



COMISSÃO EUROPEIA



ANIMAL TRACTION IN MOZAMBIQUE

A PROMISING TECHNOLOGY FOR SMALL-SCALE FARMERS

PROCEEDINGS OF THE NATIONAL SEMINAR WHICH TOOK PLACE
AT THE AGRICULTURAL INSTITUTE IN CHIMOIO (IAC)

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Cristiano Taimo
Casimiro Abreu**

INTRODUCTION

His Excellency the Governor of Manica Province; speech at Animal Traction Seminar

The speech was read by **Eng. Happy Joaquim of DINAP** (Livestock National Directorate) in representation of his Excellency The Provincial Governor **Eng. Felício Zacarias**.

Esteemed colleagues

The Provincial Director of Agriculture and Rural Development,
The Representatives of Zambia, Malawi and Zimbabwe
The Representatives of National and International Organisations
The Director of IAC (Chimoio Agricultural Institute)
Participants and Invited Guests.
Ladies and Gentlemen

In the tropical and sub-tropical regions, animal traction and human beings provide 80% of agricultural power in the small-scale (family) sector. It is thus not a surprise that animal traction has a considerable impact on agricultural production in Sub-Saharan Africa.

Agriculture is the base of the economy in our country. More than 80% of the population live in the rural areas. In 1996, according to the National Agricultural Survey of the Ministry of Agriculture, 2,570,528 household families with an average of 5,36 persons each (13,778,030 persons) were cultivating a total of 4,696,000 hectares producing different crops, mainly cereals for their subsistence. We acknowledge with merit that this class of agricultural producers have contributed greatly to the availability of basic foods. But at the same time we acknowledge that this cultivated area represents only about 20% of the available cultivable area (estimated at 24 million hectares).

We have the capacity to produce much more. Two of the main constraints are the shortage of labour to cultivate the land and the shortage of rural transport for crops harvest and commercialisation. This scenario exposes the country to a permanent risk of food insecurity and hunger, a situation which necessitates the mass mobilisation of scarce resources to offset calamity.

An appropriate way to alleviate the shortage of labour and transport in the family sector is the promotion of AT. The potential of AT within the Rural Development Programme was recognised soon after the independence. In 1979, the Government introduced the first animal traction programme at national and provincial level. Due to the civil war, this programme was discontinued and its dynamism never reappeared. At the same time, in the neighbouring countries (e.g. Zimbabwe, Malawi, Zambia), animal traction promotional programmes initiated in 1970s and 80s are resulting today in greater use of AT in agriculture than here in Mozambique.

Mozambique has an excellent potential for AT development. We have about 36 million hectares of cultivable land in our country of around 12 million hectares are of natural pastures which the potential of supporting at least 1,5 million Tropical Animal Units (TAU).

After a long period of decline the cattle population is finally growing and there are an estimated 50.000 pairs of oxen available for animal traction in the country.

The existence of Kanes Engineering Company in Maputo, which produce agricultural and animal traction implements, and many other small-scale, informal sector workshops which produce and repair carts and ploughs constitute an impulse for animal traction.

The neighbouring Zimbabwe, Malawi, Zambia and South-Africa have active network in the promotion of animal traction comprised of people from Ministries, Universities, Research Centres, Private Companies, etc. These networks actively promote AT, influencing policies in favour of AT development. Mozambique need such networks and can with the aid of specialists can learn from the experiences of the neighbouring countries in order to benefit our country

Therefore , the promotion of animal traction within the family sector is a viable alternative and will be even more viable and sustainable when it is accompanied by a system able to absorb the agricultural surpluses generated from the adoption of AT.

We acknowledge that AT is not the only technology which helps guarantee food security and alleviate poverty. But, before we arrive at the tractor, it seems like a more viable intermediate and sustainable technology for Mozambique.

I wish all participants of this Workshop a successful discussion and please feel at home.

Muito obrigado!

