

The utilization and management of draft animals at farm level

by

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Abstract

Draft animal technology fits well into the socio-economic structure of rural people. In West Africa, crop farmers are a target for the animal power technology. Since their knowledge in cattle husbandry is often limited, improvement of their animal management skills is essential and socio-ethnological aspects must be considered. Animal management determines the work potential of draft animals and should be of serious concern to all draft animal programmes. Most draft animal programmes underestimate the importance of the veterinary component until casualties occur.

In Sierra Leone, draft animal technology was introduced in 1927. Despite lack of promotion it persisted, mainly for primary cultivation. Farmers have developed a double plowing technique that increases soil organic matter and reduces weed growth. On-farm surveys have shown that N'Dama oxen averaged 41 working days a year on plowing and 3 days a year on harrowing, cultivating 6.7 hectares, with other operations being of negligible importance.

Sweet potatoes and cassava are grown on mounds and the normal ox-plow makes suitable ridges more quickly and effectively than a conventional ridger.

The use of draft animals increases the area of cultivation and the area to be weeded. Seeders are expensive, complicated and sensitive to soil conditions, but their advantages are realized at the time of inter-row weeding. Animal-drawn weeding leads to 40-50% cost saving compared with hand weeding. The acceptance of work oxen weeding techniques is very low due to seeder problems, the fact that weeding is mainly done by women and the reduced potential for traditional

mixed cropping if seeders are used. Few farmers use groundnut lifters. Animal gears are being tested on station. The use of ox carts is increasing and such rural transport keeps animals utilized throughout the year.

In Sierra Leone natural pasture is the basis of the nutrition of draft animals as it is available throughout the year. If animals lose condition work is reduced and grazing time increased. Herdsmen prepare mineral supplements from a mixture of leaves, termite hill soil and salt. Agro-forestry feed supplements requiring little work may have potential.

Introduction

The use of draft animals as a source of farm power dates back some thousands of years but in sub-Saharan Africa with the exception of Ethiopia the introduction of draft animals for crop cultivation occurred between 1905 and 1935, particularly for the production of export crops like cotton and groundnuts (Starkey, 1986).

It is worth recalling that European agriculture relied on animal traction until after the second world war when tractors increasingly replaced draft animals. By this time a permanent infrastructure had been developed for the maintenance and repair of machines and farmers had become well skilled and business-orientated. In contrast to European farmers, the majority of the farmers in sub-Saharan Africa still depend on human labour, using rudimentary tools like hoes and cutlasses. Therefore the utilization of draft animals in farming in sub-Saharan Africa must not be viewed as a step

backward but rather as a technology appropriate to the prevailing socio-economic conditions and moreover an intermediate technology from human power to conventional mechanization.

In Sierra Leone the draft animal technology was introduced in 1927 on a very small scale in the Mabile Valley and part of the Koinadugu District. Although the authorities neglected to promote the technology, it persisted. Plows bought in 1950 are still in use today, the technology having passed on from one generation to the next. Though the technology was appropriate and viable, it never expanded beyond the areas into which it had been introduced because of lack of infrastructure for repairs and maintenance.

In Sierra Leone, cattle husbandry and management are exclusively practised by the Fulani tribe. The non-Fulani groups concentrate mainly on crop farming and raising of small ruminants and they therefore have little or no knowledge of cattle husbandry and management. The crop farmers generally regard livestock particularly cattle farming as an inferior occupation. Since crop farmers are now the target for the animal power technology, socio-ethnological aspects must be reckoned as a constraint to the acceptance, use and management of draft animals. The degree of acceptance varies among ethnic groups. For example the Madingoes, the Yalunkas and the Korankos in Sierra Leone are more receptive to animal power technology than other ethnic groups.

Like several draft animal programmes, the Sierra Leone Work Oxen Project has focused mainly on equipment development, and has tended to neglect socio-ethnological factors that affect village level animal management. This neglect has resulted in the slowdown of draft animal programmes among certain ethnic groups, novices in cattle husbandry.

