

# ECONOMICS OF TRADITIONAL CATTLE PRODUCTION IN THE NORTHERN GUINEA SAVANNA OF NIGERIA.

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## ABSTRACT

A survey to determine the economics of traditional cattle production among agropastoralists was carried out in Giwa Local Government Area of Kaduna State. The survey covered 75 agropastoral households grouped into three categories viz: CI, CII and CIII for livestock activities and two groups GP1 and GP2 for cropping activities. The analytical framework used in the study include simple gross margin and multiple regression analyses. Results of the study indicated that 66.67% of the respondents have lived in the study area for up to five years. Total variable cost (TVC) varied with the size of herd. TVC averaged ₦958.72/LU for CI, ₦818.48/LU for CII and ₦561.29/LU for CIII. The agropastoralists were making some profit in both livestock and cropping activities. Gross margin/LU averaged ₦967.28/LU ₦1,118.93/LU and ₦1,344.93/LU for farmers in CI, CII and CIII, respectively. The gross margins in cropping activities were ₦372.24/ha for GP1 and ₦480.18/ha for GP2. Inputs identified in cattle production were relevant in explaining variations in output. There was a decreasing return to scale in cattle production. There was also an inverse relationship between unit cost of production and size of herd. The above results indicated that a substantial increase in the income of the farmers was possible. This could be achieved through integrated crop/livestock production, proper herd management and adequate provision of supplementary feed for dry season cattle production.

**Key Words:** Cattle Production, Agropastoralists, Profitability, Savanna.

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## INTRODUCTION

The need to improve the productivity of livestock in Nigeria has for a long time been recognised. It was in recognition of this that the Shika Stock farm was established in 1928 by the Colonial Department of Agriculture of northern Nigeria. The primary aim was to supply improved male stock as stud bulls to cattle owners (Otchere, *et al.*, 1990).

The livestock industry, particularly cattle, plays an important role in the Nigerian economy. Cattle trade is the largest livestock enterprise in Nigerian agriculture. It involves millions of people engaged in various aspects of the enterprise from trade in live animals and transportation to meat retailing (Nuru and Buvanendran, 1984). The sale of livestock and livestock products such as hides, skins and milk generates income to the producers. The value of livestock droppings for soil fertility is recognised by most tropical farmers and livestock holders (Jahnke, 1982).

In Nigeria, cattle production is almost entirely carried out under the extensive, free range management system as practised by the Fulani pastoralists. There is a paucity of relevant quantitative information on the production strategy of the mixed crop/livestock farming system. Such information include, among others, the combinations of crops and livestock that could maximise output and farm income as a result of resource adjustments and efficient resource allocation. Since it is the government's intention to raise farm income, output and resource productivity in the rural areas, where the majority of the small-scale

farmers dwell, this information is needed to provide adequate basis for planning and policy decisions that will benefit the mixed crop/livestock farmers.

The dearth of economic information may have stemmed from two main points: the rigours in tackling the complexities envisaged in analysing this sort of production system the common assumption that the management objectives of agropastoralists are to satisfy mainly social not economic goals (Doran, Low and Kemp, 1979; Amaza and Mohammed, 1990; Mohammed-Salih, (1991). The assumption of social goal implicitly precludes the use of economic principles to analyse their production processes. Some of the previous economic studies in traditional cattle production include those of Okaiyeto (1987) and Okon (1987). The former used partial budgeting and linear programming to analyse the economic activities of the pastoralists in Gombe Local Government Area of Bauchi State while the later laid emphasis on the optimal plans for resource allocation in the traditional crop/livestock production in Giwa District of Kaduna State using linear programming. The partial budget done by Okaiyeto (1987) showed that the pastoralists were making some profit in both crop and livestock production systems.

This study was carried out to analyse the costs and returns in cattle production under the agropastoral production system. This is with a view to determining the profitability or otherwise of the enterprise and provide baseline information for further economic studies.

## METHODOLOGY

Seventy-five purposively sampled agropastoral households from five villages in Giwa Local Government Area of Kaduna State were used for this study. Copies of structured questionnaires were administered to the agropastoral household heads. Information were collected on parameters such as cattle structure, off-take, feeds and feeding, labour supply and use, capital and cash inputs, farm land, crop farming etc. In calculating the costs

and returns in cattle production, consideration was given to the fact that it is usually impossible to attribute a particular output to inputs applied during a specific period. The inputs applied during each period contribute to the production of outputs offered for sale. To achieve this therefore, the lifespan of the animals involved was taken into account and the cost incurred in raising the animals to the age at which they were either sold or kept for production purposes was computed. Since there were no data on costs incurred in raising the animals to the age they were during the study period, the cost was discounted for a period of four years using 25% of current year's cost and working backwards for the four years which was assumed to be the average age of adult animals in the study.

