

ANIMAL TRACTION RESEARCH AND EXTENSION IN AFRICA - AN OVERVIEW

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INTRODUCTION

In attempting to provide an overview of animal traction in Africa one is faced with many problems. There is a shortage of reliable information; very few statistics are available on the extent to which draft animals are used in the various African countries. There is no single source of information, and research data relating to animal traction are often in the form of reports, circulated only within the country of origin. When data are published internationally, they can be in any one of a wide range of journals, covering many disciplines. Thus, while the information given here is based on computer database searches, literature reviews and visits to a large number of African countries, it is far from comprehensive. The limitation of the information presented here is therefore acknowledged from the outset.

The great diversity of Africa geographically, ecologically, socially, economically and politically makes meaningful generalization very difficult. Yet in taking an overview, one must inevitably generalize. It is accepted from the outset that this presentation will be full of over-simplifications, which can be justified only to the extent to which they help provide a general picture of animal traction in Africa. Further, in order to stimulate ideas, reactions and debate, this presentation will involve certain exaggerations and the questioning of priorities. The justification for these will simply be the discussions catalysed by such overstatements.

It is estimated that there are up to 400 million draft animals in the world, directly or indirectly serving two billion people. Around 250 million draft cattle representing 20 per cent of the cattle population of the world are employed for work, the vast majority (approximately 220 million) in Asia. In China alone there are 92 million draft animals, and in India between 72 and 110 million draft animals are employed. Animal traction is used to cultivate about half the total area cropped in the developing world, and on the order of 25 million carts are pulled by draft animals throughout the world. Thus, by world standards, the total number of draft animals in Africa (approximately 15 million) is very small; the great majority of the land farmed on the continent is cultivated with human labor. Nevertheless, many million farming families in Africa do depend directly on animal traction, and the use of draft animals is growing in almost all countries of the continent.

To put animal traction research into context, the present use of draft animals in Africa will be considered first from a historical, and then from a geographical perspective. Some generalizations will be presented on the present status of animal traction research before questions are posed

concerning the future needs and direction of draft animal research and extension.

A HISTORICAL PERSPECTIVE

In Egypt and North Africa, the use of animal traction for crop cultivation and transport goes back several millennia. The use of war-elephants by Hannibal in 218 B.C. was a particularly dramatic use of animal energy. In Sub-Saharan Africa, Ethiopia is notable for widespread use of oxen for farming, a tradition that dates back many centuries. However, elsewhere in Africa, the use of animals for crop cultivation is relatively recent.

Pack animals have been traditionally used in several African cultures, and draft animals were introduced for transport in many towns on the African Coast, particularly during the nineteenth century. For example, horses were used for commercial and military transport, and for recreation in Dakar and Freetown in the nineteenth century. In Southern Africa, early white settlers used animal power on their overland treks, and also for their farming operations.

The major introduction of animal traction for crop cultivation occurred between 1905 and 1935. In most cases, emphasis was placed on the production of export crops. In many parts of Francophone West Africa, including Senegal, Guinea, Ivory Coast, Mali, Burkina Faso and Cameroon, independent companies provided all the training, extension, credit and equipment necessary to allow some rapid adoption of draft animals for cotton and groundnut production. In other countries, including Sierra Leone and Botswana, colonial administrators encouraged animal traction to increase local food crop production, and public funds were used to provide various services including equipment importation, extension services and, in some cases, credit.

By 1940, the time of the Second World War, animal traction had become very well established in Botswana, and was widely used in many specific and geographically limited areas within most of the African subregions, notably in parts of Senegal, Mali and Burkina Faso in West Africa, and areas of Kenya and Tanzania in East Africa. However, at this time, most of Africa was under European administration, and it is important to understand what was happening to European agriculture at this time. For centuries, draft animals had been the major source of farm power in Europe, but after the Second World War the numbers of draft animals in Europe fell dramatically as tractors became widely adopted. Thus, in Great Britain, around 11 million draft horses were used in 1910. As tractor power developed, this fell to 650,000 in 1940 and 370,000 in 1965. In France, in 1940 there were around two million draft cattle and 1.8 million work horses, but by 1965 this had dropped to 100,000 draft cattle and 730,000 horses. From the point of view of European agriculture, it seemed clear that animal traction was an old-fashioned technology that was being rapidly superseded. In universities and agricultural colleges, emphasis was placed on the new forms of mechanization.

