Observations on animal power utilization in the farming systems of northern Nigeria

by

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Abstract

Animal traction is advantageous due to its low cost, its timely availability and its capacity to increase cultivation areas. Tractor ownership or hire is beyond the reach of most peasant farmers. Animal traction is superior to both manual cultivation and tractor mechanization in the returns to land, labour and costs. Animal traction is predominantly used in agro-pastoral areas where draft animals are readily available and there is a tradition of owning livestock.

A survey was carried out in which 105 respondents answered questions on their age, their work animals (numbers, cost, feeding, income generated from hiring, number of years worked and salvage value) and their fields (areas, crop yields and crop residues). Most farmers using animal traction were under thirty. The majority (65%) of the respondents kept a pair of work bulls while 31% kept three or four animals. Most (62%) had four to six separate sites of farm land, providing a total of about 1.5 ha. Salvage values of work bulls were high (mean N1242, range N600-2700) enough to acquire two young bulls for each mature bull sold.

Introduction

The development of Nigeria's agriculture largely depends on the productivity of numerous small-scale farmers. It is this sector of the population that provides the bulk of the staple food consumed in the country. The need to increase the level of production of traditional staple food crops in the savanna areas of Nigeria has long been recognised. This is particularly important in the light of the present human population growth, urbanization and rural depopulation, all of which have, directly or indirectly, caused the demand for marketed food to exceed domestic productive capacity (Berry, 1984).

Manual labour is predominantly used to cultivate most of the total area cropped. The resulting bottlenecks at peak labour periods (land preparation, weeding and harvesting) limit not only the area under cultivation but also yields *per capita*. The end result is that the area cropped remains small unless tractors are available when required.

The problems associated with tractor farming in Nigeria needs little elaboration here. Tractors, spares and implements require scarce foreign exchange and as a result their prices have risen greatly in Nigeria, and in many other developing countries. This effectively makes tractor hire or ownership beyond the reach of peasant farmers. In many developing countries, the numbers of tractors in operation has fallen and the importance of tractor farming has declined (Kjærby, 1987). This trend of shrinking tractorization is very evident among small-scale farmers in the northern savannas of Nigeria.

The on-going food crisis in Africa, in general, and Nigeria, in particular, has been linked with a variety of factors ranging from socio-psychological predisposition of the farmer to production and institutional crises (Tabatabai, 1985; Abalu, 1986; Berry, 1984). Attempts by the Nigerian government to boost agricultural production through an aggressive tractorization policy have not been very fruitful. The adoption of inappropriate policies on agro-

Table 1: Some suggested relative economic returns using draft animal technologies

Level of use	Area under cropping (ha)	No. of active workers needed	Area per active worker (ha)	Net income per ha (%/ha)
Animal traction: light *(Horses or donkeys with light equipment)*	5.2	3.4	1.55	100
Animal traction: semi-intensive *(Oxen with recommended equipment)*	8.4	5.1	1.65	182
Animal traction: intensive *(Oxen with high-capacity equipment)*	12.0	6.3	1.90	255

Source: H.P.F. Curfs (1982) quoted in Musa (1988)

mechanization explains part of the food crisis Nigeria is currently going through. Various food programmes aimed at mechanizing agricultural production have benefited a few, privileged large-scale farmers at the expense of the numerous small-scale farmers.

The small-scale farmers lack access to production resources such as land, tractors and other vital agricultural inputs, and the food crisis in Nigeria may be said to be a crisis of access, control and use of production resources. A potential solution to the problem of food shortage is the utilization of animal power to perform farm operations.

Ox-powered mechanization has been shown to be far superior in terms of returns to the land, labour and capital than both manual cultivation and tractor mechanization (Beeney, 1975). The highly successful oxenization programme which contributed significantly to the expansion of cotton and cereal production in Burkina Faso is an example. The main advantage of animal traction is its relatively low cost, which facilitates its adoption by farmers with low financial resources (i.e. the majority of farmers). Furthermore draft animals under the control of the farmers themselves can be available at the time of need. The use of animal traction is an appropriate technology which will not only ameliorate the food crisis by boosting production but it will also conserve energy and pave the way to domestic industrial growth through small-scale manufacturing of farm implements. The integration of crop and livestock production will also be encouraged and enhanced.

Oxen are important suppliers of draft power for land development, tillage, threshing and transportation in Nigeria and many developing countries. The use of bullocks as animal power on farms appears to be widespread in certain areas of northern Nigeria but nonexistent in others. Agropastoralists traditionally own cattle but do not use them in their farming activities, although the reasons for this are not always apparent. In Nigeria, animal traction was first utilized for farm tasks in Daura in 1922 and predominantly used in the areas within agropastoral systems of land-use. The confinement of animal traction to this ecological zone may be due to the non-clayey nature of the soil which is plowed by animal-drawn tools. Secondly, docile draft animals are readily available in this tsetse-free area. Thirdly, the operators/owners of the animals have a livestock tradition.

Ox-plowing is capable of extending the *per capita* cultivation factor by almost two (Kjærby, 1983). It has been further observed that increases in yield and net income of up to 255% per hectare could be attained if more efficient animal-drawn equipment and management techniques are employed (Musa, 1988). The economic returns realised from work oxen under varying conditions are illustrated in Table 1.

The benefits of animal traction are numerous. This is evident from the growing interest in

the adoption of this technology by many rural households in the agropastoral farming systems of northern Nigeria. Furthermore, the growing interest in on-station and on-farm research on the subject in the last decade indicates that researchers too are recognizing the increasing importance of animal traction in the agricultural systems of northern Nigeria.

