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**Review Article**

# Economics of Cow Milk Production in Yola South Local Government Area of Adamawa State, Nigeria

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**Abstract:** This study analyzed the economics of cow milk production in Yola South Local Government Area of Adamawa State, Nigeria. Despite the importance of pastoral milk in the provision of nutritional requirement of Nigerians, the supply from the local production to meet up with the demand is still low. The specific objectives of the study were, to describe the socioeconomic characteristics of the respondents, determine the profitability of the respondents and determine the factors influencing milk production. Questionnaire was used for data collection. The analytical techniques used for the study were the descriptive statistics, net farm income and inferential statistics. The results revealed that about 87% of the respondents were married and most (34%) of the respondents were in their active age. Profitability analysis showed a net farm income of ₦ 40,125 with an average rate of return of 0.46k per every naira spent from an average of 28 lactating cows. This implies that the business is a profitable venture. The regression analysis result shows that $R^2$ value is 0.74, this implies that 74% of variation in the output of milk was explained by independent variables in the model. The regression model is statistically significant at F-statistic of 76.6 and prob. (F= 0.0000).The variables $X_2$, $X_3$ and $X_6$ were statistically significant at 1% while $X_1$ is statistically significant at 5%. The study recommends that the use of improved milk technology should be encouraged among small scale milk producers.
**Keywords:** Economics, cow milk production, profitability, regression analysis, statistically significant.

## INTRODUCTION

Agriculture plays a significant role in the Nigerian economy, providing two thirds employment opportunity to the population [1]. Cattle represent one of the most economically significant groups within the livestock sub-sector in Nigeria. The livestock sub-sector is dominated by traditional systems of production and marketing. A reasonable number of pastoralists in the north of the country, rear a very high proportion of the cattle herd and many sheep and goats [2].

The activities of the Nigerian dairy industry are centered on milk production, importation, processing, marketing and consumption. Despite the unorganized nature of the industry, the dairy industry represents an important component of the agricultural sector of the economy with great economic, nutritional and social implications, the industry, through commercial dairy processing plants and marketing segments, provides employment and value [3, 4]. The industry provides a means of livelihood for a significant proportion of rural pastoral families in the sub-humid and semi-arid ecological zones of Nigeria. Thousand rural households derived some income from the dairy industry [5].

Ninety six percent (96%) of cattle in Nigeria are in the hands of the pastoral Fulani. This pastoral herd is the most important source of domestic milk. Only a few imported cattle breeds such as Friesians and Brown Swiss, and their crosses are kept in experimental dairy farms owned by government agencies. A few private commercial dairy farms, owned by companies and individuals, are known to exist. These farms, which constitute the organized dairy farms, produce an insignificant proportion of the domestic milk supply [6].

At the global scale, milk production is heavily concentrated and dominated by two countries: India and the USA followed by China in third place. The position of Nigeria is 57th in world cow milk production. One of the most prominent trends in the Agricultural Outlook, published by Sriri, *et al.* [7], is the increasing importance of developing countries in the supply and demand for dairy products. Strong growth in milk production is expected in Asia, most notably in China and India [8].

Though Nigeria is the largest producer of cow milk in West Africa and the third in Africa, the country is a net importer of the product and in order to increase the percentage of the livestock sector and local milk production in Nigeria need to be increased.

Milk accounts 16% of the total value of all food products from livestock in sub Saharan Africa [9]. Despite this contribution, sub Saharan Africa has failed to attain self-sufficiency in dairy products. This is particularly true in Nigeria where the growth in livestock production has been insufficient to meet consumption level. The supply of animal products has been declining over the past years, while demand has been increasing, as a result of increases in population, urbanization and income [10].

This study addressed the following research objectives; describe the socio economic characteristics of the respondents determine the profitability of milk production; determine the factors influencing milk production in the study area.

## MATERIALS AND METHODS

**The Study Area**

This study was carried out in Yola South Local Government area of Adamawa state. Yola South Local Government Area lies between latitude 9° 14` N of the equator and longitude 12° 12` E of the Greenwich meridian. It has a land mass of 1,913Km$^2$ and altitude of 185.9m above sea level. It has a population of about 191,607 people [11], and projected population of 270,275 in 2016.

