Trypanosomiasis And Animal Production In Nigeria

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SUMMARY

TRYPANOSOMIASIS is one of the principal factors restricting growth of the livestock industry in Nigeria and, therefore, is a direct concern of animal scientists who aspire to increase the production of animal protein in this country.

The present paper reviews the value of drug treatment of disease animals, destruction of game, clearing of vegetation, and the extermination of the tse-tse flies by insecticides as methods of controlling this disease; it also discusses the contribution of integrated land use, improved standards of nutrition and management, and trypanosome-tolerant cattle to minimize, for the present, the effect of trypanosomiasis on the development of the livestock industry.

INTRODUCTION

HUMAN and animal trypanosomiasis have influenced the history of Africa for a variety of reasons. They have determined what areas could be settled; they have interdicted man from some and led to the over-population and land exhaustion of others; they have excluded extensive use of work animals and by limiting the production of domestic food animals, have played an important part in the chronic protein deficiency of the tropical African; this in turn has contributed to the high mortality, short life-span and considerable debility resulting from malnutrition.

Despite all efforts and some impressive achievements, the problem of trypanosomiasis persists and in some respects, is unchanged. The total area occupied by tse-tse (one-third of Africa) has scarcely been reduced. Consequently, cattle cannot be raised throughout extensive areas of this continent which, according to estimates, would otherwise support an addi-

tional 125,000,000 head, or more than double the present number.

ANIMAL TRYPANOSOMIASIS IN NIGERIA

When discussing the problem of animal trypanosomiasis in Nigeria, one is invariably referring to the epidemiology and control of the disease in cattle. Bovine trypanosomiasis is one of the principal factors restricting growth of the cattle industry in this country. Considerable areas of potential pasture, not utilized for arable farming or yet fully grazed, still exist but are inaccessible to cattle due to heavy infestation by tse tse. The presence of tse-tse, together with climatic factors, has a profound effect on the pattern of nomadic husbandry adopted by the traditional cattle raisers, the Fulani (MacLennan, 1963). In spite of tse-tse and trypanosomiasis, the Fulani have succeeded in making the cattle population one of the most important natural resources of Nigeria.

Animal trypanosomiasis has a sylvatic transmission cycle; the disease is maintained in an ecological system which includes tse-tse, woody vegetation and game. It is only when livestock is introduced into this system that tse-tse will use cattle as their food source, and infect them with trypanosomes (MacLennan, 1973). Eradication of bovine trypanosomiasis must, therefore, be directed to the destruction of the whole, or part, of this ecological system or to the destruction of

trypanosomes by drug treatment.

Curative and prophylactic drug treatment

Much effort has been made in the past to cure infected cattle by the use of curative drugs or, in a much smaller scale, to prevent trypanosome infections by means of prophylactic drugs. However, control by drugs alone cannot be completely effective in the presence of tse-tse, because of the persistent trypanosome reservoir in game. Furthermore, the development of drug resistance in trypanosomes has restricted its application.

Drugs are valuable to maintain cattle in areas with low tse-tse challenge, to protect animals passing through fly belts on trade cattle routes, or to enable cattle to survive when grazing for short periods in tse-tse infested areas. But calamities have occurred after the use of drugs in Fulani cattle, when owners, gaining confidence from the drug, introduced their cattle into areas heavily infested by tse-tse (Nash, 1969).

Prophylactic treatment in nomadic cattle has never been favoured because owners may not return for the next injection at the interval prescribed. As a result, the concentration of the drug in the animals will fall to low levels and resistant strains of trypanosomes may develop.

However, the availability of drugs no longer necessitates the complete eradication of tse-tse (Nash, 1969). When the treatment regime is conducted by professional people and optimal methods of animal husbandry are provided, cattle may flourish under moderate tse-tse challenge.

Game Destruction

The elimination of game will not only destroy the natural trypanosome reservoir, but will also deprive tse-tse of its food source. The great rinderpest epidemic in 1896 killed the livestock in vast areas of Transvaal, Rhodesia, Zambia, Mozambi-

que and Tanzania, but also destroyed large numbers of game animals, particularly those species which were the preferred hosts of savannah tse-tse. As a result, tse-tse disappeared from these areas and the elimination of game as a mean to eradicate trypanosomiasis became appreciated. However, this method has never been introduced in Nigeria, and nowadays, world opinion has discouraged its use in general, since it is realized that game must be preserved, rather than be destroyed.

