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Relative Resource Use Efficiency in Selected Smallholders' Ruminant and Non-Ruminant Enterprises in Imo State, Nigeria

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Abstract: This study estimated the relative profitability and resource use efficiency of ruminant and non-ruminant livestock production in Imo State identified constraints to production and their remedies. Results showed that ruminant and non-ruminant livestock offer profitable investment opportunities. They do not differ significantly in profitability and are influenced by farming experience, area of land used for raising them from day old to market weight, breeding stock used in production, cost of production, cost of labour and cost of feeds. The operators were found to be inefficient in resource use, although the level is significantly higher for the non-ruminant category, it was recommended among others that investors should be indifferent in decisions to finance such non-ruminant livestock as poultry and piggery and such ruminant livestock as sheep and goat because of their similar profitability that these operators should be reached and encouraged to effect adjustments recommended in this study for the attainment of efficiency in resource use by strengthening the agricultural extension system.

Key words: Relative resource use, efficiency, smallholders, ruminant and non-ruminant enterprises, Imo State, Nigeria

INTRODUCTION

The scarcity and low level of protein from animal sources available to citizens in the country have become very glaring and worrisome. The mean daily intake of only 8g/caput/day, reported in FAO (1985a, b) against the recommended annual average of 20 g day^{-1} (Adebambo, 1986; Adesehinwa *et al*., 1999) indicates that there is a serious shortfall in animal protein consumption. This situation, which was also noted by Oguoma and Ohajianya (2007), had led governments, at all levels and at various times, to initiate remedial measures without appreciable success. This deficiency is most pronounced in the Southern states, particularly Imo State of Nigeria, for reasons identified by Monod (1975), Aramolaran and Igharo (1998) and Esonu *et al.* (2007). These factors place protein supply beyond the reach of ordinary people in State and given the projection for meat production and consumption by the Food and Agriculture Organization of the United Nations (FAO, 1980) the situation cannot be easily met by the ruminant livestock class only. This is because of such constraints suggested by Aduku and Olukosi (1990), Kurwijila and Mtenga (1989), Anyim *et al.* (1997) and Ladele and Ayoola (1997). These are in addition to their slow production cycle and the high human population density in the area, estimated by the National Population Commission at over 400 persons km^{-2}, which has made the availability of grazing land for ruminants increasingly difficult. No farmer, in fact, has up to two hectares of grazing land. This makes it imperative for the livestock farmers to shift attention to non-ruminant production as a panacea for bridging the protein demand-supply gap. It was thought that non-ruminant production could bridge this gap because of a number of obvious advantages, implied by Adebambo (1986), Ayinde and Aramolaran (1998), Aduku and Olukosi (1990), Payne (1990) and Alimi and Odogun (2000), such as their requirement of relatively small area of land, short production cycle, less capital to establish; their possession of high fecundity, perfect size, more cost-effective measures of preservation and relatively easy adaptation to climatic conditions of the sub humid tropics. In addition to their high reproductive rates relative to maintenance costs, they were also considered to be most appropriate in the context of the activities of small-scale producers, reported by Preston and Leng (1994). It is not obvious, however, if the enterprises are profitable under the prevailing economic melt-down and if the operators are efficient in their resource use relative to those in ruminant livestock operations. It has not also been established if the production of both ruminant and non-ruminant livestock could be prioritized on the basis of their profitability and efficiency in the use of resources for purposes of financing under the prevailing capital constraint in the economy so that the protein deficiency gap in the area can be bridged. The broad objective of this study was, therefore, to analyze the profitability and resource use efficiency of ruminant and non-ruminant livestock production in the area. Specifically, the study aimed to estimate the relative profitability of ruminant and non-ruminant operations and their influencing factors, estimate and compare the efficiency of resource use in their production, determine measures for improving the resource use efficiency of the operators. It was hypothesized that there was no significant difference in the profitability of ruminant and non-ruminant enterprises that ruminant and non-ruminant farmers were efficient in their use of resources that there was no significant difference in the efficiency of resource use between ruminant and non-ruminant farmers.

