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PROFITABILITY OF RAIN-FED MAIZE PRODUCTION: A COMPARATIVE STUDY OF JAUNPUR DISTRICT, INDIA AND ADAMAWA STATE, NIGERIA

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ARTICLE INFO	ABSTRACT
	Present research work analysed and compared the profitability in rain-fed maize production in Jaunpur district, India and Adamawa state, Nigeria. Purposive and simple random sampling was adopted for the selection of district, block, local government areas, villages as well as 280 respondents that is 140 from each of the study area. The data was collected for the period of 2014-2015 cropping season in both countries. The result revealed that per hectare average in rain-fed maize production in the study areas was found to be 20.00 and 17.55 quintals in Jaunpur district and Adamawa state respectively. Per hectare gross margin and net income was estimated to be Rs. 16,069.59 and Rs. 3,795.00 in Jaunpur district and Rs. 13,938.36 and Rs. 4,218.50 in Adamawa state respectively. The study suggests that rain-fed maize production was profitable in both study areas but slightly higher in Adamawa state. The study further suggests that provision and timely supplies of credit and fertilizer to needy farmers in both study areas to enhance the production of rain-fed maize.

INTRODUCTION

Maize is grown throughout the year in India. It is predominantly a kharif crop with 85 per cent of the area under cultivation in the season. Maize production in India has grown with a compound growth rate of 5.5 per cent per annum over the last ten years from 14 MnMT in 2004-05 to 23 MnMT in 2013-14. During 2009-10, there was a decline in production primarily due to drought that affected production of kharif crops in the country. The area under maize cultivation in India has expanded with a compound growth rate of 2.5 per cent during 2004-05 to 2013-14, production from 7.5 Mn hectare in 2004-05 to 9.4 Mn hectare in 2013-14, the remaining increase in production is due to increase in yield. Factors such as adaptability to diverse agro-climatic conditions, lower labour costs and lowering of water table in the rice belt of India have contributed to the increase in acreage under cultivation (FICCI, 2014). India is sixth largest producers of maize in the world, contributing about 2.4% of global production in 2014, (GOI, 2014). In India, maize is third most important crop after rice and wheat. Nigeria is the largest

producer of maize in Africa and thirteen in the world with a total production of 7300 MT in 2015, with 2.67 percent decrease from previous year, based on sizeable carryover supplies and declines in market prices. The Government of Nigeria proposed to purchase carryover supplies from farmers, but lowered global oil prices reduced government revenue. As a result, government purchases of corn supplies have been limited to date. Moreover, *Boko Haram's* insurgency, farmer grazer conflict as well as frequent cattle theft across Nigeria's main corn producing areas cut off transportation routes for food supplies within Nigeria and across borders to neighboring African countries. Farmers are expected to shift away from corn cultivation in 2015/16 as inadequate security and storage facilities, shortage of funds and low prices continue to cut into their earnings. The current average corn price for 2014/15 is $230 per ton, which is $130 lower than the average 2012/13 price of $360 per ton (Ryan, 2015). Present study was there for an attempt to investigate and compare the profitability in rain-fed maize production in India and Nigeria.

Data and analytical procedure

Present study was based on the primary data and it was collected through personal interview using pre-tested schedule. Purposive and simple random sampling was used for the selection of district, block, local government areas, villages as well as respondents. 140 respondents were selected from each of the study area. Total respondents selected for primary data collection was 280. Primary date related to inputs used for rain-fed maize production, crop output (both grain and by-product), market price etc. was collected for the period 2014-2015 Kharif maize.

MATERIALS AND METHODS

The cost concept developed by the Commission on Agricultural Cost and Price (CACP) was adopted for the estimation of cost of cultivation for rain-fed maize in the study areas. The different cost was calculated as:

Cost A_1 = All actual expenses in cash and kind incurred in production by owner.

These include: cost of seed, cost incurred on manures and fertilizers, plant protection chemicals, land revenue, wages of hired human labour, hired labour charges of implements and machinery, charges for bullock labour, depreciation on fixed assets, excluding family labour.

Cost A_2 = Cost A_1 + rent paid for leased-in land.

Cost A_2+ FL = Cost A_2 + imputed value of family labour.
Cost B_1 = Cost A_1 + interest on value of owned fixed capital assets (excluding land).

Cost B_2 = Cost B_1 + rental value of owned land (net of land revenue) and rent paid for leased-in land.

Cost C_1 = Cost B_1 + imputed value of family labour.

Cost C_2 = Cost B_2 + imputed value of family labour.

