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Economic Effects of *Fascioliasis* on Animal Traction Technology in Adamawa State, Nigeria

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Abstract: This study reports the results of a survey conducted in 2001 to investigate the economic effects of *Fascioliasis* (Liverflukes) on drought animals in Adamawa State, Nigeria. Data were collected from 60 and 74 farmers' owners of 148 non-infested and 204 infested drought animals, respectively, through a cost-route method using structured questionnaires and supplemented with interviews. Analysis using descriptive statistics and animal traction efficiency measure showed that the non-infested drought animals were efficiently utilized than the infested drought animals. It was concluded that the non-infested drought animals were more productive. The study therefore, recommend among others, the regular deworming of drought animals in order to improve their efficiency.

Key words: Adamawa, animals, *Fascioliasis*, infested, Nigeria, traction

INTRODUCTION

The livestock sector plays a crucial role in the economies of many developing nations by providing protein-rich food supplies, generating vital income and employment and earning much-valued foreign exchange. For many farmers in the developing world, their animals are also a form of stored wealth, a cushion against starvation when food is scare, a source of fertilizer or fuel, a means of transportation and a source of traction in crop production (World Bank, 1994).

Of the benefits enumerated above, Jama'are (2000) observed that the use of animal traction in crop production passed through several policy changes in Nigeria in an attempt to provide suitable form of farm power to the majority of the farming populace. Gefu and Kolawole (2003) attributed this measure to the need to provide food of crop and animal origin to meet the ever-growing demand due to population increase which necessitates the opening up of land hitherto uncultivated. It has been observed over the years that efforts by various governments of the Federal Republic of Nigeria to mechanized agriculture through massive tractorization had created little effects. This was either due to the high maintenance index or the equipment was unsuited to the agro-economic condition which prevails in the country (Irtwange and Akubuo, 1990).

As labour accounts for over 70% of the total cost of production in most farming operations in the rural setting (Arene, 1995), the search for an alternative source of farm power which will be cheap and affordable to the peasant farmers therefore, became necessary. Kuyembeh (1986) recommended animal traction technology. However, this practice is saddled with many problems. Irtwange and Akubuo (1990) noted that for farmers already using animal traction technology in the rural areas of northern Nigeria, veterinary care is a major constraint. They observed that it was not only with respect to controlling *trypanosomiasis* but also other cattle diseases such as foot and mouth disease, contagious bovine pleuropneumonia (CBPP), *Anthrax*, *Streptothricosis* and *Piroplasmosis* to mention but a few.

The ecological condition of Adamawa State with earth dams and several ponds provides a near-perfect condition for the survival and development of helminthes parasites and Liverflukes fall in this group. Although these parasites are widely prevalent (Hensen and Perry, 1994), the clinical problems they cause in infested animals can be less obvious than those of other diseases. For this reason partly, infestations with gastro-intestinal and other helminth parasites are among the most neglected areas of veterinary care in many parts of the developing countries.

Liverfluke (*Fasciola)* of bovine specie (cattle and buffaloes) which happen to be in this class, inhibit the bileducts of the final host at the adult stage. Infestation by these parasites may cause acute or chronic hepatic insufficiency and infestation; and necrotic hepatitis may also well develop (Blood *et al*., 1983). This condition can

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lead to impaired function of the liver. Invasion of this organ (liver) by liverflukes in drought animals therefore, means inability to work well leading to reduce power output and consequently less productivity.

The economic effects of these parasites in the use of animal traction technology among small-scale farmers in Northern Nigeria and particularly Adamawa State, have not been properly defined. Very minimal or no efforts have been committed in this direction. It is for this reason that this investigation became necessary in order to provide all and sundry with information and suggestions on how best this technology could be improved for the benefit of all.

MATERIALS AND METHODS

The study area: The study was carried out in 2001 in Adamawa State of Nigeria, an area believed to have endemic incidence of *Fascioliasis* and animal traction is commonly practiced in farms using bulls. The state lies roughly between latitudes 7° and 11°N of the equator and between longitudes 11° and 14°E of the Greenwich meridian. It has a total land area of 42, 159 square kilometer with an estimated population of 3, 602, 511 (NPC, 1991).

Majority of the people are farmers. Cash crops produced include groundnuts and cotton. Food crops include Cassava, Maize, Yams, Sorghum, Millet and Rice. The fulanis are the renowned cattle rearers while village communities living on the banks of Gongola and Benue rivers engage in fishing.

The rainy season commences in April and ends late October. The average rainfall is 759 mm in the Northern parts and 1011 mm in the Southern parts. While the relative humidity is 13%, temperature varies from place to place. The minimum recorded for the state is 18°C while maximum is 40°C (Adebayo and Tukur, 1999).