The local government lies in the hot humid climate zone of Nigeria with temperature ranging from 39°C - 45°C and alternate rainy and dry season. It has a rainfall of 1600mm per annul each year with its peak in the month of July and august, the vegetation is guinea savannah. Agricultural ranges from cropping to pastoral system. Perennial crop such as mango, guava, orange, and annual crops like rice, maize, millet, sorghum, cowpea, and groundnut are produced. Some farmers grow vegetables such as okra, amaranthus, tomatoes, and their like. The soil found in the local government area ranges from sandy soil and loamy soil. The local government share common boundaries with Yola north, Fufore, Demsa,and Mayo Belwa local government areas of Adamawa State. Yola South local government area is heterogeneous in ethnic composition with rich diverse historical and cultural heritage. Prominent among are Fulani.

**Method of Data Collection**

Data for this research were collected from primary source. The primary data were collected with the aid of a well-structured questionnaire,

**Sampling Size and Sampling Techniques**

Milk producers constituted the study population. Purposive sampling techniques were employed to draw respondent accordingly. Five wards out of the eleven wards in Yola South Local Government Area were purposive selected based on their relevance in milk production. Respondents in the ward were selected in proportion to the number of milk producers in the area. Seventy respondents were randomly selected to form the sample size for the study.

**Method of Data Analysis**

Descriptive statistics such as frequency, percentage and mean were used to analyze the socio-economic characteristics; the gross margin analysis was used to analyze the profitability level of the enterprise while regression analysis was used to determine the factors influencing milk production in the study area.

**Net Farm Income Analysis**

This study adopted the gross margin analysis as applied by Olukosi and Erahbor [12]. The model is specified as follows:

The net farm income shows the total sales less the total cost of production (variable and fixed cost). This is expressed as follows:

Net Farm Income (NFI) = Gross Income (GI) - Total cost (TC).
The model for its estimation is stated as:
$NFI = Y.Py - \sum P_{Xi}\, x_i - \sum FK$
NFI = Net Farm Income
Y = Total product or output
Py = Price Per unit of product

Xj = Quantity of variable inputs used
Pxj = Price per unit of variable inputs
FK = Cost of fixed inputs
$\sum$ = Summation sign
This will be used to analysis objective ii

**Regression Analysis**

Regression Analysis was employed to determine the factors influencing milk production.
This explicit function is expressed below:-
$Y = bo+b_1X_1+b_2X_2+b_3X_3+b_4X_4+b_5X_5+b_6X_6$
Where: Y
Y = Milk output (in liters)/ week
$X_1$ = cost of Feed [in ₦ /(kg)] / week
$X_2$ =cost of labor {(₦/Man- Day)/week}
$X_3$ = Breeds of Cattle
$X_4$ = years of business experience
$X_5$ = Cost of veterinary service (in ₦)
$X_6$ = Number of lactating cows per Herd
bo = constant
$b_1 - b_6$ = estimated regression coefficient perimeters
$x_1 - x_6$ = estimated variables

## RESULTS AND DISCUSSION

**Socio – economic Characteristics of the Respondents**

The business of cow milk production in the study area was dominated by women. The men were not involved in milk production, this is attributed to the culture and norms of the Fulani's, where men engage in rearing of animals the women are engaged in selling of the milk and milk products**.** The result in Table 1 revealed that, most (87.1%) of the respondents was married, 5.7% were divorced, 4.3% were widows and only 2.9% were single. From the distribution it is evident that married women dominated milking business in the study area because their male counterpart is saddle with the responsibility of taking care of the animals

Results of age distribution are presented in Table 1. The result shows that majority (34.3%) of the respondents were between the ages of 35-44 years, 25.7% were between the ages of 25-34 years; 22.9% between ages 45-54 years. This indicates that a good number of the women were still in their active and productive age. This shows involvement of younger women in cow milking and marketing than the elderly ones. This may be as a result of the fact that women get married at their young ages and help their husbands in selling of the cow milk to the public in order to generate income for the family. The educational level of the respondent is presented in Table 1. The results indicate that 92.9% of the respondents have non formal education, 4.3% attained nomadic education while 2.8% attained primary school. None of the respondents have advanced beyond primary school level. Low educational level of the respondents will hamper adoption of improved technologies or modern strategies that will boost their business.