Cost C3 = Cost C_2 + 10 per cent of cost C_2 on account of managerial functions performed by the farmers. (Narayanamoorthy, 2013)

RESULTS AND DISCUSSION

Cost of rain-fed maize production in Jaunpur district India and Adamawa state Nigeria

Per hectare average variable costs for maize cultivation were found to be Rs. 17,925.41 and Rs. 16,751.64 accounting for 59.36 and 63.28 per cent of the average total cost of cultivation (Rs. 30,200.00 and Rs. 26,471.50) in Jaunpur district and Adamawa state respectively (Table 1). There were wide variations in variable costs in the study areas. The cost of fertilizer, hired labour and seed were 9.91, 8.51 and 7.75 per cent respectively and considered to be the major variable cost in Jaunpur district. The high cost of fertilizer may not be unconnected to its unavailability to farmers at a required time due to lack of district-wise supply plan adopted by the state. In Adamawa state agro-chemicals, seed and machine labour which occupied 10.12, 10.10 and 9.30 per cent respectively were the major variable costs. The high cost of Agro-

chemicals experienced by farmers was in line with the findings of Kemi *et al.* (2016) who reported a strong positive relationship between agro-chemical inputs' use and maize yield among small-scale farmers in Iwo local government area of Osun state, Nigeria. The total fixed costs were 31.55 and 27.63 per cent of the total cost, where rental value of own land claimed a significant portion with 25.19 and 20.78 per cent in Jaunpur district and Adamawa state respectively for rain-fed maize production. The evidence gathered from the analysis shows that fixed costs were higher for rain-fed maize producers in Jaunpur districts while variable costs were higher for rain-fed maize producers in Adamawa state. This may not be unconnected with the high rental value of owned land experienced by rain-fed maize farmers in Jaunpur district.
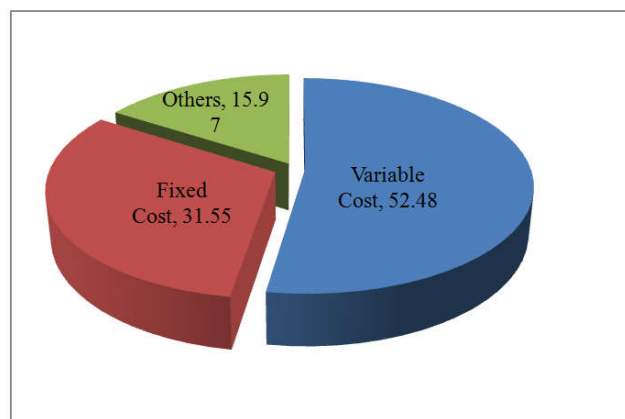

Figure 1. Percentage share of different cost in rain-fed maize production in Jaunpur district
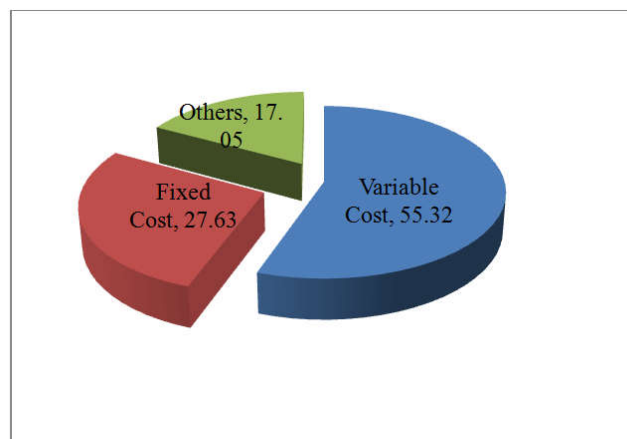

Figure 2. Percentage share of different cost in rain-fed maize production in Adamawa state

The share of different cost in rain-fed maize production in Jaunpur district and Adamawa state

Percentage share of total cost (C_3) in Figure one and two reveals wide variations in fixed costs between Jaunpur district and Adamawa state. These were attributed to the high cost of rent on leased land as well as the rental value of owned land in Jaunpur district which indicates that the land is more expensive in Jaunpur district than in Adamawa state. The pattern of expenditure shows that variable costs were the highest cost followed by fixed costs then other costs incurred by rain-fed maize farmers in both the study areas.

Cost and return in rain-fed maize production in Jaunpur district India and Adamawa state, Nigeria

Per hectare crop yield for rain-fed maize production was found to be 20.00 and 17.55 per hectare for main product while 13.99 and 10.20 per hectare for by-product in Jaunpur district and Adamawa state, respectively (Table 2).