The assumption of an annual inflation rate of 25% was necessary for the ease of calculations. Similarly, for the purpose of this study, the respondents were grouped into three-size categories, Category I (CI) consisted of farmers who had less than or equal to 17.5 livestock Units (LU) (25 head) of cattle. Category II (CII) was made up of those that owned between 18.2 to 35 LU (26 - 50 head) while category III (CIII) was made up of farmers with greater than 35 LU (50 head). For the cropping enterprise activities, the whole respondents were grouped into two (G1 and G2). G1 consisted of respondents with  $\leq 24.5$  LU of cattle and G2 is those with  $> 24.5$  LU. The grouping was done in order to see the effect of herd size on crop enterprise activities. One LU is assumed to be equivalent to a cattle of 250kg liveweight. Simple gross margin and regression analyses were used in this study. The regression model is as follows:

$$\text{Log } Q = \log b_0 + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + \log U \text{ where:}$$

- Q = Value of beef cattle output (Naira)
- X<sub>1</sub> = Cost of labour (Naira)
- X<sub>2</sub> = Cost of supplementary feeds (Naira)
- X<sub>3</sub> = Cost of veterinary service (Naira)
- X<sub>4</sub> = Number of sheep (LU)
- X<sub>5</sub> = Number of goats (LU)
- b<sub>0</sub> = Intercept

$b_1 - b_5$  = Regression coefficients

U = Stochastic variable

## RESULTS AND DISCUSSION

### Length of stay in the study area.

The agropastoralists are known to be in constant migration influenced by changes in weather and climate. Majority of the respondents (66.67%) had been resident in the study area for only 1-5 years (Table 1). Only 1.33% of the farmers had lived in the area for up to 20 years while 28% and 4% had lived between 6-10 and 1-15 years, respectively. This suggests that in the recent time, more and more of the agropastoralists in the study area are getting sedentarized. This result showed that the old idea that the pastoralists are completely nomads is changing. This will therefore facilitate transfer of interventions meant to ameliorate production problems of the agropastoralists.

### Land acquisition

Land is the most valuable asset of the rural agricultural population. The average size of holding by the respondents was 1.74 ha. Land is communally owned by the Hausa. Among the Hausa, about 65% of land transfer is through inheritance (LSRP, 1985). On the other hand, the Fulani pastoralists acquire farm sites and areas for settling through various channels such as the Dagaci (village head), the Talakawa (village citizens who do not hold titles), Jingina (mortgage terms), the Mai Unguwa or ward head. However, the most predominant channel of land acquisition in the area is through the Talakawa as this constituted 65% of all land acquisitions. This is followed by the Dagaci with an average of 24.6% of all land acquisition channels in the area. The remaining 10.4% is accounted for by land acquisition through the Jingina (7.0%) and Mai Unguwa (3.4%).

The implication of this finding is that the agropastoralists will continue to face difficulties in acquiring plots for their agricultural purpose if the Talakawa are not properly checked. This is because, over time, the Talakawa may start to

exert undue control over land allocation to those in need.

### Labour Utilization

The family provides the bulk of the farm labour requirements. The available family labour is utilized between crop activities which spanned through May and November and livestock activities which took place all year round. There is thus labour bottleneck at the peak of cropping activities. Family labour was augmented by hired labour during the peak labour demand period. Herding of livestock was done mainly by junior members of the family, either males or females who are generally less than 15 years of age in the study area. In most cases, the men were responsible for milking cows while the women were indicated to be responsible for milk sales and processing of milk and grain products for food.

### Other inputs.

The level of fixed assets or capital among the agropastoralists in the study area was relatively low. Farm equipment consisted of mostly hoes, knives and matchets, axes and sickles. For the livestock activities, operating items included supplementary feed for dry season feeding, drugs and mineral lick (kanwa.) Veterinary services were provided mainly by NAPRI. None of the respondents borrowed money from institutional sources during the study period. Reasons advanced for this ranged from complete ignorance of availability of credit facilities to lack of knowledge of application procedures. This problem may be solved by the recent establishment of a Community Bank in the area.