MATERIALS AND METHODS

The study was carried out in Imo State, Nigeria between February 2008 and March 2009. Three sets of questionnaires were pre-tested on a sample of 75 purposively selected ruminant and non-ruminant farmers drawn from each of the three Agricultural Zones of the State. The questionnaires were restructured and appropriate variables selected for the final survey on the basis of their validity in capturing the objectives of the study. Another fifty respondents from each of the three Agricultural Zones of the State were purposively selected and using the test-retest method, the product moment correlation coefficient of 0.96 and 0.78 (which were significant at 5% probability level) established the reliability of the instruments.

A purposive sampling technique was used in the sample selection for the final survey. The list of livestock farmers registered with the state Ministry of Agriculture and the ADP was compiled by the block extension agents in the various LGA's of each Agricultural Zone. Information on the names and locations of the livestock farmers who were not registered with the State Ministry of Agriculture or Imo ADP were obtained from feed dealers, veterinary clinics/stores and egg sellers through a preliminary survey. From the list, 75 poultry and piggery farmers and 80 sheep and goat farmers were purposively selected, making a total of 155 respondents from whom primary data were collected. The data covered the types of ruminant and non-ruminant livestock in the area, the production systems, resources used in production their costs and returns as well as the problems associated with the production. Secondary data were collected from journals and publications of the Imo ADP and the livestock division of the State Ministry of Agriculture. Data were analyzed using tables, frequency distributions, the Z-Statistic and Multiple Regression Function.

To compare the estimated profitability of the ruminant and non-ruminant livestock enterprises, a Z-test was used, specified as:

$$\text{Z-cal} = \frac{P_i - P_j}{\sqrt{\frac{S_i^2}{n_1} + \frac{S_i^2}{n_2}}} \qquad (1)$$

Where:

- Z = The statistic by which the mean difference in profitability of the ruminant and non-ruminant livestock enterprises was determined
- P_i and P_j = Profitability indices of ruminant and non-ruminant livestock enterprises respectively, measured by their earnings/ cost ratio (Umeh and Odo, 2002)
- S^2_i and S^2_j = Variance of the profitability indices of the ruminant and non-ruminant livestock enterprises, respectively
- n_1 and n_2 = Sample size of the ruminant and non-ruminant livestock enterprises, respectively

If the computed Z-value is greater than the tabulated Z-value at 0.05 level, then there is significant difference in the profitability of the two categories of livestock.

The OLS Multiple Regression Technique was used to estimate the factors that influenced the profitability of these livestock. The model was specified implicitly as:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, Ui) \qquad (2)$$

Where:

- Y = Net earnings from operations (₦)
- X_1 = Dummy, D (D = 1 for Ruminants and Zero otherwise)
- X_2 = Farming experience (years)
- X_3 = area of land used for raising the livestock from day-old to market weight (m^2)
- X_4 = Breeding stock used in production (no)
- X_5 = Cost of transportation
- X_6 = Cost of labour (₦)
- X_7 = Cost of feeds (N)
- X_8 = Cost of drugs (N)
- U = Stochastic error term

It was expected, a priori that the co-efficients of X_1-X_4 would be significant and positively related to Y, while X_5-X_8 would be significant but negatively related to Y. Four functional forms of the model were estimated, namely the Linear, Semi-log, the Double-log and Exponential. The Double-log function was used as the lead equation because of the superior economic, statistical and econometric results obtained from its estimates. To corroborate the Z-test of hypothesis that there was no significant difference in the profitability of ruminant and non-ruminant enterprises, a test was carried out following Gujarati (1995), by estimating the regression function and testing the statistical significance of the dummy coefficient (i.e., that the two regressions have the same intercept), on the basis of the traditional t-test.