The gross income in Jaunpur district Rs. 33,995.00 was slightly higher as compared to Rs. 30,690.00 per hectare in Adamawa state. The gross margin was Rs. 16,069.59 and Rs. 13,938.36 per hectare, respectively. The finding support the reports earlier made by previous researchers (Sekumade *et al.,* 2009; Segun-Olasanmi, *et al.,* 2010; Sanusi, 2014) in profitability analysis of maize production.

Table 1. Cost of cultivation of rain-fed maize in Jaunpur district, India and Adamawa state, Nigeria

Particulars	Jaunpur District		Adamawa State	
	Amount (Rs./Ha.)	% to total cost (C_3)	Amount (Rs./Ha.)	% to total cost (C_3)
Variable Cost				
Family labour	2,000.50	6.62	1,850.70	6.99
Hired labour	2,569.63	8.51	1,753.80	6.63
Machine labour	2,337.50	7.74	2,462.96	9.30
Bullock labour	850.00	2.81	344.40	1.30
Seed	2,340.48	7.75	2,674.89	10.10
Fertilizer	2,991.59	9.91	2,301.12	8.69
Plant protection chemicals	2,294.13	7.60	2,678.40	10.12
Farm yard manure	464.56	1.54	580.16	2.19
Other expenses	1,429.11	4.73	1,499.73	5.67
Interest on working capital	647.91	2.15	605.48	2.29
Sub Total	17,925.41	59.36	16,751.64	63.28
Fixed Cost				
Depreciation	875.09	2.89	338.59	1.28
Rent paid for leased land	1,500.00	4.97	1,350.00	5.10
Rent value of own Land	7,000.00	23.18	5,500.72	20.78
Interest on fixed capital excluding Land	154.05	0.51	124.05	0.47
Sub total	9,529.14	31.55	7,313.36	27.63
10% of cost C_2 as managerial cost	2,745.45	9.09	2,406.50	9.09
Total Cost	30,200.00	100.00	26,471.50	100.00
Cost of Cultivation				
Cost A_1	16800.00	55.62	15,210.73	57.46
Cost A_2	18,300.00	60.60	16,560.73	62.56
Cost A_2+ FL	20,300.50	67.22	18,410.73	69.55
Cost B_1	16,954.05	56.14	15,364.78	58.04
Cost B_2	25,454.05	84.28	22,215.50	83.92
Cost C_1	18,954.55	62.76	17,214.78	65.03
Cost C_2	27,454.55	90.91	24,065.00	90.91
Cost C_3	30,200.00	100.00	26,471.50	100.00

Table 2. Cost and return in rain-fed maize production

Particulars	Jaunpur District	Adamawa State
Crop Yield		
Grain/Main Product (Q/ha)	20.00	17.55
By Product (Q/ha)	13.99	10.20
Market Price		
Grain/Main Product (Rs/Q)	1,350.00	1,400.00
By Product (Rs/Q)	500.00	600.00
Gross Income (Rs/ha)	33,995.00	30,690.00
Gross Margin (Rs/ha)	16,069.59	13,938.36
Net Income (Rs/ha) Over		
Cost A_1	17,195.00	15,479.27
Cost A_2	15,695.00	14,129.27
Cost A_2+ FL	13,694.50	12,279.27
Cost B_1	17,040.95	15,325.22
Cost B_2	8,540.95	8,474.50
Cost C_1	15,040.45	13,475.22
Cost C_2	6,540.45	6,625.00
Cost C_3	3,795.00	4,218.50
Input-Output Ratio Over		
Cost A_1	1:2.02	1:2.02
Cost A_2	1:1.86	1:1.85
Cost A_2+ FL	1:1.67	1:1.67
Cost B_1	1:2.01	1:2.00
Cost B_2	1:1.34	1:1.38
Cost C_1	1:1.79	1:1.78
Cost C_2	1:1.24	1:1.28
Cost C_3	1:1.13	1:1.16
Cost of Production (Rs/Q)		
Cost A_1	840.00	866.71
Cost A_2	915.00	943.63
Cost A_2+ FL	1,015.03	1,049.04
Cost B_1	847.70	875.49
Cost B_2	1,272.70	1,265.84
Cost C_1	947.73	980.90
Cost C_2	1,372.73	1,371.23
Cost C_3	1,510.00	1,508.35