PART 1: COUNTRY PAPERS

ANIMAL TRACTION AND ITS ROLE IN THE DEVELOPMENT OF AGRICULTURAL SECTOR

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- B. Historical Background of Animal Traction in Moçambique.
- C. Present situation of Animal Traction in the Country - some problems.
- D. Ideas and proposals for the progress of Animal Traction.

A. HISTORICAL SUMMARY OF THE USE OF ANIMAL DRAFT POWER IN THE WORLD

- 1 ***Agriculture*** - oxen, donkeys and water buffalo.
- 2 ***Transport*** - passengers and cargo transport (carts and coaches)
 - Temperate zones - oxen, horses, donkeys
 - Artic zones - dogs and reindeer
 - In Asia - cattle, buffalo, camels, donkeys, elephants
- 3 ***Armed Forces***
 - cavalry
 - transport of war equipment
- 4 ***Industry:***
 - grinding mills
 - water capture systems
 - ceramic production
- 5 ***Leisure***
 - horse riding, racing, competitions etc

B. Historical background of Animal Traction in Moçambique

1 Before independence (before June 1975)

Migratory movement to South Africa and to the Federation of Rhodesia

Use of animal traction:

In agriculture - oxen and donkeys pairs plus a plough

In transport - oxen and donkeys pairs plus a cart or sledge

Rural transport

Urban transport

First experience with draught wild life species in Panda, Inhambane province

Animal traction in Provinces and Districts

Most used in:

South Provinces - Maputo, Gaza and Inhambane

Central Provinces - Tete, Manica and Sofala

Animal traction equipment:

Imported from RSA, Portugal and Rhodesia

National production since 1960s

2 After independence (from 1975 to 1980)

Development strategy based on agriculture

Social and economical directives and resolutions of policy on animal traction.

Animal Traction National Programme

* Animal Traction Commission

* AT National Centre in Umbeluzi

* AT Provincial Centres

* Local Centres for AT within the Livestock Government Companies.

* AT in agricultural cooperatives

* AT Centres at:

- Livestock Breeding Centres

- Livestock Research Centres

- Faculty of Veterinary - University of EM, Moçambique

* Equipment - importation of AT tropical-cultivators

* Courses and Training

* Industry - AGRO-ALFA

3 From 1980

- Emergence of Agro-Industrial Complexes, big projects and agricultural mechanization:

- CAIL - Chókwè
- CAIA- Angónia
- 400.000 hectares with Romenia
- 200.000 hectares with GDR
- SERLI
- Management Units - UDA, UDC, etc.

Reduction of cattle population (civil war) and its effects on AT

4 From 1988

The seminar of ACCAR in Maputo on Animal Traction (1991)

In 1991 the re-constitution of AT work group, involving interested Governmental Institutions and coordinated by DINA (National Department of Agriculture)

Seminar on AT held at INIA (National Institute of Agricultural Research) and dynamization of Animal Traction Group (1995).

C. PRESENT SITUATION OF ANIMAL TRACTION IN THE COUNTRY

1 Current problems

- Draft power reduced in Agriculture
- Shortage of cattle and donkeys for draft power
- Lack of animal traction equipment, high costs and poor distribution network throughout the priority districts
- Low buying power of producers
- Poor publicity of AT technology by agricultural extension networks and other intervenients
- Lack of animal traction management board
- Lack of inter-institutional and inter-sectorial co-ordination
- Lack of animal traction development strategy

D. IDEAS AND PROPOSALS FOR THE PROGRESS OF AT

1. To define within the Ministry of Agriculture and Rural Development level, the Department responsible for AT.
2. To create a Technical Committee for AT involving different Private and Public Departments.
3. To promote inter-institutional and inter-sectorial co-ordination for affairs connected to Animal Traction.