The utilization of draft animals

Primary cultivation

Plowing has been the oldest and the principal farming operation using work animals. In much of Africa and Asia plowing is the only operation performed by draft cattle, although plowing may be followed by harrowing or levelling in order to obtain a good seedbed. In Sierra Leone, plowing is done in swamps, riverain grasslands, bolis and stump-free uplands. Plowing is a major constraint in subsistence agriculture. In 1986 a farmer in Sierra Leone wishing to cultivate a hectare of farmland might have to pay an average of Le500 to hire manual labour, Le375 for the service of a tractor, but only Le100 for the hire of work oxen. Thus there are substantial savings to be made through hiring work animals.

Farmers in Mabile Valley in Sierra Leone have developed a double plowing technique with work oxen. This involves plowing at the beginning of the rains and the second plowing towards planting. This practice has been observed to increase yield due to increase in soil organic matter and reduction in weed growth.

Secondary tillage or seedbed preparation is considered as a light operation and is usually performed by women and children. However it is time- and labour-consuming and the use of draft animals for harrowing would relieve women and children. Therefore harrowing with draft animals could become important in peasant agriculture. Farmers in Sierra Leone are being introduced to a triangular wooden harrow which can be made by village artisans and this implement is being promoted by the Work Oxen Project. Besides upland harrowing, the triangular wooden harrow can be used for puddling in swamps and levelling in both swamps and upland.

On-farm surveys have shown that a pair of N'Dama oxen averaged 41 working days a year on plowing and 3 days a year on harrowing, with other operations being of negligible im-

portance; an average of 24-30 ox-team-hours per hectare was recorded, representing an average of 6.7 hectares a year. There are individual teams recorded to have plowed 18 hectares in a season at the rate of 0.5 hectares per working day (Allagnat & Koroma, 1984). On-station trials in developed swamps gave figures of 33 ox-team-hr ha⁻¹ for plowing and 38 ox-team-hr ha⁻¹ for harrowing and levelling (Starkey, 1981).

In Sierra Leone, the Work Oxen Project has promoted the practice of two-person control of animals instead of the traditional several-person control. In neighbouring Guinea control by one person is practised which is more efficient in terms of human labour.

Ridging

Tuber crops like sweet potato and cassava are traditionally grown on mounds or heaps prepared by using the local broad hoes. The operation is almost similar to traditional plowing in terms of labour requirement. The use of work oxen for such operations can substantially reduce the labour requirement and time spent compared with the traditional method.

In Sierra Leone, the ridger has not proved to be a better implement than the plow, for in heavy soils the plow itself makes good ridges more quickly and effectively than a conventional ridger. The ridger requires several passes on a well-plowed and harrowed area to make a ridge, whilst by using the plow, two passes on either side produce a standard ridge even in unplowed land. The use of the ridger is restricted to upland but the plow can ridge in all the three ecologies: upland, riverain grassland and swamp. Farmers are therefore not very keen on the use of the ridger.

Seeding

In West Africa seeding with draft animals is only common in certain dry upland ecologies. This practice is much more popular in the Sahelian zone than in the forest zone where

the soil is heavy and stumping is a difficult operation for farmers. In Sahelian countries seeding with animal-drawn seeders is common among cotton and groundnut farmers. For example in 1977, Senegambia had 233,000 seeders (Sargent *et al.*, 1981). The advantage of seeding with draft animals using a single row seeder is only realized at the time of inter-row weeding, which is a very big constraint in peasant farming. Animal-drawn weeding leads to 40-50% cost saving compared with hand weeding.

Trials carried out in Sierra Leone showed that oxen working 5-6 hours a day could seed an area of 0.4 to 0.5 hectares. A single ox can also be used in seeding since it is a light operation. In the villages seeding with oxen is still at a demonstration stage and the demand for seeders is not as high as the plow, the ox cart or the harrow. Generally seeders are expensive, complicated and sensitive to the quality of seedbed preparation and soil moisture.