It is apparent from table 2 that the net income over cost A_1 which is the direct cost involved in rain-fed maize production was Rs. 17,195.00 and Rs. 15,479.27 per hectare while over cost C_3 which is the total cost of cultivation was found to be Rs. 3,795 and Rs. 4,218.5 per hectare in Jaunpur district and Adamawa state respectively. The input –output ratio analysis was worked out on the basis of cost A_1 to C_3. Cost A_1 has the highest ratio of 1: 2.02 each while cost C_3 has the lowest ratio of 1:1.13 and 1:1.16 in Jaunpur district and Adamawa state respectively.
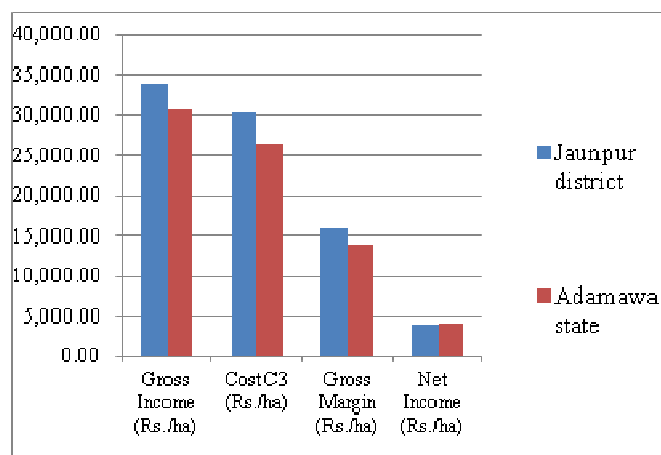

Figure 3. Comparison of cost and return in rain-fed maize production in Jaunpur district and Adamawa state

It is obvious that the ratio of cost A_1 was the same in both Jaunpur district and Adamawa state while cost C_3 was slightly higher in Adamawa state. The finding is in line with what Narayanamoorthy (2013) reported in his study on profitability in crops cultivation in India. Similarly, the table further reveals quintal cost of rain-fed maize production for cost A_1 to cost C_3; where cost A_1 was found to be lower with Rs. 840.00 and Rs. 866.71 per hectare while cost C_3 has the highest cost of Rs. 1,510.00 and Rs. 1,508.35 per hectare in Jaunpur district and Adamawa state respectively.

Therefore, it can be inferred from the table that rain-fed maize production was profitable in the study areas but farmers in Adamawa state had slightly higher net return than their counterpart in Jaunpur district. The study therefore, suggests that rain-fed maize production was more profitable in Adamawa state than in Jaunpur district. This concord the findings of Usman *et al.* (2016) who earlier reported that white maize production was profitable in Fufore local government area of Adamawa state, Nigeria. It is clearly revealed in Figure 3 above that Cost of cultivation was higher in Jaunpur district while net income at cost C3 was higher in Adamawa state. Thus justifying the reason why the production provides more returned to farmers in Adamawa state.

Hypothesis 1

There is no difference between the mean profitability of rain-fed maize farmers in Jaunpur district and Adamawa state ($\bar{x}_1 = \bar{x}_2$).

$\bar{x}_1$ = Mean profit of rain-fed maize farmers of Jaunpur district
$\bar{x}_2$ = Mean profit of rain-fed maize farmers of Adamawa state

Since Z computed value (3.972) is greater than Z tabulated (1.96) at 5% level of significance. Hence the difference is significant. It means null hypothesis is rejected. It implies that there is significant difference between the profitability of rain-fed maize farmers in Jaunpur district and Adamawa state.

Summary and Recommendations

The results of the cost concept analysis revealed the return in rain-fed maize production in the study areas with the average yield of 20.00 and 17.55 per quintals in Jaunpur district and Adamawa state respectively. Per hectare gross margin and net income was estimated to be Rs. 16,069.59 and Rs. 3,795.00 in Jaunpur district and Rs. 13,938.36 and Rs. 4,218.50 in Adamawa state respectively. The study therefore, revealed that rain-fed maize production was profitable in both study areas but slightly more in Adamawa state. The result of Z-statistics test showed that there was a significant difference between profitability of rain-fed maize farmers in the study areas. The study therefore, suggests that credit should be extended to rain-fed maize farmers to enable them purchase farm inputs, such as seeds, agro-chemicals, fertilizer, increase farm holding and pay for hire labour; timely provision of fund will definitely ameliorate the problems associated with these inputs and increase productivity. Also as revealed from the findings' of the study that most farmers in the study areas still cannot afford fertilizer due to high prices despite government subsidized fertilizer being available. Therefore, there is need for each state to adopt district/village-wise supply plan to ensure efficient distribution of fertilizer to farmers at a required time.

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