4. To define Animal Traction development strategy.
5. To strengthen agricultural extension networks capacity in AT materials.
6. To promote with the competition of private sector, draft animals production, distribution and selling (cattle and donkeys).
7. To dynamize industrial production of AT equipment for different crops operations and incentivate the amplification selling networks within the priority districts.
8. To establish an incentive scheme for the family producers who use animal traction in agriculture and transport.
9. To promote the involvement of donors and NGOs within AT programmes.
10. To include AT material within the agricultural education programmes at all levels.
11. To dynamize creation of Centres or Nucleus for AT at Zootechnic Centres, Livestock Research Centres, Faculty and Institutes of Agriculture, Research Institutes and others.
12. Promote research within the animal traction area.
13. To establish connection and co-operation with institutions and specialists of the region and of other countries which deal with AT issues.

ASPECTS OF ANIMAL TRACTION USE IN MOZAMBIQUE

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INTRODUCTION:

Animal traction and human beings provide an estimated 80% of the energy used in small-scale agriculture in tropical and sub-tropical regions. Thus, it is not surprising that animal traction has a considerable impact on agricultural production in Sub-Saharan Africa. The use of animal power in small scale farming sector in Sub-Saharan Africa is increasing mainly where disease control measures are adequate to keep cattle populations increasing.

Although animal traction has a long history in many African countries, there are few references of the use of animal traction in Mozambique, and, as in many other countries of Africa, this topic has been neglected and is not included in educational curriculum. There is a serious lack of knowledge in those who are responsible for making decisions, extending technologies, training and education. Other countries consider continuously the activities of animal traction, and since the 1980s, the national programmes and international organisations are providing funds for animal power research, development and extension. In 1990 the Eastern and Southern Africa Animal Traction Network (ETNESA) was formed in order to unite animal traction specialists within the region. Other, national networks exist, for example in South Africa, Zambia and Kenya. There is also a small group of people in Mozambique who, as a result of a AT meeting held in 1995 in Maputo, banded together to collect and disseminate AT information.

It is known that animal traction was the main source of mechanised energy for agricultural family sector of the southern part of Mozambique, and it is estimated that there were around 1.400.000 head of cattle up to the year 1973, of which many cattle belonged to the small-scale farmer.

The traditional cattle keeping areas are the southern and central parts of the country. These are also the areas where AT is most widely practised. However, there are areas which although they breed cattle, they do not widely use AT (many central areas). This may be related to the plans for the development of cattle farming in the colonial era where some traditional chiefs received cattle to cement relationships/linkages with the Government. Ownership of cattle represented status and position. Generally these leaders had the power to recruit human labour to work their fields

ANIMAL TRACTION TODAY

Animal's used and geographical distribution: Cattle continue to be a more used species for animal traction in Mozambique. Even in areas where donkeys are bred, these are only used for

transport and oxen do agricultural operations. The animal population used for the animal traction is shown in table 1 below.

Table 1 Population of draught animals - 1974 to 1998 (DINAP, 1998)

YEAR	EXISTING DRAUGHT OXEN
1974	130.000
1996	22.000
1998	42.007

DISTRIBUTION OF CATTLE POPULATION BY AREAS

The distribution of cattle by zones is 51,1% in the southern area, 44,1% in the central area and only 4.8% in the northern area. This distribution tendency has changed since 1980 with a higher proportion of cattle currently in the central zone and a greatly reduced number in the south. Partly this is because many of the southern cattle were the property of big Companies which have since disappeared, while the major owner of cattle in the central area, mainly in Tete province, are kept by small-scale farmers (family sector).

Table 2 Distribution of draught animals by zone - 1980 to 1998

	1980	1990	1998
North	53.677	20.705	20.996
Centre	354.940	105.511	191.363
South	929.549	213.701	228.374
Total	1.340.146	341.709	440.703

Table 3 Estimates of cattle popn. and their use for AT (Nhantumbo and Toro, 1994)