### General herd management

Herd size averaged 36.9 (range 5-166). Usually, calves were restricted at night by tying them with neck loops which are then tied to a single rope stretched between two posts dangwail to prevent them for suckling their dam. The adult cattle were confined during the night in single enclosures. Weaning was always by natural method and always took place when the calves were one year old. Milking was done once or twice daily. This continued till about

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13.5 months. During the wet season, kanwa, a local mineral supplement was given in order to enhance appetite of the animals.

Small ruminants featured greatly in the farming activities of the agropastoralists. Traditionally, sheep usually accompany cattle for grazing while goats are tethered and fed fresh grass especially during the planting season to avoid crop damage. Time spent for grazing averaged eight hours and eleven hours for wet and dry seasons, respectively.

### Results of the gross margin analysis in cattle production

The total variable cost (TVC) varied with size of herd. For farmers in CI, TVC average N958.72/LU. Farmers in CII incurred N818.48/LU and those in CIII spent on average of N561.29/LU. As shown in Table 2, also variable cost decreased with increase in herd size. This is in consonance with the theory of economies of large-scale production. When expressed as per cent of gross income, the TVC represented 49.77% for CI while it was 42.25% for CII and 29.44% for CIII. In all three cases, labour cost represented a substantial proportion of farm variable cost. It was 91.42% for C1; 86.90% for CII and 89.60% for CII and CIII. This confirms labour as the most important single input in cattle production. The results of the gross margin analysis in cattle production indicate that the agropastoralists in CI had a profit of N967.28/LU while the gross margin was N118.93/LU and N1344.93/LU for CII and CIII, respectively (Table 2). Since there were no items of fixed cost recorded, the various gross margins could safely be regarded as the farmers profit. The results also point to the fact that it is more profitable for the agropastoralists to kee large herds in order to utilize available labour resources more efficiently since gross margin was highest for CIII and lowest for CI.

### Cattle offtake

Total cattle offtake was found to be 8.16% of total animals made up of 7.43% sold, 0.34% slaughtered and 0.39% gift. This compares favourably with the work of Wilson (1986) who reported a total offtake of cattle to be 8.36%

composed of 6.98% sold, 0.53% slaughtered and 0.85% given-out. This offtake rate could be regarded as low, lending credence to the findings of Doran, Low and Kemp (1979) where they hypothesized that the Swazis regard cattle as a store of wealth and only sell them to meet specific cash needs. The implication of this is that proper efforts should be made to integrate the agropastoralists into the market economy.

### Costs and returns on cropping activities

The gross margin per hectare was positive at the 1989/90 season prices. The farmers in GP1 made a profit of N372.24/ha while those in GP2 had N480.18/ha. The TVC for GP1 was N651.81/ha and it averaged N345.52 for GP2 (Table 3). The results further confirm the fact that the integration of crops and livestock production is profitable enterprise and can result in increased income to the farmer.

When compared with the gross margin per LU of cattle, it was seen that the agropastoralists made a reasonable profit from both crop and livestock enterprise. There is a tendency for the farmers with larger herd sizes to equally make more profit from crop than the farmers with smaller herd sizes as shown in Table 2 and 3 for the various farmer groups.

### Results of the multiple regression analysis

Sheep and goats were included in the model not as production inputs but as a means of determining the nature of interaction between them and cattle production. The results of the multiple regression analysis are presented in equations 1-3. From the equation, it could be seen that most of the regression coefficients tested in all three cases were significant at 1% level of significance. This implies that, the variable included in the model were significant in explaining variation in the output of cattle.

$$\text{Equation 1 } Q = -268.268 + 0.725x^1 + 0.188x^2 + 5.148X3 + (6.196)^{**} (0.531) (2.858)^{**}$$

$$1.395x4 - .63X5$$

$$(1.911)^* (-0.687)$$

$$R^2 = 0.64 \quad F = 24.608^{**} \quad n = 75$$

$$\text{Equation 2. } Q = 1633.03 + 0.178X_1 + 0.042X_2 + 0.042X_2 + 2.746X_3 + (1.946)^* 1.786X_5$$

$$(0.741) \quad 2.342)^*$$

$$R^2 = 0.346 \quad F = 4.46^{**} \quad n = 48$$

$$\text{Equation 3. } Q = 1303.21 + 0.856X_1 + 0.957X_2 + 2.46X_3 + (4.852)^{**} (1.726)^{**} (1.060)^*$$

$$3.301X_4 - 3.046X_5$$

$$(2.310)^* (-2.322)^*$$

$$R^2 = 0.744 \quad F = 12.215^{**} \quad n = 27$$

\*\* = Significant at 1% probability level

\* = Significant at 5% probability level

1 LU of goat or sheep is assumed to be equivalent to 10 units of 25kg liveweight and 250Kg liveweight for cattle Numbers in parenthesis are t-values

The percentage of variation explained by the equation was 64 for the overall sample, 34.6 for G1 and 74.4 for G2. Labour was significant at 1% level of significance for all the farmers and those in G2 while it was not significant for GP1. Supplementary feed was significant at 5% level only for G2.