Vegetation clearing

The control of tse-tse by altering the vegetation is a direct attack on tse-tse and hence an indirect attack on trypanosomes by eradication of its vector (Nash, 1969). In Nigeria, riverine tse-tse have successfully been eliminated in vast areas of the Sudan and Guinea vegetation zones by clearing forest islands and thickets of river plains. Vegetation clearing at Mokwa was an attempt to eradicate savannah tse-tse in a circumscribed area.

Wholesale destruction of the savannah vegetation in northern Nigeria would result in soil erosion and would cause irreparable damage to the land. Furthermore, vegetation clearing is expensive; it is also wasteful in that much valuable woody vegetation will be destroyed. For these reasons, vegetation clearing as a single measure to combat savannah tse-tse has never been introduced.

Selective clearing of vegetation has been commonly practised in Nigeria through the settlement of arable farmers in areas, which were previously cleared from savanna tse-tse. This effectively prevented re-infestation of tse-tse, provided that there was a sufficient human population density to maintain the *status quo* (minimal 100 people per sq. mile).

Extermination of tse-tse by insecticides

The application of insecticides to control

tse-tse and, therefore, trypanosomiasis was introduced in Nigeria, when it became generally accepted and understood that other means of disease control would never be able to solve the problem. The potential of persistent insecticides became appreciated and spraying of the vegetation became the mean weapon in the fight against tse-tse.

Successful spraying against tse-tse is a technique that can only be developed after much research work has been done. The behaviour of the fly in its own particular habitat must be studied, especially the places where it rests on the vegetation and where it returns periodically during the course of its daily activities. These places are known as the "true" resting sites. Studies are complicated by the fact that the eleven known species of tse-tse in Nigeria require different types of vegetation in their habitats and make use of different resting sites on the vegetation. These resting sites vary also for one particular tse-tse species in different climatical and vegetational zones (Davies, 1974).

Spraying is directed to the application of insecticides to the "true" resting sites of the fly and not directly onto the fly. This selective method appears quite effective when persistent insecticides are used, it reduces the actual spraying costs, limits the amount of insecticides that is spread in the environment and, therefore, minimizes the risk of side effects that may result from pollution. For example, in the savannah vegetation of Nigeria, spraying is confined to selected sites in only 10% of the total infested areas. Because of the persistence of the insecticides, eradication can be achieved by a single application only. A severe problem, however, is the tendency of flies to re-infest previously reclaimed land.

So far, 170,000 sq. km. of Nigeria has been reclaimed from tse-tse; this area

is equal to the part of Nigeria which is by nature free from tse-tse because of its unsuitable habitat for the fly. This has been achieved through the sole activities of the Tse-tse and Trypanosomiasis Division during the last 18 years and almost entirely done by ground spray units.

Aerial application of insecticides is not as selective as ground application but it is particularly suited to riverine species of tse-tse and to savannah species occupying country with strongly differentiated *Isobberlinia* woodland. It will thus supplement ground spraying in selected parts of the country, in particular in the south where the vegetation is more dense, and where ground spraying may not be so practical.

FUTURE APPROACH

It is evident that the tse-tse extermination programme has many more years to go, before the Nigerian livestock will have access to all potential grazing areas in the country. It is, therefore, appropriate to evaluate which measures could be taken to improve animal protein production in Nigeria today, in order to make a better use of the economic potential of the cattle population.

Integrated farming

At present, there is an inevitable trend inside tse-tse extermination areas, to break up the pasture land and to open it for cultivation. Although this is an important contribution to prevent tse-tse re-infestation of the reclaimed areas, it does not serve the purpose i.e. the provision of grazing areas, which were in the past inaccessible for livestock because of heavy tse-tse infestation. An acceptable compromise seems to be the integration of arable farmers and cattle raisers (Leeftang, 1975a). This emphasizes the need for effective land use planning and revision of the existing land-tenure laws of the

Northern States of Nigeria. Integrated farming will increase the use of crop residues and by-products of the neighbouring farms for livestock feeding; this requires more research directed to the nutritional value of these residues and by-products. The development and rehabilitation of land, creation of grazing reserves and the provision of water with a strict control on overstocking, and a good pasture management in reclaimed tse-tse areas could also contribute to the required stability and increased production of our national herd (N.L.D.C., 1971).