Province	No.of farmers & (x000)	Farmers with cattle	Cattle popn.	No. of animals	Farmers who own/use cattle	No. of animals	
Niassa	139	1.800	11.700				
C. Delgado	264					1.300	1.300
Nampula	485	1.300	1.300				
Zambézia	573						
Tete	174	8.600	58.000	1.400	5.000	385	1.400
Manica	103	11.000	70.000	9.400	30.800		
Sofala	178	10.200	42.000	2.100	4.300		
Inhambane	274	20.600	43.000	17.000	37.200	4.800	6.900
Gaza	181	43.700	229.000	29.200	85.000	3.300	4.900
Maputo	95	3.700	13.000	2.200	6.000	900	1.100
Total	2.465	100.900	470.000	61.700	168.200	10.700	15.700

Agricultural activities which employ AT (Animal Traction)

The majority of farmers in the family sector of about 2.464.000 use human force for field preparation, 8% use animal traction (their own, hired or borrowed), 5% use hired tractors and 2% of the farmers both own and use AT. (Toro and Nhantumbo - 1994).

Almost all oxen owners and users have either a plough, a cart or both. Ploughing and transport are the major activities in which AT is employed. Some farmers use the plough for weeding and others own a weeder, a few use a ridger, very few persons use a planter, cultivator etc.

HARNESS

Traditional wooden 2 neck yokes. Close to the country border with our numerous neighbours, the farmers benefit from the improvements done in the neighbouring countries and in other projects they do train farmers to improve their harnesses.

TRAINING METHODS

Given the nature of cattle keeping, in which the animal are always close to humans, the animal is taught from birth to obey orders and to pull weights. Few farmers are familiar with other types of training. The animals are not well trained and they are not able to perform correctly many operations of the field.

ANIMAL TRACTION TRAINING AND PROMOTIONAL ACTIONS

Government paper: As already mentioned, there is not a programme or specific policies defined for the development of animal traction in Mozambique. The Ministry of Agriculture defines animal traction as a rural technology fitting within the "extension" area. However, in the agricultural extension area, at national level, AT is not included. In DINAP (Livestock National Directorate) the new livestock strategy within PROAGRI (National Programme for Agrarian Development 5 Year Plan, in the brief section on animal traction priorities, only refer:

- a) to identify sources for draught animals;
- b) to develop extension packages for draught animal feeding.

There are some isolated actions in the educational component and research in animal traction in Mozambique. The Veterinary Faculty has an animal traction section and has some trained oxen and some donkeys with their respective implements. The faculty of Agronomy included recently in the Agricultural Engineering courses the component of animal traction in co-ordination with the University of Sweden and are carrying out different trials with several implements in three districts in the provinces of Gaza and Maputo (Chokwe, Boane and Matutuine) in which ploughs, weeders and planters are being tested. The Institute of Animal Production carried out some studies in this area of the south zone. The Agricultural Institute of Boane has a component of animal traction in the subject of mechanisation of agriculture and does practical works at the school farm. IAC (Agricultural Institute of Chimoio) has this component since from 1995 but is just a curriculum topic.

The role of NGOs: In almost each province of country, a NGO tried to introduce or to promote animal traction. Once there is no a defined national policy, each NGO or the respective donor agent simply define their own policies accordingly. I hope that the provincial representatives in this seminar have some experiences on animal traction, which you would like to share with other participants. The time did not allow collecting some details of animal traction programme existing throughout the country. It is known that there is effort by the side of different entities (VETAID for example) in combining livestock restocking with the promotion of animal traction.

What limits the development of animal traction?

Animal traction is a technology suited to the small-scale farmer. In the other hand, in many traditionally agricultural areas, the small-scale farmer does not own animals either by lack of habit or lack of possibilities to acquire a pair of oxen. Despite the lack of success with tractorization, the option for this accessible and sustainable technology has not been recognised by the agricultural policy makers; there's no investment being made in either human or material resources in this area. The isolated actions of NGOs do not have a follow-up and a lot of animals end up at the butcher after the end of the programmes.

- Misunderstanding on the part of agricultural technicians at all levels concerning the use of animal traction, which is considering an out dated technology.
- High cost of acquisition of animals and implements.
- Limited animal health coverage.
- Non-existence or insufficient extension services.