Result in Table 1 shows that majority (42.9%) of the respondents had been in cow milking and marketing business between 11-20 years, 27.1% of the respondents have been in the industry for 21-30 years, while 18.6% of them had been in the business between 1-10 years. High involvement in the industry among Fulani starts from childhood till they are old for the work. The experience gathered in the business help them to employ strategy that makes their business profitable. The result in Table 1 shows that, 81.4% of the respondents rear White Fulani breeds; while 18.6% of the respondents rear Ndama breeds. The reason for the predominance of the White Fulani in the study area is attributed to its adaptability to the environment.

**Table-1: Socio-economic characteristics of milk producers**

| Variables | Frequency | Percentage |
|---|---|---|
| **Marital status** | | |
| Single | 2 | 2.9 |
| Married | 61 | 87.1 |
| Widow | 3 | 4.3 |
| Divorced | 4 | 5.7 |
| **Total** | **70** | **100** |
| **Age** | | |
| 15 – 24 | 7 | 10 |
| 25 – 34 | 18 | 25.7 |
| 35 – 44 | 24 | 34.3 |

| | | |
|---|---|---|
| 45 – 54 | 16 | 22.9 |
| ≥ 55 | 5 | 7.1 |
| **Total** | **70** | **100** |
| **Educational level** | | |
| Non formal | 65 | 92.9 |
| Nomadic | 3 | 4.3 |
| Primary | 2 | 2.8 |
| **Total** | **70** | **100** |
| **Years of business experience** | | |
| 0 – 10 | 13 | 18.6 |
| 11 – 20 | 30 | 42.9 |
| 21 – 30 | 19 | 27.1 |
| 31 – 40 | 5 | 7.1 |
| ≥ 41 | 3 | 4.3 |
| **Total** | **70** | **100** |
| **Breed of cattle** | | |
| White breed | 57 | 81.4 |
| Ndama | 13 | 18.6 |
| **Total** | **70** | **100** |

Source: Field survey, 2017

**Costs and Returns from Milk Production**

This section gives the summary of the cost and returns of the small- scale milk producers and consequently the gross margin and the net farm income. The gross margin is obtained by subtracting the variable costs from the total revenue, while the net farm income is obtained by subtracting fixed cost elements from the gross margin.

The average number of cows lactating in a herd was 28 cows, average feed used was 297.5kg/week, average labor was 56 man hours/week, and milk output was averagely 504 litres/week. All efforts were made to determine the total costs and revenue associated with milk production in the study area. These costs include all expenses incurred in the production process. The net farm income is ₦ 40,125; while gross margin is ₦96, 875. The farmer's average rate of return is 0.46k indicating that for every naira spent by the milk producer in the study area, has a gain of forty six (46) kobo. This implies that the business of milk production in the study area is a profitable venture.

**Table-2: Net Farm Income Statement for Milk Production for 28 Lactating Cows /Week**

| Items | Unit product (litres) | Unit price (N) | Total |
|---|---|---|---|
| **A. Output (Fresh Milk)** | **504** | **250** | **126,000** |
| **B. Variable Cost;** | | | |
| Feed | 297.5 kg | 58.8 | 17,493.00 |
| Labour | 56 man hour | 59.5 | 3,332.00 |
| Veterinary service | | | 6,500.00 |
| Fire word | | | 900.00 |
| Transport | | | 900.00 |
| **Total variable cost** | | | **29,125.00** |
| **C. Fixed Cost** | | | |
| Calabash | | | 2,400 |
| Stirrer | | | 150.00 |
| Pot | | | 1000 |
| Rope | | | 1000 |
| Feeding trough | | | 15,000 |
| Watering trough | | | 15,000 |
| Fencing | | | 18,000 |
| Bowel | | | 3,500 |
| Depreciation | | | 2,000 |
| **Total fixed cost** | | | 56,750 |
| D. Total Cost (B+C) | | | 85,875 |
| E. Gross margin GM (A-B) | | | 96,875 |
| F. Net farm income = NFI=A-(B+C | | | 40,125 |
| ARR=Average rate of return | | | 0.46 k |