Nutrition and management

Studies on the epidemiology of trypanosomiasis have clearly demonstrated that the adopted methods of animal husbandry greatly influence the actual course of the disease (Kirkby, 1963; Leeflang, 1975b). Poor nutritional and management conditions not only increase the liability to contract infestation but also render the animals less capable of withstanding the effects of infection. But adequate nutrition and good management, and this is not only valid for trypanosomiasis but also for many other diseases, enables the animals to withstand infection and to develop resistance to further challenge. High standards of husbandry, if necessary supported by an effective drug treatment regime, make it possible to breed and rear cattle in areas with moderate tse-tse challenge.

Trypanosome-tolerant breeds

There are very substantial variations in susceptibility to trypanosomiasis between breeds of cattle. Generally speaking, breeds exotic to the tse-tse zone are much more susceptible than the White Fulani, which exhibits a certain tolerance to moderate tse-tse challenge. The other extreme is shown by the Muturu and

N'Dama breeds which can develop a significant degree of tolerance (MacLennan, 1973).

An FAO (1966) report on agricultural development in Nigeria stressed that the future of beef production in tse-tse areas must lie with improved lines of Zebu stock, following the control or eradication of the flies. However, until tse-tse extermination is achieved, there is a place in the agricultural economy of Nigeria for cattle with more tolerance to the pathogenic effects of trypanosome infections.

The N'Dama has already made a significant contribution to the livestock economy of several African countries. Many of the misconceptions about the productivity of this breed may have arisen from the data from herds kept under poor conditions (Roberts and Gray, 1973a) but when conditions are favourable, N'Dama mature early and are exceptionally fertile (Williamson and Payne, 1965). The Muturu has not been used to the same extent as the N'Dama because of its smaller size, lower productivity and susceptibility to diseases other than trypanosomiasis (van Hove, 1972; Roberts and Gray, 1972, 1973a).

Nigeria has always been interested in the N'Dama breed for the improvement of livestock production in those parts of the country which, in the present situation, are inaccessible to Zebu cattle.

The quality of trypanosome-tolerance has a genetic basis and enables the N'Dama to respond to infection. But the animal has to become infected to exhibit this ability. Furthermore, circumstances of the initial exposure to trypanosomes decide on the fate of the animal (Roberts and Gray, 1973b).

Calves, born of hyperimmune dams and exposed to tse-tse challenge early in life, will develop an acquired immunity which enables them to withstand further tse-tse

challenge when maintained under favourable conditions of husbandry.

However, if the first exposure to infection is delayed until maturity, N'Dama, similar to other breeds, may succumb to trypanosomiasis. The same will also happen when N'Dama cattle are introduced from tse tse-free areas into tse tse-infested areas, even when the fly challenge is only moderate, unless such cattle are maintained in the new area under professional supervision and favourable conditions, severe losses due to trypanosomiasis will occur. Furthermore, the effect of chronic trypanosomiasis in young N'Dama cattle may cause retarded growth and under-development of the reproductive system of both, male and female animals (Stephen, 1966).

CONCLUSION

In conclusion, it can be said that the extermination of tse tse in the potential grazing land of Nigeria is of significant importance for further livestock development; however, it is still a long way to achieve. In the mean time, certain measures can be taken to improve the cattle industry, notwithstanding the existing tse-tse problem. Under favourable conditions of husbandry and adequate supervision, Zebu cattle can withstand moderate tse-tse challenge. In areas, not yet accessible to Zebu cattle, N'Dama cattle can thrive and contribute to the growing demand for animal protein. Finally, integration of cattle raisers and arable farmers, and the development and rehabilitation of pastures and provision of water in those areas already reclaimed from tse-tse, will increase the economic potential of the cattle industry.

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