

MAIZE COB LOSSES AND THEIR EFFECTS ON THE POVERTY STATUS OF MAIZE FARMERS IN EDO STATE, NIGERIA

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ABSTRACT

This study analysed fresh maize cob losses and its effect on the poverty status of maize farmers in Edo State, Nigeria. The specific objectives were to estimate the physical and financial amount of fresh maize cob losses experienced by maize farmers, examine the effect of fresh maize cob losses on the respondents' poverty status, and determine the poverty status of the respondents. Multistage sampling technique was used in selecting 108 maize farmers. The data were analysed using descriptive statistics, budgeting technique, relative poverty line analysis, the Foster-Greer-Thorbecke (FGT) poverty measure, and t-test. The average profit without loss per maize farmer was ₦165, 599.15. However, with loss of about 185kg of fresh maize cobs per farmer, the profit reduced to ₦118, 931.17. The difference in the mean profit with and without loss was significant at 1%. Fresh maize cob losses increased the proportion of the poor respondents by 14%. The poverty incidence with and without maize cob loss was 0.64 and 0.50 respectively. The study concluded that maize farming was a profitable venture. However, maize cob loss resulted in significant reduction in the income of the farmers. This study therefore recommended that relevant bodies such as the government, farmers' cooperatives and non-governmental organizations should assist in addressing the problem of maize cob loss among farmers which would help alleviate their poverty.

Key words: relative poverty line, FGT poverty measure, budgetary technique

INTRODUCTION

Maize is an important cereal crop that originated from South and Central America and came into West Africa in the 10th century (Ukonze *et al.*, 2016; Olaniyi and Adewale, 2012) and to Nigeria in the 16th century. Maize is a widely accepted crop cultivated in most parts of the country in several varieties. The most common types are yellow, white and red maize (Iken and Amusa, 2004). Maize which started as a subsistence crop in Nigeria is now grown on commercial basis due to its economic importance. It thrives well in diverse ecological zones; it is consumed either as a snack or substitute for normal food, serves as a source of carbohydrate to humans, feed for livestock, raw material for many industries and source of income, thereby seen as a panacea for poverty in Nigeria (Olaniyan 2015). Its grains are said to be rich in essential minerals, protein, fats, fibre and carbohydrates (Sule *et al.*, 2014).

In terms of production (area harvested), maize is the third largest cereal produced worldwide after wheat and rice (Olaniyan 2015). Africa accounts for 7% of the global maize production and 12% of the global maize imports. Nigeria is the largest

producer of maize in Sub-Saharan Africa. Its production in 2010 accounted for 0.9% (7.7 million tons) of world production (844 million tons) (FARA, 2009). However, with the importance of maize and the level of the country's production, it is still faced with diverse constraints. Amongst such diverse constraints are: pests and diseases, low soil fertility, lack of /inadequate technology, inadequate capital, unavailability of labour, poor road network, lack of transportation, weather factors, high labour cost, high cost of storage facilities, lack of technical know-how and poor storage facilities, which result in maize losses. Survey carried out on food loss in some communities in Nigeria found that as much as 20 – 30% of total grain production (maize inclusive) is lost with a substantial amount recorded during storage (Bolarin and Bosa, 2015).

Maize loss is experienced by all stake holders in the maize food chain including producers. However, most research on maize loss focus on losses experienced by marketers and processors and not on producers. Is there a possibility that this is so because maize loss at the producers' level is insignificant or not in existence? It is therefore very

important for this study to answer this question by analysing the losses experienced by maize producers. These losses could occur during production, harvesting, immediately after harvest if they are unable to sell all that is produced and during transportation. This could also have an effect on their level of poverty; the material, social, and emotional deprivation of individuals or group (Tomlinson *et al.*, 2008). This study therefore seeks to answer the following research questions: What is the physical and financial value of loss experienced by maize producers? What is the poverty status of the maize producers? What is effect of maize cob losses experienced by the farmers on their poverty status? The general objective of the study is maize cob losses and their effects on the poverty status of maize farmers in Edo State. The specific objectives are to determine: the physical and financial value of loss experienced by maize producers, the poverty status of maize producers and the effect of maize cob losses on the poverty status of the farmers. The hypothesis of the study- Ho: no significant difference in the income of the respondents with and without fresh maize cob losses.

MATERIALS AND METHODS

This study was carried out in Edo State, Nigeria and comprised of maize producers. Edo State has a total land area of 17,802 km² and an estimated population of over three million people. The state is made up of 18 Local Government Areas (LGAs). The three agro-ecological zones of the state as delineated by Edo State Agricultural Development Programme (EADP) are Edo South, Edo Central and Edo North. Edo State has a tropical climate characterized by wet and dry seasons having mean annual temperature of about 25 and 28°C, respectively. The climate and soil condition favours the growth of plants. Specifically a well drained sandy, loam to clayey loam soil rich in humus and plant nutrients is ideal for maize production (Anyanwu, 1979). The minimum temperature requirement for maize is 10°C and maximum temperature of about 46°C. Maize is an important food crop that is grown all over the state for its economic value as food, source of income and source of employment amongst others. Other crops grown in the state are cassava, yam, vegetables, pineapple, oil palm, cocoa, rubber, etc.

