

Research and Development of Draught Animal Power Utilisation in West Africa

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Abstract

Research and development of draught animal power is relevant in areas with an already high concentration of large animals such as cattle, horses, donkeys and camels and where farmers are familiar with their management. Introduction of animal traction depends upon a thorough study and understanding of the animal husbandry, farming systems and pedi-climatic conditions for the development of appropriate animal drawn equipment. Regional co-operation in research and development into animal power utilisation is desirable for exchange of ideas and information, but it must be done in the context of total approach to mechanisation studies involving manual, animal and mechanical power utilisation for agricultural development in West Africa.

Introduction

Research and development into draught animal power (DAP) utilisation in West Africa has generated passionate arguments among mechanisation technologists and other experts. A few engineers, mechanisation technologists and practically all manufactures of animal-drawn equipment strongly believe that DAP is the solution to African mechanisation problems. However, a majority of such engineers and technologists believe that promotion of DAP is a deliberate attempt to keep African nations perpetually under-developed and dependent on developed countries for economic survival. Both those experts who are for and against the research and development (R&D) into DAP have not specifically addressed the question as to where and who should use draught animals for agricultural production and processing operations.

The purpose of the following paper is to present the right approach to where DAP should be applied and who should apply it. It suggests ways to develop appropriate tools and equipment to maximise available animal muscle energy. To do this, the views of those who are for and against research and development into animal power utilization are presented and analysed and suggestions made on the right approach to the methodology, to promote regional co-operation in the development and utilization of animal power and other power sources. Any attempt to introduce new technology into a

farming system must have as guiding principles: availability, adaptability, reliability, affordability, acceptability and sustainability. The introduction of 'Mixed Farming System' into Nigeria by the British colonial administrators will be used to illustrate this guiding principle.

Views for and Against Research and Development of Animal Draught Power Utilisation

Those experts who support research and development of animal power systems have the following salient points to make:

- Animals have more power than man for timely and efficient farm operations.
- Animals cost less than tractors.
- Animals are easier to maintain and feed on crop residue.
- Animals are available and dependable.
- Animals have a high resale value.

Those experts who oppose research and development of animal power systems make the following points:

- Use of animals as source of power for farm tasks should be regarded as another form of animal slavery and should be banned by the government.

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- Research and development into animal power utilisation is holding back scientific and technological development.
- Animal power does not reduce human effort appreciably.
- Draught animals require extra production of food and require grazing land.
- Death rate can be high due to poor health management.

Right Approach to the Promotion of Animal Power Utilisation Through Research and Development

Research and development essentially involves investigating problems by adopting scientific methodology to find solutions. But research and development must take account of the social and economic environment to be successful. When considering the African farmer, his very self and his environment must be thoroughly studied and understood before seeking to find solutions to his agricultural production problems. The successful introduction of oxen in Nigeria by the British illustrates the need for knowledge of the farmer, his environment and his culture, to effectively and successfully research, develop and introduce a new farming technology. The colonial experience will also suggest procedures on how to effect the adoption of the new technology. The failure of optimum utilization of draught animals in Nigeria's farming systems stems from the researchers' inability to start from where a farmer is and what he thinks he needs, not what we (the experts) think the farmer needs.

Objectives

The objective for the introduction of oxenisation was to enable the Nigerian native farmers to produce cash crops, namely groundnuts and cotton, in sufficient quantities to meet the British agro-industrial requirement by cultivating more land and increasing productivity per land unit. A second objective was to improve the diet and income of the peasant farmer.

Constraints

When the British studied the production techniques more closely the following facts were revealed:

There were two distinct seasons - wet and dry - in a year. Erratic rainfall distribution at the

beginning and end of rainfall many times necessitated replanting several times before crops were established. This often resulted in crop failure at the end of the rainy season when rainfall suddenly ceased before the crops were mature.

The vegetation was savanna. The major food crops were sorghum, millet and some cowpeas. The major cash crops were groundnuts and cotton. Cattle, goats and sheep were used for income purposes. Horses, donkeys and camels were kept as beasts of burden.

All tribes but one practised mixed cropping on ridged and flat cultivation. Shifting cultivation was also practised. Only one tribe, the nomadic Fulanis, kept cattle.

The introduction of price incentives for the two crops resulted in farmers abandoning food crop production for cash crop production which resulted in famine the following harvesting season.

Due to population increase, the fallow periods observed by the shifting cultivators became shorter, having a detrimental effect on the soil fertility. Overgrazing and cattle footpaths led to soil degradation and desert encroachment. The diet was mainly starch and lacked protein and other essential nutrients for healthy growth. Crops were genetically low yielding and cattle took 6 to 8 years to mature and produced very little milk.

Solutions

A new farming system was thought necessary, to change shifting cultivation practices and the pastoral life of the cattle rearers and to improve diets with egg, milk and meat from livestock, and to increase income through higher production. Therefore, a mixed farming system was introduced which aimed at mixing the animal husbandry of the nomadic Fulani with the cultivation of the soil by the Hausa peasants at a permanent settlement. The system required the farmer to feed his livestock with crop residue from the farm and if need be, grow the supplementary pasture so that he did not resort to what the British policy statement regarded as, 'trespassing in other people's land in search for food' and raise his standard of living by increasing the productivity of his labour. Furthermore, research stations were established at Samaru and Shika, near Zaria, in order to improve the germplasm of crops for higher yields and animal breeds for early maturing and higher milk production, respectively.