Sampling procedure: Adamawa State has 21 Local Government Areas (LGAs). However, this study was based on 16 LGAs where animal traction is mostly practiced. Cluster and random sampling methods were adopted for selecting drought animals for the research. After identifying the endemic and non-endemic areas in each LGA by the aid of veterinary records and personnel, 15 pairs of drought animals were clustered in each area and 5 pairs selected randomly from same giving rise to 10 infested and non-infested drought animals, respectively, from 10 farmers.

Initially, in the 16 LGAs, a total number of 160 farmers (80 for each category of animals) with total of 320 drought animals (160 in each group) were involved in the research. However, in the course of the study, 60 farmers who own non-infested drought animals and 74 farmers who own infested drought animals responded positively. It was later discovered that among the two categories of farmers, some either have two or three pairs providing traction on the same piece of farmland for an individual farmer as against a pair earlier anticipated. In the end, 148 non-infested drought animals and 204 infested drought animals were studied.

As the infestation by *Fasciola* in cattle (drought animals belong to this class) takes an asymptomatic course, the analysis of fecal samples of the selected drought animals using the sedimentation technique was adopted in confirming the status of drought animals. Hensen and Perry (1994) reported that it is the ideal and qualitative method of detecting liverfluke eggs in the faeces.

A set of questionnaires was used for primary data collection. The livestock superintendents of the respective LGAs who were trained as enumerator and supervised by the researchers obtained information through interviews using a cost-route method. Secondary data with regard to government policies on animal traction technology was obtained from the State Ministry of Agriculture and the LGA department of Agriculture and Natural Resources.

Data analysis technique: The use of descriptive statistics and Kay (1981) efficiency measure which is modified by the researchers, were used in the analysis of the data. The descriptive statistics include frequency distribution, percentages and means, whereas the Animal Traction Efficiency (ATE) measure was classified into four as follows:

- Value of farm production per animal year (ATE 1).
- This method measures the total value of agricultural products produced per animal year equivalent and is realized by dividing the value of farm production by the animal year equivalent. Higher values denote greater traction efficiency.
- Farm size per animal year (ATE 2).
- This is obtained by dividing the tillable hectare by animal-year equivalent. Higher values also indicate greater traction efficiency.
- Animal traction Cost per Naira of Farm Production (ATE3).
- This is obtained by dividing the value of farm production by the total animal traction cost. Lower values implied greater animal traction efficiency.
- Animal traction cost per hectare of land (ATE4).

- This is obtained by dividing the animal traction cost for a year by the number of tillable hectares. Lower values indicate greater animal traction efficiency.

These were applied to the different farm sizes of the farmers and to both categories of drought animals for comparison.

RESULTS AND DISCUSSION

Farmsize, specie and pair of animals used for animal traction in the area: The study revealed that the average farmsize for all the respondents was 3.8 hectares with a minimum of one hectare and maximum of eight hectares owned by an individual farmer. The total number of hectares cultivated by all the farmers in the area was 514.3 hectares. The farmsize was categorized into three groups with a range of 0.1-2.9, 3.0-4.9 and 5.0 and above hectares for the purpose of analysis and also to determine the area within which majority of the traction users cultivated.

It could be observed from Table 1 that a larger proportion (38.81%) of the farmers cultivated farmland ranging from 3.0-4.9 hectares, whereas about 32.84% had their farms between 1.0-2.9 hectares with only 28.35% farmers cultivating about 5.0 hectares and above. Also, the two species (bovine and equine) shown in Table 1, indicated that the use of bovine (ox) by the farmers to supply farm power accounted for 99.30%, while the use of equine (donkeys) accounted for only 0.70% for the same purpose. Majority (69.40%) of the farmers used a pair of drought animals on their farms. While about 28.40% farmers owned two pairs for the purpose of traction, a mere 2.20% of the farmers used three pairs for the same purpose.

Table 1: Distribution of farmers according to farmsize, specie and pair of animals used for traction in Adamawa State, Nigeria

	Frequency		
Items	Owners of non-infested animals	Owners of infested animals	Percentage
Farmsize range in hectares			
1.0-2.9	16	28	32.84
3.0-4.9	29	23	38.81
5.0-6.9>	15	23	28.35
Total	60	74	100.00
Specie of animals used in traction			
Bovine (ox)	59	74	99.30
Equine (Donkeys)	1	0	0.70
Total	60	74	100.00
Number of pairs used in traction			
1 pair	45	48	69.40
2 pairs	14	24	28.40
3 pairs	1	2	2.20
Total	60	74	100.00

Source: Field Survey (2001)

The above results implied that majority of the food producers in the state are small-scale farmers who use oxen as animals of choice in providing traction on their farms. This finding agreed with Jama'are (2000) who reported the abundance of oxen as draft animals in Northern Nigeria among the small-scale farmers.