To estimate the resource use efficiency for each category of livestock the MVP of each input was computed as:

$$MVP_i = b_i \times \frac{Y}{X_i} \tag{3}$$

Where:
MVP_i = Marginal Value product of the ith input
b_i = The regression co-efficient of the ith input
Y = Net earnings from operations
X_i = Quantity of ith input used

Then the allocative efficiency ratios (r_i) of each specified input was calculated as:

$$r = \frac{MVP_i}{MFC_i} \tag{4}$$

Where:
MFC_i = Marginal factor cost of the ith input

If the ratio was equal to unity it was concluded that the farmers were efficient in their resource allocation otherwise, it was concluded that they were inefficient as resources were either overutilized or underutilized. The percentage reduction required for overutilized resources, in order to achieve efficiency was estimated, using the statistic specified as:

$$C_i = \frac{[MVP_i - MFC_i]}{MVP_i} \times 100 \tag{5}$$

$$= \frac{[1\text{-}1]}{r_i} \tag{6}$$

For underutilized resources

$$C_i = \frac{[MFC_i - MVP_i]}{MFC_i} \times 100 \tag{7}$$

$$= (1\text{-}ri) \times 100 \tag{8}$$

Where:
C_i = The value of the required percentage change in the quantity of input X_i to arrive at unity
r_i = Mean allocation efficiency ratio of input x_i

Furthermore, the Z-test was used to compare the efficiency ratios of inputs used in each enterprise pair. For each enterprise pair the test was specified as:

$$\text{Z-cal} = \frac{r_i - r_j}{\sqrt{\frac{S_i^2}{n_i} + \frac{S_i^2}{n_j}}} \tag{9}$$

Where:
r_i and r_j = Mean efficiency ratios of an input used in production in the ith and jth enterprise, respectively
S^2_i and S^2_j = Variance of efficiency ratios for the input in ith and jth enterprise, respectively
n_i and n_j = Sample size of farmers producing ith and jth enterprise, respectively

Descriptive statistics such as frequencies, tables and percentages were used to accomplish objective 5.

RESULTS AND DISCUSSION

The estimated relative profitability of non-ruminant livestock production (specifically poultry and piggery production) and those of the ruminant production (specifically sheep and goat production) are as shown in Table 1. The table shows that an average of ₦ 145,970 and 114,140 were invested in ruminant and non-ruminant livestock, respectively and with the mean earnings of ₦651,770 and 445,990 the estimated net earnings of ruminant and non-ruminant livestock operators in the area are ₦505,800 and 331,850, respectively. The test of significance shows that at 5% probability, the null hypothesis of no significant difference between these net earnings was accepted, indicating that the profitability of ruminant and non-ruminant livestock operations do not differ significantly. It means that non-ruminant production guarantees similar level of profit and holds potentials comparable to those of ruminants as reliable investment outlet. This suggests that under financial constraints, investors should be indifferent in decisions to finance such non-ruminant livestock as poultry and piggery on the one hand and such ruminant livestock as sheep and goat on the other. The findings of Ian and John (1985), therefore, become relevant here. According to them, at maturity a broiler weighing 1.5 kg of carcass contains about 300 g crude animal proteins, which is sufficient to satisfy an adult human protein requirement for, at least,

Table 1: Distribution of estimated profitability of ruminant and non-ruminant livestock operators in the study area

	Non-ruminants (N'000per farmer)			Ruminants (N'000 per farmer)		
Items	Poultry	Piggery	Average	Goat	Sheep	Average
Gross revenue from	688.05	615.49	651.77	384.05	507.94	445.99
Total variable costs	92.69	162.26	127.48	112.03	101.46	106.75
Total fixed cost	16.42	20.56	18.49	9.92	4.87	7.40
Total cost	109.11	182.82	145.97	121.95	106.33	114.14
Net income	578.94	578.94	505.80	262.10	401.61	331.85
Z-tab $_{0.05}$	1.96					
Z-cal	1.11					
Decision	Accept H_0 Reject H_1					

Field survey data, 2009

8 days. Viewed in this light, this result means that non-ruminant livestock production can be relied upon to bridge the protein deficiency problems in the study area if their production is intensified (provided their operators are efficient in their use of resources), inspite of the problems identified by Ikeme (1990) associated with their production. Besides, the rearing of non-ruminants has the added advantages suggested by Aramolaran and Igharo (1998), Ikeme (1990), Ladele and Ayoola (1997), Aramolaran and Ashiru (1998) and Alimi and Odogun (2000). These are in addition to their being more amenable to the intensive management practices than the ruminant, given the high human population density in the area and the associated shortage of land for livestock grazing.