To Be or not to Be

Perhaps the major area of conflict between those who support or oppose DAP utilization lies in the fact that both sides have not grasped who is to

manage draught animals, and where and what type of cropping system to use to apply animal power efficiently for profitable agricultural production. Innovations, thought to be superior to traditional farming techniques, must be introduced only when they can be proved to lead directly or indirectly to improvement of the farmers' welfare.

Consideration of Crop and Cropping System

Experience has shown that due to crop vegetative growth most grain crops are amenable to draught animal manurability as their production operations are also timebound. Tuber crops have unique vegetative growth and cultural requirements which are not easily amenable to animal mechanisation. Furthermore, both in the grain and tuber crops regions farmers practise mixed cropping which incidentally is highest in Nigeria. In this respect land preparation is perhaps, the only common operation but the subsequent operations, such as planting, weeding and harvesting, whether with animal or tractor power systems, are not easily practicable. This factor was responsible for the inability of the British colonial experts to introduce animal-drawn equipment for these operations, succeeding only in land preparation, hence the successful introduction of the Ercot ridger for ridging. Whereas in the root crop regions mounds and large ridges are made, in the grain regions flat and normal ridge cultivation are easily made. Therefore, animal mechanisation in the areas of grain crops and practising flat and ridge cultivation is more efficient and profitable.

Management Consideration of Draught Animals

Animal Maintenance

Unlike tractors which consume fuels only when they are working, draught animals must eat to survive whether they work or not. Experience in Samaru research station has shown that draught oxen need extra feeding during the farming season. When not being used for experiments, the pair of workbulls at the Department of Agricultural Engineering of IAR were being fed with 2kg of maize/sorghum and 1kg of cotton seed/groundnut cake from January to May - 5 days a week and the ration was doubled daily during the months of farm work. Hay comprising groundnut haulm and grass was maintained in their stable daily, water supply and licking salt were provided at all times. Veterinary care consisted of vaccinations, tick bath which was maintained

weekly in the rainy season and very seldom in the dry season.

Economic Benefits of Draught Animals

Apart from alleviating human drudgery especially in tillage work, support for research and development of efficient animal drawn equipment will lead to strengthening the farm economy, full employment of the rural labour force and creation of capital which is necessary for larger investment in more advanced and efficient technologies for higher productivity. More work is needed in planting, weeding and spraying equipment to utilize to the full animal power in the peasant farming systems in West Africa.

Selection of Draught Animals

As might be expected, farmers make use of locally available cattle breeds which is to be encouraged. Thus in Sokoto-Gusau- Birnin Kebbi- Kaura Namoda areas they use Sokoto Gudali and some white Fulani breeds. The Sokoto Gudali is the largest body breed in the country and can weigh over 500Kg. Much of Funtua-Katsina- Zaria-Kano areas make use of white Fulani (Bunaji) which have a body weight from 300 to 500kg. The Gombe-Potiskum-Maiduguri-Mubi areas make use of Bororo (Zebu) breeds weighing from 300 to 400kg. The Shuwa cattle breed around Lake Chad have the largest horns and together with their body frame look deceptively big but are not larger than the White Fulani. The draught performance of Shuwa cattle is not known. Again there is no experimental data to give a comparative performance of different breeds in Nigeria but we could deduce from widespread use that White Fulani breeds are the most acceptable breeds for draught work because of their good temperament.

The Place of Animal Draught Power in West Africa - Now and in the Future

Animal power utilization should not be regarded as a transition or the so-called intermediate technology between hand-tool technology and mechanical power-technology. It must be stressed that the mechanisation drive in Nigeria in particular and in West Africa in general, has not and may never have a definite path from manual to mechanical (tractor) power systems. Due to differences in crops, cropping techniques, soil and topography, socio-economic considerations, level of literacy, culture and habits, farm size and climatic conditions (especially rainfall distribution), manual, animal and tractor power systems will continue to have

relevance and place of application in tropical farming systems. Technologies in general whether manual, animal or tractor power system, are place-and time-specific for efficient application. Hence, relevance to conditions and situations in systems application better describe efficient and effective application of any of the three power systems.

Many authors would like to portray animal mechanisation as an intermediate stage between manual and tractor mechanisation. This interpretation has always created a negative attitude among agricultural mechanisation technologists towards a serious research and development to evolve adaptable animal, manual and tractor tools, equipment and techniques for efficient application in the environments and conditions where they are most suitable for application. Mechanisation drive is a dynamic process and always strives for

improvement so that what is appropriate and economical today may not be appropriate and economical tomorrow.

Conclusion

The promotion of animal traction power in west Africa sub-region will depend upon the thorough knowledge of specific needs of local farmers and their farming systems, the pedi-climatic conditions and need for local manufacture. Research and development are indispensable for the evolution of efficient, and techniques for manual, animal and mechanical power systems. Regional co-operation is highly desirable to promote research and development, dissemination of information and exchange of ideas on broad mechanisation coverage.

Résumé

La mise en place de programmes de recherche et de développement centrés sur l'utilisation de l'énergie animale doit s'effectuer dans des régions qui abritent déjà un grand nombre d'animaux (bovins, chevaux, ânes, chameaux) et où les paysans maîtrisent la conduite des troupeaux. L'introduction de la traction animale doit s'appuyer sur une étude approfondie et une bonne connaissance de la gestion de l'élevage, des systèmes de production et des conditions pédoclimatiques qui influent sur la mise au point de matériel approprié de traction animale. La coopération régionale est souhaitable en vue de l'échange d'idées et d'informations; elle doit cependant s'inscrire dans le cadre d'études globales de la mécanisation portant sur l'utilisation de l'énergie manuelle, animale et mécanique en vue du développement agricole de l'Afrique de l'Ouest.