During the 1950s and 1960s, there were many attempts to introduce

mechanical cultivation on the African continent, often with disastrous economic and ecological consequences. At the time of independence, the decision makers in most countries had been educated in Europe, had been educated by European expatriates, or had been educated by other Africans who themselves had received European training. Thus a whole generation of African decision makers and African educators had been trained in an environment in which it was generally assumed that animal traction was old fashioned, and of purely historical interest. This gave rise to many rejections of the whole concept of animal traction, which was perceived, to quote a West African, as "a U-turn back to the Stone Age".

By the early 1970s, most countries had recorded failures of over-ambitious tractorization schemes. Fuel crises were followed by chronic foreign exchange problems. Agricultural planners became fully aware that despite tractorization schemes the vast majority of the farming population was actually still using hand labor. Thus almost everywhere in Africa there was a new interest in the possibility of developing animal traction. Multilateral and bilateral aid projects proliferated, particularly in the Sahel, where drought conditions attracted extra aid resources. Thus, by 1985, in almost all countries in Africa the use of animal traction was being actively promoted by government departments, parastatal organizations, major aid projects and by smaller non-governmental aid agencies. In a smaller number of countries, draft animals were also being actively encouraged by private manufacturing or commodity trading companies.

A GEOGRAPHICAL PERSPECTIVE

Of the 15 million draft animals used in Africa, a very high proportion are found in one country, Ethiopia, where more than six million draft cattle are used to plow with the traditional ard (plow). In the highlands of Ethiopia more than 90 percent of farmers make use of animal power. Elsewhere in Africa the use of animal traction is very uneven, with the average figure of about ten percent of farmers using animal power; in some areas it is used by less than one percent of the farming population.

In West Africa there are three broad ecological zones in which animal traction is used. In the Sahel zone of northern Senegal, northern Mali and northern Burkina Faso, horses and donkeys, and to a much lesser extent camels, are the preferred draft animals. To the south of this zone is a belt where Zebu breeds of cattle are mainly used for draft purposes. Further south, in the tsetse zone, to the south of a line running from The Gambia, through southern Mali and southern Burkina Faso to central Nigeria, the small trypanotolerant taurine breeds of cattle are employed in animal traction.

To give an idea of the order of magnitude of draft animal usage in West Africa, about 20 percent of the farmers in Senegal make use of 500,000 draft animals, including horses, donkeys, Zebras and Taurines. Senegal is exceptional in Africa in that the use of seeders for planting is common. In The Gambia, about 33 percent of farmers use animal traction, mainly donkeys and N'Dama taurines. About 100,000 N'Dama oxen are used in Guinea, mainly for plowing. In southern Mali, around 170,000 draft oxen are used,

and inter-row cultivation of cotton and maize is relatively common. In Ivory Coast about 30,000 draft cattle are used, often for weeding of cotton as well as plowing, and in northern Ghana about 20,000 draft taurines are employed. Much smaller numbers of draft cattle, mainly taurines, are used in Sierra Leone, Togo and Benin. In central African countries, cattle populations are small, and while animal traction is slowly expanding, absolute numbers of draft animals are still low.

In East Africa, around 700,000 draft cattle are used in Kenya, and the overall usage by 12 percent of farming families includes certain areas where 80 percent of farmers use oxen for plowing. In Tanzania, about 300,000 draft oxen are used, and in Zambia, Malawi and Zimbabwe about 15 percent of farmers use draft cattle. In Southern Africa, Botswana is exceptional in that virtually no primary cultivation is carried out with hand tools. In Botswana, 80 percent of the farmers use animal traction, employing 360,000 cattle and a few thousand donkeys. In West and East Africa, animals are almost always used in yoked pairs. However in Southern Africa large teams comprising two to six pairs are common. In Madagascar around 330,000 draft cattle are employed.