The factors that influenced the profitability of ruminant and non-ruminant livestock production, obtained from the results of the estimated double-log regression function, were as follows:

$$\begin{aligned} Y = 1.22 &+ \underset{(0.01)}{0.49X_1} + \underset{(0.33)}{0.63X_2} + \underset{(0.24)}{0.88X_3} + \underset{(0.38)}{0.29X_4} + \\ &\underset{(1.47)}{} \; \underset{(0.67)}{0.17X_5} - \underset{(0.11)}{0.36X_6} + \underset{(0.39)}{0.47X_7} - \underset{(0.87)}{0.35X_8} \end{aligned} \tag{10}$$

$R^2 = 0.78$, Adjusted $R^2 = 0.77$. Figures in parentheses are standard errors of estimates.

Equation 10 shows that all the variables conformed to the a priori expectation except X_1 and X_8 that were not significant. The Dummy variable for the ruminant category (X_1 = D =1) was, in particular, not significant, indicating that the relative profitability of ruminant and non-ruminant livestock operations did not differ. This corroborates the result reported by the Z-test in Table 1. The result also shows that the profits from ruminant and non-ruminant livestock production were influenced by farming experience (X_2), area of land used for raising livestock from day old to market weight (X_3), breeding stock used in production (X_4), cost of transportation (X_5), cost of Labour (X_6) and cost of feeds (X_7). The net earnings from farming operations were increased following increases in (X_2), (X_3), (X_4), while they were decreased following increases in (X_5), (X_6) and (X_7). From the composite regression result in Eq. 10, therefore, the estimated functions for the ruminant and non-ruminant livestock were obtained respectively as:

$$Y = 1.71 + 0.63X_2 + 0.88X_3 + 0.29X_4 + 0.17X_5 - 0.36X_6 + 0.47X_7 - 0.35X_8 \tag{11}$$

$$Y = 1.22 + 0.63X_2 + 0.88X_3 + 0.29X_4 + 0.17X_5 - 0.36X_6 + 0.47X_7 - 0.35X_8 \tag{12}$$

The allocative efficiency of the ruminant and non-ruminant farm operators, estimated from the Marginal Value Products (MVP), the Marginal Factor Costs (MFC) and the Efficiency Ratios (r) of their operations are as shown in Table 2. The Table 2 shows that among the non-ruminant enterprises, all resources used in production were underutilized, while for the ruminant livestock, floor space and breeding stock were underutilized. Feed was overutilized in the production of both sheep and goat. The result suggests that a lot of inefficiency in resource use exists in the production of both ruminant and non-ruminant in the area, although this appears to be more pronounced among non-ruminant entrepreneurs. This is worrisome because, in the face of rising inflationary spiral that has characterized the economy, resources are becoming increasingly costly in the input market and hence, will tend to be out of reach of small-holder farmers who are being looked upon for sustainable agricultural growth. The indication is that under the present pattern of resource use, ruminant and non-ruminant livestock entrepreneurs are high credit risks because the profitability of their farm operations is subject

Table 2: The MVP, MFC and r of the ruminant and non-ruminant enterprises

	Non-Ruminants						Ruminants					
	Poultry			Piggery			Sheep			Goat		
Variables	MVP	MFC	r	MVP	MFC	r	MVP	MFC	r	MVP	MFC	r
Feed	63918	40200	1.59*	16117.8	15063.3	1.1*	7650	19125.	0.4**	20038.5	27631.7	0.73**
Drugs	29506.7	329.50	89.55*	13696.2	926.7	14.78*	8479.9	652.3	1.3*	12562	6281	2.0*
Floor space	38709.5	762.90	50.74*	64117	763.3	8.4*	51741.9	821.3	6.3*	4782	784	6.1*
Breeding stock	161.6	125.3	1.29*	50828.3	2465.0	20.6*	24142.8	731.6	3.3*	5050.5	1295.	3.9*
Mean efficiency	-	-	35.7925	-	-	11.22	-	-	2.825	-	-	3.1825