Study Area

Sampling procedure and sample size

The study employed a multi-stage sampling procedure for the selection of respondents. Firstly, two local government areas (LGAs) were randomly selected from each of the three agro-ecological zones (Edo South, Central and North) of the State

as delineated by Edo State Agricultural Development Programme (EADP) to give a total of 6 LGAs. Secondly, two communities involved in maize production were randomly selected from each LGA making a total of 12 communities selected for the study. The third stage was a random selection of 9 producers from each community giving rise to a total of 108 maize producers.

Data Analysis

Budgeting technique

The budgeting techniques employed were the gross margin and the net profit analyses. These were used to determine the profitability of maize production, according to Olukosi and Erhabor (1988):

$$GM = TR - TVC$$

where GM is gross margin of maize production (₦), TR is total revenue from maize production (₦) TR is the product of the unit price of maize (P) and quantity(ies) sold (Q), TVC is total variable cost of maize production (₦) which is the sum total of labour cost (LC), seed cost (SC), fertilizer cost (FC), herbicides cost (HC), pesticides cost (PC), and transportation cost (TC).

The net profit is given as:

$$\pi = GM - TFC$$

where π is net profit of maize production (₦), GM is gross margin of maize production (₦), TFC is total fixed cost (₦), TFC is rent on land (RL) plus total depreciated cost (TDC).

Return on investment of maize production (ROI) is obtained of π to total cost.

Relative poverty line analysis

Relative poverty was used to evaluate the poverty status of the respondents. This was achieved employing the monetary (income) indicator. Respondents were categorized into poor and non-poor groups using two-third mean per-capita income as poverty line as used by Edoumiekumo *et al.* (2014) and Igbalajobi *et al.* (2013). Poverty line using income approach is defined as per-capita income (PCI) which is income per head per day.

$$\text{Total per -capita income (TPCI)} = \sum_{i=1}^n \text{PCI}$$

Mean TPCI (MTPCI) is TPCI divided by the total number of households.

$$\text{Poverty Line (PL)} = 2/3 \times \text{MTPCI}$$

Poor households were households whose mean per-capita income fell below the poverty line, while the non poor were households with mean per-capita income on and above the poverty line.

Poverty indexes analysis

The Foster, Greer Thorbecke (FGT) (1984) poverty measure was used to assess the poverty status of the maize producers. It is defined as:

$$P_{\alpha} = \frac{1}{n} \sum_{i=1}^q \left(\frac{z - y_i}{z} \right)^{\alpha}$$

where n is the sample size, q is the number of poor households, y_i is the income of the i^{th} farmer, Z is the poverty line and, $Z - y_i$ is the poverty gap for each household and α is a parameter which takes values 0 for poverty incidence.

Use of *t*-test

T-test was used to test the hypotheses. The t-test is given as:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sigma \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

where t is t-test, $\sigma \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$, \bar{X}_1 is mean income of maize producers without post harvest losses, \bar{X}_2 is mean income of maize producers with post harvest losses, σ_1 is standard deviation of income of maize producers without post harvest losses, σ_2 is standard deviation of income of maize producers with post harvest losses, and $n_1 = n_2$ is the sample size of respondents.

RESULTS AND DISCUSSION

Costs and Returns of Maize Production per Farmer per Production Cycle with and without Maize Cob Losses

The results of the costs and returns of maize production with and without maize cob losses (Table 1) showed that the total variable cost and total fixed cost of maize production per average farm size of the farmers (1.46 ha) per production cycle were ₦144,733.21 and ₦17,634.31 respectively, giving rise to total cost of ₦162,367.48.

The total variable cost accounted for 89% of the total cost while the depreciated total fixed cost accounted for 11%. The low fixed costs indicate that the farmers, who were mainly small scale farmers, used crude implements (hoes and cutlasses) for their production. Labour cost accounted for 76% (₦123,840.06) of the total cost of production followed by rent on land which accounted for 9% (₦14,849.77) of the total cost of production as shown in Table 1. This suggests that hired labour was not readily available in the study area which could have resulted in the high labour cost. Also, the use of crude implements and human labour as against the use of machinery could have also contributed to the high labour cost.