A RESEARCH PERSPECTIVE

While animal traction is generally a neglected area of research, in most African countries one or more research center, agricultural project or NGO development program is actively involved in some aspect of draft animal research and development. While noting that there are huge variations between different countries—some of which have excellent, well-coordinated, farming systems-orientated animal traction research programs—some broad generalizations can also be made.

Frequently, within countries there is very little liaison and information exchange between the different organizations working on animal traction. This may be because different institutions and projects fall under different ministries. For example, there may be separate ministries responsible for agriculture, livestock, higher education and research. However, even when a single administration is responsible for all aspects of rural development, there may not be liaison between its different projects in different parts of the country. For example, recently in one West African country there were two projects developing animal traction, both financed by the same multi-lateral aid donor, and both with expatriate animal traction "experts", but they worked in complete isolation and the "experts" had never met each other. In a Central African country, there were five projects funded by different donor agencies developing animal traction in different parts of the country, and each of them believed they were the only animal traction project in that country. Each project was starting from the beginning in trying to identify suitable equipment, techniques and cropping systems, and, unaware of each other's existence, there was no possibility to build on each other's experience. Recently in one East African country, there was almost no liaison between the implement designers and producers on the one hand, and the extension workers and farmers on the other. As a result equipment was being developed and produced at considerable expense, and not adapted to the needs of the farmers. In this same country there was similar lack of liaison between

the research stations and the agricultural development projects. In one Southern African country a development worker spent four years designing and adapting a system of donkey carts and harnesses, and he eventually made the effort to contact a research worker from West Africa to discuss his problems and seek further information. However, it transpired that he had never considered looking to see whether there were more appropriate sources of information expertise within the country in which he was working.

While information exchange within countries is seldom ideal, communication and liaison between countries is extremely rare. Draft animal research workers in one country are generally completely unaware of similar research in neighboring countries. When technical problems occur, the historical and communications links with Europe, combined with language barriers and the organizational structures of bilateral and multilateral aid donors, mean that it is generally easier to seek advice from outside Africa than from colleagues who may be just a few kilometers away, across a political frontier. While there are some encouraging signs that more intra-Africa "network" contacts are being developed, in general there is still a tremendous duplication of research effort. In particular there is the failure to learn from other people's experience, simply because there is not the liaison that would allow profitable information exchange.

The vast majority of animal traction research, development and extension projects are supported by one or more multilateral, bilateral or NGO aid agencies. However there is very little technical liaison relating to animal traction either within or between these donor agencies. Most aid agencies are organized with departments administratively responsible for specific countries, or sub-regions, and funds are allocated to individual national programs in agreement with the government concerned. There is seldom an administrative structure that allows problems to be viewed and funds allocated on a regional basis with liaison benefits for more than one country. While it may be administratively possible to write intra-Africa liaison into the budgets of aid projects this is seldom done, although the practice of budgeting for consultants from outside the region is extremely common. There are very few donor agencies that have internal mechanisms whereby experience from a supported project in one part of Africa can benefit another project elsewhere on the continent. Thus one sees the very same mistakes being repeated in different projects supported by the same donor agencies, but in different countries. Frequently there is lack of liaison between different aid donor departments. For example, those specializing in crop production, animal production, agricultural engineering, rural transport, implement production and rural sociology may separately be involved in animal traction activities. Overall progress could be much faster if the aid agencies made more use of their own expertise and experience gained from many parts of Africa. Not only is there insufficient information dissemination within the donor agencies, there are very few channels of communication between the different donors, so that there is great duplication of effort and failure to learn from each other's experience. There are, however, a few examples of specific liaison between different donors. In one East African country, a forum has been established with government departments, non-government organizations and the major donor agencies which aims to help coordinate activities and share experience on specific development issues, such as animal traction.