Field Survey Data, 2009, * underutilized resources, ** over-utilized resources

Table 3: Resource use efficiency between specific ruminant and non-ruminant livestock enterprises

Enterprise pairs	Null hypothesis	Computed Z-value	Critical Z-value at 1% level of significance	Decision
Poultry and sheep	35.7925 = 2.825	2.93050	2.58	Reject H_o
Poultry and goat	35.7925 = 3.1825	2.98320	2.58	Reject H_o
Piggery and sheep	11.22 = 2.825	2.59860	2.58	Reject H_o
Piggery and goat	11.22 = 3.1825	2.66540	2.58	Reject H_o
Poultry and piggery	35.7925 = 11.22	1.64760	2.58	Accept H_o
Sheep and goat	2.825 = 3.1825	0.5987	2.58	Accept H_o

Field survey data, 2009

to variability. This is unfortunate as it will further dampen the low determination of financial institutions, who are being persuaded through numerous policy measures (Iganiga, 2007), to increase their lending to farmers. The situation calls for urgent measures to enhance the efficiency of their operations, which in the view of Olayide and Heady (1982) is a sine qua non for increased profitability and so that the reluctance of lending institutions to extend credit to them will not be justified.

The results of the test for significant difference in resource use efficiency between specific ruminant and non-ruminant livestock are as shown in Table 3. The Table 3 shows that except for poultry and piggery on one hand and sheep and goat on the other hand, the null hypotheses that there was no significant difference in the efficiency of resource use between the ruminant and non-ruminant livestock was rejected for the other enterprise pairs. This was because their computed Z-values were less than the corresponding tabulated values. Going by the values in Table 4, the indication, therefore, is that poultry enterprise is more efficient in resource use than sheep, goat and piggery enterprises. In the same vein, piggery is more efficient in resource use than sheep and goat. Poultry and piggery enterprises are equally efficient in resource use, just as sheep and goat are equally efficient in resource use. This means that within the ruminant enterprises and also within the non-ruminant enterprises, resource use efficiency does not differ, while it differs between the ruminant and non-ruminant livestock. These differences in efficiency explain the variability in earnings and risk between the enterprises in the area, reported in Oguoma (2005) that various levels of variability in earnings and risk exist among enterprises in the study area. The result here makes a good case for channeling more resources into non-ruminant livestock production than is presently the case since, given the added advantage in their production by Aduku and Olukosi (1990), higher productivity and higher net farm income are likely to be earned from this category of enterprises. This may be of major interest to financial institutions in the state interested in financing those enterprises with higher profit potentials that minimize the risk of default in loan repayment. This would be assured if these livestock categories are prioritized in line with the fore-going findings.

For purposes of prioritizing the enterprises for enhanced profitability and financing the efficiency in the use of specific resources by livestock pairs were estimated and the results are shown in Table 4. The Table 4 shows that poultry and sheep enterprises have the same level of efficiency in the use of feeds and this led to the acceptance of the null hypothesis of no significant difference between them in the use of this specific resource. The null hypotheses with regard to drugs, floor space and breeding stock were however, rejected between this pair. The Table 4 shows that while, the efficiency in the use of drugs and floor space was higher for poultry, the efficiency in the use of breeding stock was higher in the sheep enterprise. It means that given the constraint of limited floor space and drugs, the poultry enterprise has higher prospect for profitability than sheep, while, the later has a higher prospect for profit when the

Table 4: Distribution of the relative efficiency in the use of specific resources by pairs of ruminant and non-ruminant enterprises