Weeding

Weeding with oxen has a high potential for saving labour and time as compared with the traditional method. For example, with trials in Sierra Leone, hand weeding of groundnuts required 403 person-hours ha⁻¹, while the use of oxen reduced it to 76 person-hours ha⁻¹ (Starkey, 1981). As in many places, the acceptance of work oxen weeding techniques among peasant farmers in Sierra Leone is very low and this is attributed to:

- The disadvantage of a seeder which is complex, costly and sensitive to soil conditions.
- Weeding is mainly done by women and unfortunately only males work with the animals who consider weeding as a very light operation.
- The potential for traditional mixed cropping is greatly reduced if a seeder is used.

The use of draft animals implies increases in the area of cultivation and therefore the area to be weeded. Weeding being a major limiting

factor to crop production, the adoption of ox-weeding techniques by peasant farmers through effective extension will be a major step forward in agricultural development.

Another means of reducing weed growth is practised by experienced farmers in the Mabolé Valley of Sierra Leone. They practise double plowing to avoid pre-planting weed clearance and to reduce subsequent weed growth on uplands and in swamps. Farmers also claim to have increased yields with double plowing compared with single plowing because of the additional green manure.

Harvesting

Unlike Senegambia where there are about 90,000 lifting implements for uprooting groundnuts, in Sierra Leone hardly any farmers use groundnut lifters. This is mainly due to the practice of scattered planting, the fact that groundnuts are not a major crop and because most of the operations are done by children and women.

Harvesting of rice is a big constraint in rice production. Farmers can lose a high proportion of the yield of the rice if harvesting is not done in a very short period from the point of complete maturity. Should it be possible, the development of an ox-drawn rice harvesting implement would be much more appreciated than groundnut lifters.

Animal-powered gears

Animal draft force can be converted to mechanical energy to operate water pumps, rice hullers, maize grinders and cassava graters through gear systems. The animals are attached to a horizontal pole and as they walk in a circle the gear system is operated.

In Sierra Leone, this technique is fairly recent and it is currently only undergoing on-station trials at Rolako. If it works, and is accepted by farmers in Sierra Leone, the processing of agricultural produce at village level will be facili-

tated and by adding value in the villages, a greater proportion of high consumer prices will remain with the farmers. It will therefore reduce the powers of the shrewd middle-men who reap more profit from farm produce than the farmers themselves.

Irrigation can be a constraint in the farming systems in the dry season. Farmers are willing and able to cultivate crops right through the year but lack of rains for six months prevents this. Therefore the use of animal power for irrigation purposes could increase annual food production and lead to self-sufficiency in the staple food, rice.

Transport

Transport is a major constraint at village level. Substantial quantities of agricultural produce are transported on the heads of the people, mainly women and children. Inadequate transport can be a limiting factor to the production of crops like fruits and vegetables. The use of draft animals to pull carts leads to a convenient form of rural transport and keeps the animals utilized throughout the year. The technique is fairly recent in Sierra Leone but the demand for it is very high among farmers.

The work achieved by draft cattle in transport operations is very variable, depending on animal size and conditions, cart design and the nature of the terrain. In Sierra Leone, the metal-wheeled ox carts manufactured at Rolako carry about one tonne using 4-5-year-old animals.

The management of draft animals

General

Management is invariably the most important factor that determines the work potential and working life of draft animals. In West Africa cattle rearing is a tradition of the Fulani tribe and the non-Fulani tribes are crop farmers

whose traditional skills in cattle management are few. Animal management should be of serious concern to all draft animal programmes in West Africa since most farmers involved tend to be non-Fulani. Draft animal management includes feeding, housing and health.

Nutrition

In sub-Saharan Africa the natural pasture is the basis, and in most cases the only component, of the nutrition of draft animals. Minerals and farm residues such as groundnut hay, rice straw and maize stover are seldom made available to animals in the more humid areas like Sierra Leone. During the dry season, farmers leave their animals to range widely in search of grazing. In the Sahel areas the effect of the dry season is to reduce the animals to a very poor state by the time they are required for work at the beginning of the rainy season. In Sierra Leone, the availability of green pasture for work oxen throughout the year makes it possible for most farmers to keep their animals in the dry season and apparently the animals are in a better state during the dry period when there is less work and less of a health problem.