There is an inverse relationship between goat and cattle production for the overall sample and farmers in G2. This implies that an increase in goat production would jeopardise cattle production. The reason for the positive value of the same coefficient in G1 was not apparent but could be because farmers in G1 were still operating at rather low level of both cattle and goat production. A positive interaction was observed throughout in the case of cattle and sheep production. This may be attributed to the fact that the two forms of livestock are often reared together and therefore they were not competing for the production resources, especially labour.

#### Marginal value productivities (MVPs)

The marginal value products obtained for the inputs are presented in Table 4. A given input is said to be efficiently used when its MVP is just sufficient to offset its acquisition cost. The MVPs of all the inputs for all farmer groups

were positive and much greater than their unit prices. This implies that they were all being underutilized. Comparing the MVPs and the acquisition price of the various inputs, it is apparent that the income of the farmers irrespective of the size of herd could still be increased by a further increase in the levels of the inputs being currently used. The elasticities of production for all the estimates were less than unity. That is a one percent increase in any of the variable inputs, holding all other inputs constant, would result in less than one percent increase in output. This is a further indication of decreasing returns to scale showing that the farmers are operating in the profitable economic region of production.

## CONCLUSION

This study was designed to assess the profitability of cattle production under the agropastoral production system. The emphasis was on the identification of costs and returns involved in such a production system. The gross margin analysis indicated that the agropastoralists were making profit in both livestock and crop production activities.

Herd size averaged 36.9 head. The MVPs derived for each of the inputs were much greater than their acquisition prices. This indicates a possibility for a greater increase in the inputs usage since farmers were operating within the profitable economic region of production. There is a tendency for the data to exhibit decreasing returns to scale. There existed a negative interaction between cattle and goat production. Therefore, there is a tendency for the goat enterprise activities to compete with those of cattle for available resources especially labour.

In general, it is strongly recommended that the agropastoralists should be encouraged to continue operating within the profitable level of production. There is a complementarity of relationship between crops and livestock. For integrated crop-livestock to be successful, crop and livestock scientists must develop appropriate technologies to handle this sort of

production system which will be acceptable to the people involved.

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**Table 1 LENGTH OF STAY IN THE STUDY AREA.**

YEARS	F	%
1-5	50	66.67
6-10	21	28.00
11-5	3	4.00
16 - 20	1	1.33
<b>Total</b>	<b>75</b>	<b>100.00</b>

**Table 2 AVERAGE COSTS AND RETURNS IN BEEF CATTLE PRODUCTION AMONG THE AGROPASTORALISTS IN THE STUDY AREA (NAIRA/LU).**

Variable	CI	CII	CIII
Specification			
Labour cost	876.42	711.22	502.88
Cost of supplementary feeding	63.93	91.17	43.53
Veterinary cost	18.7	16.07	14.88
Total variable cost (TVC)	958.72	818.41	561.29
Gross income	1926.00	1987.41	1906.22
Gross margin	967.28	1118.93	1344.93

Beef cattle output was valued at 8 naira/kg in 1992.

**Table 3 AVERAGE COSTS AND RETURNS IN CROPPING ACTIVITIES (NAIRA/HA).**

Item of cost or returns	Overall	G1	G2
Labour	405.83	560.20	251.45
Fertilizer	84.79	75.50	94.07
Organic manure	16.11	16.11	-
Total variable cost	506.73	651.81	345.52
Gross returns	924.93	1024.15	825.70
Gross margin	418.20	372.24	480.18

Labour was valued at 15 Naira/man-day

Maize and guinea corn were valued at ₦2.50/kg; millet ₦3.00/kg

**Table 4 MARGINAL VALUE PRODUCTIVITIES OF INPUTS UNDER VARYING FARMER GROUPS**

Farmer group	Functional form	Labour	Suppl. feed	Vet. serv.
Overall sample	Cobb-Douglas	0.42	0.19	0.29
< 35 head	Linear	0.18	0.04	2.75
> 36 head	Cobb-Douglas	0.62	0.19	0.11

Unit cost of labour = ₦0.06/kg 1 wt.

Unit cost of vet. service = ₦0.10/kg 1wt.