profitability of garri processing in Owerri North local government area of Imo State," *ARPN Journal of Science and Technology*, vol. 2, pp. 340-343, 2012. *View at Google Scholar*

[28]   D. N. Gujarati and D. C. Porter, *Basic econometrics*, 5th ed. New York: Mc Graw Hill Inc, 2009.

[29]   W. H. Greene, *Econometric analysis*, 7th ed. New Delhi, India: Pearson Education, 2012.

[30]   M. E. Elahi, M. Shah, A. Rashid, and S. K. Marwat, "Profitability of rice (Oryza Sativa) production in District Dera Ismail Khan," *American-Eurasian Journal of Agriculture and Environmental Science*, vol. 15, pp. 1845-1848, 2015.

[31]   C. L. Delgado, C. A. Narrod, and M. M. Tiongco, "Determinants and implications of the growing scale of livestock farms in four fast-growing developing countries," Research Report No. 157, IFPRI, Washington, D.C, 2008.

[32]   G. Ntabakirabose, M. Mbabazize, and J. Shukla, "An analytical study of the factors influencing maize production in Rwanda: A case study of Gatsibo District," *International Journal of Business & Management*, vol. 3, pp. 146-181, 2015. *View at Google Scholar*

[33]   M. Onyango, D. J. Otieno, R. A. Nyikal, and J. Ojiem, "An economic analysis of grain legumes profitability in Nandi County, Kenya," presented at the AAAE Fifth International Conference, September 23-26, 2016, Addis Ababa, Ethiopia (No. 246921). African Association of Agricultural Economists (AAAE), 2016.

[34]   P. Hazell, C. Poulton, S. Wiggins, and A. Dorward, "The future of small farms: Trajectories and policy priorities," *World Development*, vol. 38, pp. 1349–1361, 2010. *View at Google Scholar | View at Publisher*

[35]   C. Y. Okam, O. Yusuf, S. Abdulrahman, and A. D. Suleiman, "Comparative analysis of profitability of rice production among men and women farmers in Ebonyi State, Nigeria," *Asian Journal of Agricultural Extension, Economics and Sociology*, vol. 10, pp. 1-7, 2016. *View at Google Scholar | View at Publisher*

[36]   M. Z. Islam, R. Begum, S. Sharmin, and A. Khan, "Profitability and productivity of rice production in selected coastal area of Satkhira district in Bangladesh," *International Journal of Business Management and Social Research*, vol. 3, pp. 148-153, 2017. *View at Google Scholar | View at Publisher*

[37]   S. Tatsvarei, B. T. Hanyani-Mlambo, and C. Makate, "Profitability analysis of tabasco chillies grown by smallholder farmers in Nyanga district, Manicaland province, Zimbabwe," *Research Journal*, vol. 1, pp. 1-15, 2014.

[38]   I. Mahmood, S. Hassan, A. Bashir, M. Qasim, and N. Ahmad, "Profitability analysis of carrot production in selected Districts of Punjab, Pakistan: An empirical investigation," *Journal of Applied Environmental and Biological Sciences*, vol. 7, pp. 188-193, 2017. *View at Google Scholar*

[39]   M. M. Hassan, S. I. Resmi, M. S. H. Islam, and M. M. Hossain, "Farmer's profitability of maize cultivation at Rangpur district in the socio-economic context of Bangladesh: An empirical analysis," *International Journal of Applied Research*, vol. 3, pp. 794-800, 2017.

[40]   J. Basera, C. Makate, and T. Tozooneyi, "Comprehending smallholder maize enterprises' profitability with the current maize marketing system in Zimbabwe: A case of Mazowe District," *Asian Journal of Agriculture and Rural Development*, vol. 6, pp. 90-105, 2016. *View at Google Scholar*

[41]   H. L. Ahuja, *Advanced economic theory: Microeconomic analysis*, 14th ed. New Delhi, India: S. Chand and Company Pvt. Ltd, 2006.

[42]   A. Awal, "An economic analysis of potato and carrot production in selected areas of Mymensingh District," Unpublished Master Thesis, Bangladesh Agricultural University, 2013.

[43]   K. P. Ebiowei, "Marketing margin and determinants of net returns of watermelon marketing in Yenagoa Metropolis of Bayelsa stat, Nigeria," *Journal of Experimental Biology and Agricultural Sciences*, vol. 4, pp. 241-247, 2013.