Is there a future for animal traction in Mozambique?

Mozambique has an excellent potential for the development of animal traction. It is estimated that there is about 36 million cultivable hectares in Mozambique being about 12 million hectares of natural grazing with the potential to support at least 1.5 million units of tropical animals (UTA) (1unit = 250kgs of live weight). Using the crop residues, the numbers can rise to 2.000.000 UTA. (DINAP).

The cattle population enrolled in the country was 1.339.917.heads in 1980 (DINAP, 1997). The war reduced this population to 339.917 in 1990. The population has been rising from 1990 and in 1998 were enrolled 440.590 heads of cattle (DINAP, 1998).

NECESSARY ACTIONS

Mozambique is a country with a great cultural, socio-economic and climatic diversity. Animal traction use differs according to region. Although some general factors are known such as Tsetse fly, ticks, pasture and others, which limit the livestock development in Mozambique it is important to determine other factors which cause unequal distribution of cattle and consequently the use of animal traction. There are experiences of areas, which refused restocking animals even free, due to superstitious fear linked to witchcraft! Not much is known of the 'national picture' A

multi-disciplinary study is very necessary for a successful programme in the promotion of animal traction.

One must not think about AT as just an agricultural technology. AT is a multi-disciplinary issue. It includes all aspects of community development. A grassroots inquiry about the use of AT in Mozambique should include multi-disciplinary teams to determine some specific actions for each region, province, district, etc.

Concerning implements: Instead of just copying existing patterns, it is necessary to adapt implements according to the existing livestock in each area. Some situations are well known in which implements are too heavy for the type of animal used and in which some animals died when they were forced to pull very heavy ploughs. Many farmers in Tete, simply remove the plough regulation device because they think it is really complicated and therefore the plough digs too deeply and is difficult to pull.

A permanent link with the neighbouring countries with similar characteristics (as ours) and have programmes established in this area, can help us transferring their experiences to be practised by us. For example, in South Africa, although the movement of AT is recent, it has already given some meaningful steps. The University of Pretoria, The Centre of Animal Traction of the University of Fort Hare and the Veterinary Tropical Medicine Centre of the University of Edinburgh, Scotland offers post-graduation courses in AT for the region countries since 1998. The University of Fort Hare offers a Certificate in AT in two years of training. There are national programmes on animal traction in Zambia, Zimbabwe, Tanzania, Namibia, Ghana as well as Animal Traction Networks in many countries of the region. Therefore; we have many sources from which to learn.

A pressure group is necessary which can influence policy makers in AT development. A small AT network group was formed in 1995 but has not been effective yet. It should have defined and consolidated specific actions in AT development.

Agricultural Colleges such as IAC, IAB, and Agricultural Schools in the provinces should have AT Centres with enough equipment to disseminate and teach this technology.

The UEM, should play a major role not only in the investigation but also on dissemination. It is often easier to have access to the results of studies carried out in neighbouring country (conferences and seminars) than here in Mozambique. It is necessary to accompany the development of AT throughout the world. For example, It should be interesting in many countries; many commercial farmers are giving powers to the use of animals combined with tractors. Many are unanimous that they reduced in millions of dollars the cost of their operations.

(For further information, see the agricultural magazine Agrarian, no. 17, pp4-6, article by Andrew Mattick, "Animal Traction, An Under-utilised Technology", IAC, Chimoio, Mozambique)

ANIMAL TRACTION IN ZIMBABWE

By

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1. INTRODUCTION

Zimbabwe is an agrarian country whose 83,38 % of its 39 million-hectare total land area is used for agricultural purposes while the rest of the land is reserved for national parks and wild life and urban settlements (Zimbabwe Agricultural Policy Framework; 1995-2020). The bulk of agricultural land is shared among about 1 million communal farmers and about 4 000 large-scale commercial farmers who occupy 50,8 % and 33,4 % respectively. The rest is shared among about 60 000 resettlement farmers, 10 000 small-scale commercial farmers and the state who use 10, %, 4.3 % and 1,3 % respectively.