A great deal of the research relating to animal traction is carried out in research stations, in conditions very different from those of the surrounding villages. On-station research can be important, particularly as a way to assess the technical feasibility of highly innovative ideas before risking introducing them to farmers. However, to be relevant, on-station research must be carried out in conjunction with on-farm studies involving the farmers themselves. Sadly, on-station research studies are often carried out in complete isolation, using systems of management totally different from those attainable by the small farmer. For example, in one research station in East Africa, animal traction research involves purebred Friesian animals, while throughout the country farmers actually use East African Zebu cattle about half the size of the Friesians. In another research station in East Africa, an attempt has been made to create model farms to simulate, on the station, the management conditions of the small farmers. However, the danger of such research became evident when research operations fell behind schedule and a tractor was used to plow the "ox-cultivated" farm. In several African countries pronouncements have been made about the suitability of exotic cattle, or even water buffalo, as a result of on-station research where management conditions, including the availability of feed and veterinary services, were totally different from the realities of the nearby villages. Similarly, many on-station feed trials have involved complex mixtures of feed supplements, which even if technically ideal would simply be unavailable or unaffordable in the surrounding villages.

A related and in many ways more serious problem is that most animal traction research concentrates on just one component of a complex system. Thus engineers concentrate on perfecting equipment designs; animal scientists emphasize the importance of the genotype; and nutritionists concentrate on problems of forage conservation and utilization. Such studies may be valid where discussions with farmers have indicated that some area of research is a limiting factor, and where the studies are carried out in close cooperation with the farmers. However, many cases could be cited where the "problems" are mainly in the minds of the researchers, and where technically excellent studies that are largely irrelevant have been performed in specific disciplines, as the object of the research was not a limiting factor. For example, in many countries research has been carried out on crossbred cattle in the mistaken assumption that animal size was the crucial factor. In many cases, what the farmers needed were highly adapted animals, that were easily bought and sold, that could survive on limited forage and that individually did not represent too much capital risk. In such circumstances, the adapted indigenous cattle were almost ideal, and any attempt to increase draft power through increases in size would have had deleterious consequences for these other characteristics. A similar example of component-oriented research comes from Southern Africa, where researchers looking at the problem of feed supply found that an annual legume could provide highly nutritious feed resources. However, only when they looked at the whole farming system was it apparent that the crucial limiting factor was available draft power for food crop production at the beginning of the rains. As the cultivation of the proposed legumes also required plowing at the start of the rains, the suggested solution, though technically very sound, actually exacerbated the situation at the most critical time. Throughout Africa there are examples of technically excellent implements

designed by agricultural engineers (and perhaps for agricultural engineers), that most farmers would immediately realize were inappropriate, being too weak, too heavy, too complex, insufficiently maneuverable, or far too expensive for the task involved. The engineers would not have made such costly errors had they been working closely with farmers and discussed how the implements would fit into the total farming systems.

In some countries animal traction research is being carried out by multi-disciplinary teams of agriculturalists in conjunction with farmers. However, even in such ideal circumstances, there is a danger that the research will be limited to the animal traction aspects of a complex social and economic environment. It must be recognized that animal traction is just one sub-component of the total farming system and draft animal research should not ignore other social or economic factors that can indirectly influence the technical success of animal traction. For example, in an East African country, local religious festivals severely restrict the number of days in which draft animals can be used. In one West African country it was found that farmers kept their animals enclosed for dangerously long periods because palm-wine tapping took priority, being economically more important for these farmers than crop production. More seriously, research may ignore the importance of women and children in the farming systems where animal traction is employed.

A further generalization relating to animal traction research in Africa is that results are insufficiently publicized. The few excellent case histories that have been produced show just how useful such studies can be in enabling research and extension workers to learn from the mistakes of others. However, few people are prepared to publicize what may be seen as failures, and few governments or donors wish evaluations of disappointing projects to be made public. There is also a danger that misinformation may be published. For example, there are reports in the literature of apparently highly successful experiences with wheeled toolbars in Southern and Western Africa. Such reports become quoted by others and so enter the mythology of animal traction research. The fact that not long after the initial euphoric reports the toolbars proved costly failures was not reported by the original authors, and the project evaluations have had limited circulation. There are many other examples of animal traction workers in many different disciplines, rushing into print after early success, and seldom has it been stressed that their work has yet to stand the test of sustained farmer adoption.