The natural pasture in Sierra Leone tends to be inadequate in legumes, as they are dominated by fire-climax grasses like *Imperata*, *Pennisetum* (elephant grass) and *Panicum* (Guinea grass). In non-savannah areas like the southern and eastern part of Sierra Leone, shifting cultivation permits the growth of fresh, succulent grasses in the newly abandoned fields. Starkey (1984) recommended a low input/low output system for Sierra Leone, implying that free grazing fitted well into the traditional socioeconomic system and that the output of the draft oxen should be made commensurate with the traditional low feed quality. Under such a system, if animals appear to be losing condition, their work is reduced and their grazing time increased. The overall work may be four hours a day for five days a week as this can

generally be maintained on the available pasture.

At farm level it is generally difficult to preserve forage either in the form of hay or silage. For hay, the major problem involved is the unavailability of extra labour at labour peak periods, and in the humid tropics, the high humidity and rainfall makes drying difficult. The idea of silage has never extended beyond the confines of the university and livestock stations in Sierra Leone. It is labour-intensive and a costly operation at farm level. With all the difficulties in providing better feed quality at farm level, it could be more effective to use agro-forestry crops requiring little work. Certain *Acacias* or *Leucaena leucocephala* are cheap and effective means of improving draft animal nutrition at village level.

It is a good practice to ensure that working animals are provided with clean water once a day to compensate for the loss in water through sweating and salivation and to complement the increase in dry-matter intake associated with the energy requirement for work. In the dry season the provision of 30-40 litres per day/per animal is considered reasonable.

Herdsmen in Sierra Leone are aware of the importance of minerals and vitamins for their animals. They therefore prepare mineral supplements known as *tupal* from a mixture of selected leaves, termite hill soil and common salt. This is also associated with traditional ceremonies to protect the animals from supernatural forces. Work oxen farmers generally provide the animals with some common salt on a regular basis for nutritional purposes and to encourage close human contact with the animals.

Housing

The health, strength and lifespan of draft animals are of crucial importance for ensuring the viability of animal power technology. Therefore the protection of draft animals from harsh weather conditions through the provision of a

cheap form of housing is advisable. In Sierra Leone farmers generally bring their animals close to their homes at night. Some farmers provide a shed while others even allow them into their houses. The shed or paddock should have a sloping floor to allow runoff. To reduce the problem of flies, the shed should be dung-free and not muddy. Below the roof residues such as groundnut hay or rice straw can be stored for the dry season. It is advisable for each shed to have a crush and stock to facilitate yoking of the N'Dama animals and veterinary examination.

Health

For farmers unused to cattle rearing, animal health is a big problem at village level. The success of any draft animal programme depends greatly on the effectiveness of the veterinary service. However most draft animal programmes underestimate the importance of the veterinary component until casualties occur. For example, the Sierra Leone Work Oxen Project once experienced an animal mortality rate of about 25% which was associated with a heavy infestation of the fly *Stomoxys* and a shortage of insecticidal chemical in the country. Despite the hardness of N'Dama to diseases like trypanosomiasis, they are still prone to certain endemic diseases and endo- and ecto-parasitic infestations including worms, liverflukes, ticks and flies. Bloat is not very frequent but if it does occur, farmers treat it by giving half a litre of palm oil to the animal.

Conclusions

In sub-Saharan Africa, with the exception of Ethiopia, the utilization of draft animals in farming is relatively recent. Farmers still rely greatly on human power for the cultivation of their farms. Draft animal technology is not a

backward technology but an intermediate technology to tractorized mechanization that fits well into the socioeconomic structure of the rural people.

In Sierra Leone the utilization of draft animals is mainly for primary cultivation at farm level. Other operations are being demonstrated and assessed on-farm. The demand for ox carts is increasing since transport is a constraint in rural areas. The animal-powered gear system is at a trial stage but if it succeeds in processing agricultural produce and in irrigating crops during the dry season, the overall annual agricultural production could be boosted towards self-sufficiency.

The management of draft animals should be an area of concern because the viability of the technology depends to an extent on the health, strength and working life span of the animals. In West Africa draft animals are mainly used by crop farmers whose knowledge in cattle husbandry is very limited. The improvement of the animal management skills of such farmers is essential in sustaining animal power technology at farm level.

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