Source: Computed from field survey 2017

**Estimated Double–Log Production Function for Small Holder Milk Production**

The other production functions tried were rejected based on the fact that the double –log function has a higher $R^2$ value and the highest number of significant variables. From Table 3, three variables $X_2$, x3, x6 were statistically significant at 1% level of significance. The adjusted coefficient of multiple determinations – $R^2$ indicated the percentage of variations in the observed dependent value that is explained by the fitted regression equation. The $R^2$ value obtained is 0.74. This indicates that 74% of variation in the milk output was explained by independent variables $X_2$, $X_3$, $X_6$ the unexplained variation in milk output which accounted for 26% is obviously due to other inputs not specified in the model. The F- ratio measures the joint significance of all the explanatory variables in the model. The value obtained is 76.6, which is significant at 1% level.

The regression co-efficient with respect to each of the explanatory variables and their t-value are also presented in Table3.The regression coefficient shows the extent to which variation in independent variables explains variation in the dependent variable. The t- values are used to test the significance of the coefficient. The selected equation being a cobb-Douglass function, it implies that the regression coefficients represents the elasticity of production with respect to the $x_2$, $x_3$, and $x_6$ are 3.1129, 7.2608 and -5.4256 respectively. These values are significant at 1% level. This implies that a 1% increase in the $x_2$,$x_3$, and $x_6$ will lead to increase in the amount of milk obtained by 3.1129,7.2608 and -5.4256 percent respectively. These values are all less than one, which implies that they are all inelastic and a 1% increase in any of the inputs will increase output of milk by less than 1%. $X_1$ is significant at 5% level of significance; this implies that with good feed management there will be increase in the output of milk.

**Table-4.8: Estimated double- log production function for smallholder milk production**

| Items | Unit product (litres) | Unit price (N) | Total |
|---|---|---|---|
| A. Output (Fresh Milk) | 504 | 250 | 126,000 |
| **B. Variable Cost;** | | | |
| Feed | 297.5 kg | 58.8 | 17,493.00 |
| Labour | 56 man hour | 59.5 | 3,332.00 |
| Veterinary service | | | 6,500.00 |
| Fire word | | | 900.00 |
| Transport | | | 900.00 |
| **Total variable cost** | | | **29,125.00** |
| **C. Fixed Cost** | | | |
| Calabash | | | 2,400 |
| Stirrer | | | 150.00 |
| Pot | | | 1000 |
| Rope | | | 1000 |
| Feeding trough | | | 15,000 |
| Watering trough | | | 15,000 |
| Fencing | | | 18,000 |
| Bowel | | | 3,500 |
| Depreciation | | | 2,000 |
| **Total fixed cost** | | | 56,750 |
| D. Total Cost (B+C) | | | 85,875 |
| E. Gross margin GM (A-B) | | | 96,875 |
| F. Net farm income = NFI=A-(B+C | | | 40,125 |
| ARR=Average rate of return | | | 0.46 k |

Source: Computed from field survey 2017
*Significant at 1% **Significant at 5%

## CONCLUSION

Result showed that cow milk production business is still a profitable venture as revealed by the sign and magnitude of the gross margin. However, profit would be increased through adequate feeding.

## RECOMMENDATION

Base on the findings the following recommendations were made

- The use of improved milk production technology should be encouraged among small scale milk producers.
- Genetic improvement of the local cow should be encouraged especially through the establishment of artificial insemination centres.
- The pastoralists should be educated on how to select good breeds for mating.
- Marketing system should be re-organized to enable producers obtain optimum price for their product.

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