Finally, there is the problem that animal traction research workers are often unaware of valuable publications in their field, and they often do not know how to obtain the information that is available. While works on animal traction are limited, there are some excellent research reports and case studies which are often obtainable free-of-charge. Nevertheless a large number of research workers in Africa have never come across some of the most useful references. While the situation is improving with the production of animal traction bibliographies and information bulletins, there is urgent need for much greater information dissemination by those individuals and organizations who write or publish work relating to draft animal power.

EPILOGUE - SOME UNANSWERED QUESTIONS

The foregoing has included some very broad generalizations based on observations and reports from many countries. However, in view of the enormous diversity of agricultural, ecological, social, economic and political systems, and very different research and extension structures, one must question whether such generalizations are actually valid.

A further question concerns whether the farmer or the research and extension workers really know what is best for the farmer. At one extreme there are research and extension workers who regard farmers as uninformed, simple and reluctant to change. At the other extreme there are those who argue that the farmer is constantly assessing innovations, but seldom adopts them since the traditional farming system has evolved to become almost perfectly adapted to the prevailing conditions. There are many documented cases where it has been clear that the research and extension workers did not know best. In the examples cited of the research/extension workers who tried to impose wheeled tool carriers on farmers in Southern and Western Africa, the farmers quickly returned to their more conventional implements, and the research workers started asking questions rather than giving answers. However many questions are still to be answered.

In Southern Africa, farmers habitually used large teams of 6 to 12 oxen, and have done so for decades. Elsewhere in Africa oxen are generally used in pairs, so certain research workers feel that in Southern Africa it also would be more efficient to use fewer animals and smaller implements. This would imply the time-honored system is relatively inefficient and illogical but it has yet to be proven whether the research worker or the farmer knows best in this case. In one highly publicized research study, a genuine farmer quotation was used to the effect that the farmer's ancestors could not have believed it possible to plow with a single ox. If this is the case, and if the single ox technology is proved by the farmer adoption, it would seem a classic example of how a simple research program can in just two years, come up with an innovation that could revolutionize a farming system. However, it could also be that generations of farmers have preferred to use two oxen, rather than one, for some very good and logical reasons. Only time and sustained farmer adoption will demonstrate whether the innovation is fully adapted to the farming system.

A further example of the dilemma of research workers comes from a West African country where cattle are taken to a crop field specifically to allow their dung to be collected. However, prior to plowing the dung is burned on the field and only the ashes are plowed in. The first reaction of an agricultural research worker might be that this is highly irrational behavior (and this indeed might be the case) but it might be that there is some undefined and very logical reason for burning the dung. Finally the same questioning approach must be applied to farmers not using animal traction. Do they not use it because they are unaware of its potential, or is it because they have actually made an informed and logical judgement? Despite the well-meaning aspirations of animal traction projects, have these farmers decided that animal traction is not appropriate to their social, economic and farming system?

Perhaps the most important question is why do only about 10 percent of

the farmers in Africa use animal traction? Is it lack of knowledge, lack of extension, lack of money, lack of equipment or lack of feed resources? Is it related to problems of health, husbandry or social traditions? Is it related to the intensity of population and farming, or is it simply that using animal traction is seldom profitable? Given that historically animal traction spread through Asia, North Africa, Europe and the Americas without the "benefit" of agricultural development projects or significant government intervention, is the current emphasis on public sector promotion really necessary or desirable?

Is lack of technical knowledge and understanding a constraint? If research is not a limiting factor, is further research really justified? Presumably some research workers will argue that studies need to be undertaken simply to identify whether or not research is indeed a limiting factor.

Finally, if it is decided that further animal traction research is necessary and desirable and that it should be carried out on a farming systems basis with local farmers, there are still some important questions. What impact is the research really likely to have by, say, the year 2000 on both the total level of utilization of animal traction in Africa and on the efficiency of draft animal usage within individual farming systems? Are the potential benefits sufficient to justify the research, and if so what can be done to maximize the impact of the research findings?

This presentation has included some broad historical and geographical generalizations and then questioned whether such generalizations are appropriate. It has included some overstatements concerning the present status of draft animal research and questioned whether such research is necessary or desirable. One could go on to question whether such background perspectives and questions have themselves been justified; the answer to this will depend on the extent to which they have served to provoke further discussion of the issues raised.