	Poultry and sheep			Poultry and goat			Piggery and sheep			Piggery and goat		
Variables	H_o:	Z-cal	Z-tab	H_o:	Z-cal	Z-tab	H_o:	Z-cal	Z-tab	H_o:	Z-cal	Z-tab
Feed	1.59 = 0.4	1.38*	2.58	1.59 = 0.73	2.66**	2.58	1.1 = 0..4	0.11*	2.58	1.1 = 0.73	0.62*	2.58
Drugs	89.55 = 1.3	2.64**	2.58	89.55 = 2.0	3.04**	2.58	14.78 = 1.3	2.99**	2.58	14.78 = 24.6	2.98**	2.58
Floor space	50.74 = 6..3	2.94**	2.58	50.74 = 6.1	1.87*	2.58	8.1 = 6..3	2.59**	2.58	8.1 = 6.1	1.01*	2.58
Breeding stock	1.29 = 3.3	2.82**	2.58	1.24 = 3.9	2.03*	2.58	20.6 = 3.3	3.06**	2.58	70.0 = 19.7	2.67**	2.58

Field survey data, 2009. Decision: *Accept Ho at 1% level; **Reject Ho at 1%

Table 5: Distribution of required adjustment in resource use to achieve efficiency among the enterprises

	Non-ruminants		Ruminants	
Variable	Poultry	Piggery	Sheep	Goat
Feed	0.59	0.10	1.50	1.30
Drugs	88.55	13.78	0.30	1.00
Floor space	49.74	7.40	5.30	5.10
Breeding stock.	0.29	19.60	2.30	2.90

Field survey data, 2009

constraint on production is the breeding stock. The Table 4 also shows that between poultry and goat enterprises, the null hypotheses were rejected with respect to feeds and drugs but accepted with regard to floor space and breeding stock. This suggests that the poultry enterprise was more efficient in the use of feeds and drugs, while they maintained equivalent levels of efficiency in the use of floor space and breeding stock. This also means that as a profit-enhancing strategy, poultry should be given priority over goat when funds are in short supply for the purchase of feeds and drugs. The operators should however, be indifferent between the two enterprises when the constraint on production is in respect of floor space and breeding stock. As regards piggery and sheep enterprises, the table further shows that the null hypothesis was accepted with regard to feed but was rejected with regard to drugs, floor space and breeding stock. This result suggests that while Piggery and Sheep were similar in their level of efficiency in the use of feed, the former was more efficient than the later in the use of drugs, floor space and breeding stock. With regard to piggery and goat the table, again shows that the null hypothesis was accepted with regard to feed and floor space, but was rejected with regard to drugs and breeding stock. This, again, means that piggery and goat were identical in their level of efficiency in the use of feeds and that while Goat was more efficient in the use of drugs, the piggery enterprise was more efficient in the use of breeding stock.

In order to attain resource use efficiency, a number of changes have to be made by the operators The required percentage changes to attain efficiency in resource use among the enterprises are as shown in Table 5. The Table 5 shows that feed intake is to be reduced by 150 and 130% for sheep and goat, respectively, in order to attain efficiency for the ruminant livestock, while the use of drugs, floor space and breeding stock is to be increased by 300, 530 and 230% for sheep and 130, 100, 510 and 290% for goat, respectively. In the same vein, for the non-ruminant livestock, the table shows that in order to attain efficiency in poultry production an increase is required in the use of feed, drugs, floor space and breeding stock by 59, 885.5, 4974 and 29%, respectively and for piggery these resources need to be increased by 10, 1378, 740 and 1960%.