Efficiency in time use between non-infested and infested drought animals: It was observed that a non-infested drought animal used an average of 13.7 h to produce output equivalent of N29559.3 in the farming year under consideration, whereas an infested counterpart put in 24.6 h on the average to realize output worth ₦24434.4 in the same cropping season (Table 2). The implication of this, is that time was more efficiently utilized by the former category of animals and this agreed with Pearson (1989) who noted that the reduced power output and inability to work of otherwise well-fed and apparently healthy drought animals was as a result of chronic *Fascioliasis infestation*. This was further buttressed by two separate field studies by Khallaayoune (1991) in Morocco and Bliss *et al.* (1985) in Greece, where weak and inefficacious work animals were treated with Flukacide, that later resulted in stronger and more productive donkeys used for drought purpose.

Animal traction efficiency according to farmsizes between non-infested and infested drought animals: From Kay (1981) four approaches, higher values in ATE1 and ATE 2 signified higher animal traction efficiency, whereas in ATE 3 and ATE 4, lower values implied greater animal traction efficiency. For instance, it was observed that a non-infested drought animal produced output equivalent of N13696.25 (Farmsize 0.1-2.9 hectares), N28889.06 (Farmsize 3.0-4.9 hectares) and N40269.23 (Farmsize 5.0-6.9 hectares and above), while the average non-infested drought animal in all the farms produced N29559.32 (Table 3).

Table 2: Efficiency in time use between non-infested and infested drought animals in crop production in Adamawa State, Nigeria

Category of animals	Total No. of animals used in a cropping season	Total No. of hectares cultivated	Total No. of hours used in a year	Total income realized (N*)	Average hours worked by animal in a year	Average of equivalent yield animal^{-1} year^{-1} (N*)
Non-infested animals	148	227.0	2033	4374780	13.7	29559.3
Infested animals	204	287.3	5023	4984620	24.6	24434.4

Naira ((N*) 140 = US$1, Source: Field Survey (2001)

Table 3: Animal traction efficiency according to farmsizes in Adamawa State, Nigeria (Non-infested drought animals)

	Farmsize (hectare)			
Animal traction efficiency measure	1.0-2.9	3.0-4.9	5.0-6.9>	Average animal traction for all the farmers
Value of farm production per animal year (ATE 1) N*	3696.25	28889.06	40269.23	29559.32
Farmsize per animal year (ATE 2) hectare	0.97	1.54	1.72	1.48
Animal Traction cost per Naira of farm production (ATE 3) N*	6.73	6.73	5.86	4.49
Animal Traction cost per hectare of land (ATE 4) N*	3067.74	2859.11	2641.34	2660.81

Note: Naira (N*) 140 = US$1, Source: Field Survey (2001)

Table 4: Animal traction efficiency according to farmsizes in Adamawa State, Nigeria (Infested drought animals)

	Farmsize (hectare)			
Animal traction efficiency measure	1.0-2.9	3.0-4.9	5.0-6.9>	Average animal traction for all the farmers
Value of farm production per animal year (ATE 1) N*	13435.32	25979.11	29783.72	23831.47
Farmsize per animal year (ATE 2) hectare	0.81	1.38	1.85	1.41
Animal Traction cost per Naira of farm production (ATE 3) N*	5.48	4.52	3.63	6.39
Animal Traction cost per hectare of land (ATE 4) N*	3056.14	2885.36	2427.43	3771.49

Note: Naira (N*) 140 = US$1, Source: Field Survey (2001)

While one infested drought animal produced output equivalent of N13435.32 (Farmsize 1.0-2.9 hectares), ₦25979.11 (Farmsize 3.0-4.9 hectares) and ₦29783.72 (Farmsize 5.0-6.9 hectares and above), an average infested drought animal in all the farms produced N23831.47 (Table 4). Again comparatively, while the ATE2 of non-infested drought animals (Table 3) gives higher values than ATE2 of infested drought animals (Table 4), the average animal traction for all the farms of ATE3 and ATE4 in the latter animals gives higher values than ATE3 and ATE4 of the former animals.

By using this animal traction efficiency measure, this means that for both categories of drought animals, the most efficient farms were those in the range of 5.0-6.9 hectares and above. While the least efficient were farms in the category of 1.0-2.9 hectares. Farms in category 5.0-6.9 hectares and above were also the most efficient animal traction users with regard to ATE 2, ATE 3 and ATE 4. Farms of 3.0-4.9 and 1.0-2.9 hectares followed these, respectively, for ATE 2, ATE 3 and ATE 4.

CONCLUSION AND POLICY IMPLICATIONS

Based on the results of this study, *Fasioliasis* has been found to reduce the efficiency of drought animals on the farms in the area surveyed. Taking cognizance of the farm size, small-scale farmers are said to be the food producers in the area under consideration. The most efficient animal traction users in the State were farmers who cultivated 5.0 hectares and above.

It is therefore recommended that the health of these drought animals be inspected regularly by trained veterinary personnel and animals dewormed with appropriate anthelmintics to improve their productivity. The government as a matter of urgency should provide chemicals in order to eradicate the vector (snails) of this parasite in all endemic areas as a measure to break the life cycle chain for the discontinuity of this problem. Farmers are advised to cultivate 5.0 hectares and above in order to make the most efficient use of their drought animals in the area.

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