Table 1: Average Costs and returns of maize production with and without maize cob losses per production cycle

Category	Value per average farmer (₦)	Total cost (%)
Mean farm size (ha)	1.46	
Man-days per ha	118.00	
Average price per man-day (₦)	719.70	
Variable costs		
Labour Cost	123,840.06	76.27
Seed cost	6,062.00	3.73
Fertilizer cost	4,346.27	2.68
Herbicides cost	3,059.29	1.88
Pesticides cost	1,262.96	0.78
Transportation cost	6,162.63	3.80
Total Variable cost	144,733.21	89.14
Fixed cost		
Rent on land	14,849.77	9.15
Depreciated cost	2,784.54	1.71
Total fixed cost	17,634.31	10.86
Total cost	162,367.48	100.00
Returns		
Total expected yield (₦)	327,966.63	-
Total expected yield per ha (₦)	224,634.68	-
Average weight per bag (kg)	100.00	-
Gross margin without loss	168,576.13	-
Profit without loss	165,599.15	-
Return on investment	1.02	-
Output lost (bags)	1.85	46,721.31
Output lost per ha (bags)	1.27	32000.90
Average weight per Bag (kg)	100.00	-
Actual yield	281,298.65	-
Actual yield per ha	192,670.31	-
Gross margin with loss	121,854.81	-
Profit with loss	118,931.17	-
Return on investment	0.73	-

A similar result of labour cost accounting for a large percentage of the total cost of production was reported by Nkamigbo *et al.* (2015) in a study carried out in Osun State, Nigeria, on comparative analysis of costs and returns in maize production. Seed cost (₦ 6,062) accounted for about 4% of the total cost of production, fertilizer cost (₦4,346.27)

accounted for about 3% of the total cost of production, pesticides cost (₦1,262.96) accounted for 0.78%, while transportation cost (₦6,162.63) accounted for about 4% of the total cost of production. These costs were quite low. The results in Table 1 also showed that the gross margin and net profit of maize production per average farm size of 1.46 ha per farmer without post harvest loss were ₦168,576.13 and ₦165,599.15, respectively. This indicates that maize production in the study area was profitable. The return on investment without post harvest losses was ₦1.02 which indicated that every naira invested in the business yielded a net return of 1 naira 2 kobo. Nkamigbo *et al.* (2015) reported a positive profit of about ₦76,055 for non hybrid maize per hectare of maize land and ₦114,450 for hybrid maize per hectare in Osun State, Nigeria. Also, Aina *et al.* (2015) reported a positive profit among maize farmers in their study carried out in the dry savannah ecological zone of Nigeria.

However, with losses of 185 kg of fresh maize cob per average farmer amounting to ₦46,721.31, the gross margin and net profit decreased to ₦121,854.81 and ₦118,931.17, respectively. The return on investment also decreased to 0.73. The implication of this is that maize cob losses reduced the income of the respondents, as for every Naira invested the business yielded about 73 kobo as against 1 Naira 2 kobo without loss. This could mean that maize cob loss is a factor militating against poverty alleviation among farmers in the study area. This is in line with the findings of Olayemi *et al.* (2012). They reported a percentage loss of 20.33% by maize farmers across the three delineated zones in River State, Nigeria. Abass *et al.* (2014) reported loss in maize during harvesting and transportation in a study carried out in

Tanzania. Also, Oguntade (2013) reported that farmers experience losses during harvest and immediately after harvesting and in course of production attributable to pests and diseases.

Effect of fresh maize cob loss on the income of respondents in Edo State

The difference in mean income (profit) of the respondents with and without fresh maize cob losses as presented in Table 2 shows that there was a significant difference in the mean income of farmers with and without maize cob loss with significant ($p < 0.01$) t-value of 3.65. The implication of this is that maize cob loss significantly affected the income of maize producers. This could invariably have effect on their economic wellbeing as maize is a significant driving force for poverty reduction (Diao *et al.*, 2013).

Poverty indices with and without maize cob losses of respondents in Edo State

The relative poverty line of the maize farmers was estimated as ₦100.40 (Table 3). The result of the study as presented in Table 3 shows that with maize cob loss, 64% of the maize farmers were poor and were living below the poverty line. The result was different without maize cob loss as there was an improvement in the well-being of the farmers. This was seen in the percentage drop in the proportion of the poor farmers from 64% to 50%. This also means that the poverty incidence with and without maize cob loss was 0.64 and 0.50 respectively. This indicates that maize cob loss decreased the income level of the farmers thereby making them worse off. The estimated poverty line was very low (₦100.40) in comparison with the present economic situation, this can barely give you a good meal.

Table 2: Effect of fresh maize cob loss on the income of respondents in Edo State

Category	Without loss	With loss	Difference	t-value	Decision
Farmers mean income (₦)	165,599.20	118,931.10	46,668.10	3.65***	Reject Ho

*** significant at 1%

Table 3: Distribution of the poverty indices with and without fresh maize cob losses of respondents in Edo State

Producers	Without maize cob losses		With maize cob losses	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Poor (Per capita income < 100.40)	54	50	69	64
Non poor (Per capita income ≥ 100.40)	54	50	39	36
Total	108	100	108	100
Poverty incidence		0.5		0.64

CONCLUSION

The study concludes that maize production in the study area is a profitable venture. The respondents experienced maize cob loss which decreased their profit. The loss in income experienced by the maize farmers was significant as it increased the proportion of the poor respondents in the study area. More farmers should be encouraged into maize production as it is a profitable venture which could assist in alleviating their poverty. However, the study recommends that relevant bodies should assist in addressing the problem of maize cob loss among farmers to help in alleviating their poverty.

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