This study analyzed the profitability and resource-use efficiency of ruminant and non-ruminant livestock production in Imo State. Specifically, it estimated the relative profitability of ruminant and non-ruminant operations and their influencing factors; analyzed and compared the efficiency of resource-use in their production; identified the constraints that face the operators and the remedies to these constraints. It was hypothesized that there was no significant difference in the profitability of ruminant and non-ruminant enterprises; that ruminant and non-ruminant farmers allocate resources efficiently; that there is no significant difference in the efficiency of resource-use between ruminant and non-ruminant farmers. Following analyses, the net earning of ₦505800 and ₦331850 were realized by ruminant and non-ruminant farm operators, respectively. The test of significance showed that at 5% probability, the null hypothesis of no significant difference was accepted, indicating that the profitability of ruminant and non-ruminant livestock operations do not differ significantly. This was corroborated by the estimates obtained from the regression analysis conducted, from which the factors that influence the net earnings from farm operations of ruminant and non-ruminant livestock were found to be farming experience area of land used for raising livestock from day old to market weight, breeding stock used in production, cost of production (including feeds fed, transportation, capital employed) cost of Labour and cost of feeds. Results further showed that all resources expended in the production of non-ruminant enterprises were underutilized, while for the ruminant livestock, only floor space and breeding stock were underutilized. For sheep (ruminant) and goat (non-ruminant) specifically, feed was over-utilized in their production. Results further showed that except for Poultry and Piggery on one hand and Sheep and Goat on the other, the null hypothesis that there is no significant difference in the efficiency of resource use between the ruminant and non-ruminant livestock was rejected for the other enterprise pairs. This was because their computed Z-values were less than the corresponding tabulated values.

It suggested that poultry enterprise is more efficient in resource use than Sheep, Goat and Piggery enterprises while Piggery is more efficient in resource use than Sheep and Goat. Poultry and Piggery enterprises are equally efficient in resource use, just as Sheep and Goat are equally efficient in resource use. The result of the specific resource-use efficiency between pairs of the livestock shows that for feed utilization, Poultry and Sheep enterprises maintained the same level of efficiency while, for drug and floor space utilization, poultry enterprise recorded higher efficiency.

In the management of breeding stock, the sheep enterprise recorded higher level of efficiency than poultry. The result also shows that between poultry and goat enterprises, the former was more efficient in the use of feeds and drugs than the later while both have similar levels of efficiency in the use of floor space and breeding stock. As regards the utilization of feed by Piggery and Sheep enterprises, the result shows that both were similar in their level of efficiency.

As regards the utilization of drugs, floor space and breeding stock, piggery was more efficient than sheep With regard to the utilization of feed by Piggery and Goat the result shows that both are identical in their level of efficiency but, while later was more efficient in the use of drugs, the former was more efficient in the use of breeding stock.

CONCLUSION

Investments in ruminant and non-ruminant enterprises are profitable ventures. The later has potentials comparable to those of the former as reliable investment outlet and can be relied upon to bridge the protein deficiency problems in the Imo State, Nigeria. A lot of inefficiency in resource use exists in the production of both ruminant and non-ruminant in the area, although this appears to be more pronounced among non-ruminant enterprises. Resource use efficiency does not differ within the different categories of ruminant enterprises. It also does not differ within the different categories of non-ruminant enterprises. It however, differs between the ruminant and non-ruminant categories of livestock.

RECOMMENDATIONS

More resources should be channeled into non-ruminant livestock production than is presently the case, since higher productivity and higher net-farm income are likely to be earned from this category of enterprises. This is of major interest to financial institutions in the state with concern for financing those enterprises with higher earning potentials that minimize the risk of default in loan repayment.

Under financial constraints, investors should be indifferent in decisions to finance such non-ruminant livestock as poultry or piggery on the one hand and such ruminant livestock as sheep and goat on the other.

In order to attain efficiency in resource use among the ruminant livestock, feed intake is to be reduced by 150 and 130% for sheep and goat, respectively, while the use of drugs, floor space and breeding stock is to be increased by 300, 530 and 230% for sheep and 130, 100, 510 and 290% for goat, respectively. In the same vein, for the non-ruminant, in order to attain efficiency in poultry production an increase is required in the use of feed, drugs, floor space and breeding stock by 59, 885.5, 4974 and 29%, respectively and for piggery these resources need to be increased by 10, 1378, 740 and 1960%.

Urgent measures should be put in place to improve the level of efficiency of resource use among these ruminant and non-ruminant livestock and the profitability of their operations. The Agricultural Extension system should be adequately strengthened to enable it effectively reach these farm operators and encourage them to adjust their resource use as recommended above. This will enhance their efficiency and profitability so that the reluctance of lending institutions to extend credit to them will not be justified.

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