This paper is based on preliminary results obtained from a field survey of animal traction users in three states in northern Nigeria. The survey involved an in-depth evaluation of animal traction as an alternative to mechanized farming. The data highlights the profitability of animal traction as well as the appropriateness of the technology to small-farm operators in the study area.

Survey methodology

A structured interview schedule was drawn up and administered to owners and/or operators of animal traction in three regions: Kaduna, Borno and Bauchi. These regions fall within the agropastoral systems of the northern savannas of Nigeria. Data were collected in each location during the wet season which coincided with the planting period. A total of 105 respondents were randomly selected and interviewed by trained enumerators. Some of the variables investigated included: the mean age of respondents, number of work bulls owned, their initial cost, feeding and foodstuffs, fields put under cultivation, crop and crop residue yields per annum, income generated from hiring work bulls to other farmers, number of years for which work bulls were used and the salvage value of work bulls.

Results and discussion

About 75% of all respondents were 30 years old or less. This general finding was typical of all areas surveyed and implies that relatively young farmers are using animal traction for their farm operations. This suggests that animal traction could reach a large proportion of the younger generation of rural-based farm families. It is assumed that young people are more innovative than the older generations.

Table 2: Distribution of work bull ownership

No. of animals	No. of respondents	%	Cumulative %
1	1	1	1
2	68	65	66
3	18	17	83
4	14	13	96
5-7	4	4	100

Mean = 2.57 animals; SD = 0.98

The number of work bulls owned varied between one and seven with a mean of 2.6 animals (Table 2). However, the majority (65%) of the respondents in all the three locations kept a pair of work bulls while about 31% of all respondents kept three or four animals. Farmers who kept more than a pair of animals were able to use the extra animals as substitutes if one of the main work bulls was incapacitated by illness, accident or malnutrition. Work bulls are invariably used in pairs, and this practice should be reflected in any new designs or selection of implements.

The unit cost of a work bull varied between N230 and N1300 with a mean of N669 for all locations. This suggested that different categories of animals were being used. Further investigation revealed that some farmers bought mature animals and trained them for about four to ten weeks (depending on the docility of the animal). These mature animals, having attained slaughter weight, cost more than younger bulls. Other farmers preferred to buy young bulls in order to fatten them as well as train them for animal traction. Young bulls are cheaper, especially if bought during the dry season or following a natural disaster.

The majority of respondents rely primarily on natural fodder for the sustenance of their animals. During the rains animals graze natural pastures while during the dry season use is made of crop residues. Little or no concen-

Table 3: Number of sites per farm			
No. of sites	Frequency	%	Cumulative%
1-3	29	28	28
4-6	65	62	90
over 7	11	10	100
Mean = 4.4 sites; SD = 1.44			

trates were fed to the animals. Most farmers mentioned they bought maize husks to feed to their animals during the dry season when their own supply ran out. However, on the whole, a negligible amount was spent on feed. This may be explained by the fact that most farmers cultivated large areas and therefore had large amounts of crop residues and maize husks. Overall crop yields, in terms of grain and crop residue, correlated with farm size.

About 62% of the respondents had four to six separate pieces of farm land (Table 3). Each farm site was approximately one acre (0.4 ha). For simplicity, in this study farm sites have been assumed to average one third of a hectare. Table 3 shows that about 28% of the total respondents cultivated one hectare or less, while about 10% had more than two hectares. Farmers who cultivated the least number of farm plots worked more for other people, thereby making extra income as they hired their work bulls out. The income earned from renting or working with animals on other people's farms varied between N295 and N1400 per annum, with a mean of N358. This represents a modest income for a rural household.

On average, animals worked for four years before they were replaced. In exceptional cases, animals were used for up to seven years, perhaps because they were first trained at a very early age. When the productivity of animals starts to decline, it is time to sell them for then they attract a handsome salvage value with which the farmer can acquire two young bulls. Work bulls generally are sold for more than other bulls kept in the herd. This is probably because work bulls are larger, better fed and have better conformation than other bulls. The salvage value for the three locations varied between N600 and N2700, with a mean of N1242.

Conclusion

The data of this survey help to confirm the impression that animal traction is a useful and appropriate technology with many advantages. There is however much potential still to be exploited. This needs careful investigation to ensure that it is made directly relevant to the needs and conditions of smallholder farmers. If this is done it could lead to significant increases in rural incomes and improved nutrition for the Nigerian people.

Résumé

La traction animale est économique, disponible selon les besoins, et permet d'augmenter les superficies cultivées. L'achat et la location de traction sont économiquement inaccessibles pour la plupart des fermiers. La traction animale est supérieure à la culture manuelle et à la culture motorisée, aussi bien en termes de superficies, de main-d'oeuvre que de coûts. La culture attelée prédomine dans les zones agro-pastorales où l'élevage et le commerce des animaux de trait sont soutenus par une tradition de paysans propriétaires de bétail.

Une enquête a été effectuée auprès de 105 paysans qui ont répondu à des questions portant sur leur âge, leurs animaux de trait (nombre, coût, alimentation, revenu des locations, nombre d'années de travail et prix de vente à la réforme) et leurs champs (superficies, rendements, résidus de récoltes). La plupart des utilisateurs de la traction animale avaient moins de 30 ans. 65% des paysans interrogés possèdent une paire de taureaux, 31% sont propriétaires de trois ou quatres animaux de trait. 62% cultivent entre quatre et six parcelles, totalisant environ 1,5 ha. Le prix de vente à la réforme des taureaux de trait est élevé (en moyenne 1.242 N, allant de 600 N à 2.700 N) et permet d'acheter deux jeunes animaux pour chaque animal vendu.

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Title photograph (opposite)
Blacksmith workshop in southern Mali, with implements brought for repair. (see paper of C. Sidibé)
(Photo: Paul Starkey)