Like other countries in the region, the country's agriculture depends on human muscle power, draught animal power and mechanical power. In terms of total cultivated land, human muscle power contributes 15 % while animal draught power and mechanical power contribute 35% and 55 % each respectively (Comsec, 1992 and Ellis-Jones, 1997). However, these statistics understate the true importance and dominance of draught animal power, which is used by over 70 % of the total farming population in the country. Mechanical power, particularly tractor power, is used by only a small fraction of the community as revealed by the farmer to tractor ratio which is roughly 4 is to 1 for the large-scale commercial farmer households, 1 000 is to 1 for the communal and resettlement farmer households and 2 is to 1 for the small scale commercial farmer households. Although the ratio of tractor to small scale farmer household is 2 is to 1, the majority of these tractors is in poor state of repair since they are purchased after they have reached or exceeded their useful economic life. Draught animal power therefore, remains their most reliable power source. Considering that the large-scale commercial farming sector comprises less than 1 % of the total farmers in the country, draught animal power plays a far more significant role than tractor power among the majority of farmers. Although it is generally agreed that tractor power would be the appropriate alternative source for the majority of communal and resettlement-farming sector, the situation is likely to remain so due to a number of reasons.

The majority of communal and resettlement farmers in Zimbabwe have average cultivated land sizes of 3 hectares per household, which are usually subdivided into small parcels of less than 0,5 hectares for each crop. This renders individual tractor ownership uneconomic since one needs about 40 hectares of well-cropped arable land to support the costs of a 20 kW tractor, the minimum power at which a tractor is considered technically feasible (Carruthers and Rodrigues, 1992). The very nature of farm size therefore, presents economic question both in terms of tractor units and return to farmer (Ndoro, 1989). In terms of communal farmer context, the tractor is a prime example of high cost, high input, high management, resource wasteful technology that is totally inappropriate to the situation and long term match for the wholly appropriate ox (Elwell,

1991). Even though tractor tillage unit hiring services have been introduced in some parts of the country, they are 100 % more costly than draught animal tillage units, hence, the tractor is likely to remain a secondary option for the majority of farmers.

2. THE EVOLUTION AND DEVELOPMENT OF MECHANIZATION AND ANIMAL TRACTION IN ZIMBABWE

The natural evolution of mechanisation in Zimbabwe was from planting stick, through tree trunk surface scratching, which could hardly be equated to ploughing, to simple ox drawn steel ploughs, to small power units and then more rapid evolution to large community farms with more sophisticated machinery (Sampson, 1975 and Mbanje, 1998). To the majority of farmers however, the more rapid evolution to more sophisticated machinery such as tractor drawn equipment is yet to be realised due to small land holdings and poor resource base. They have to continue relying on animals.

Animals have always been a part and parcel of a typical Zimbabwean farmer household. Up to the early 1900s the use of animals, particularly cattle, was limited to transport, meat, milk and payment of lobola. They were and are still a symbol of wealth, hence, some people often kept excess number of cattle for no good reason other than prestige. The use of donkeys was specifically for transport purposes since they are not eaten in Zimbabwe. Because they are not eaten and their use was limited to transport, the majority of farmers always did and still does prefer cattle to donkeys. For this reason, cattle population has always remained higher than that of donkeys although the majority of the population is aware of the hardworking nature of a donkey as indicated in the saying “I work hard like a donkey”. Some people looked down upon a donkey to the extent that even up to now, there is a chief who would expel any of his subjects for owning a donkey.

The introduction and wide promotion of the single furrow ox drawn mouldboard steel plough in the mid-1920s (Oliver and Norton, 1988), marked the beginning of the development and promotion of most of the steel animal drawn tillage equipment that are found in the country today. The plough was readily and widely adopted to the extent that almost every farmer wanted to own one. In fact, there was an overwhelming switch from “hand” to “animal” tillage. To the majority of farmers who until then, had either been using tree trunks for scratching the land or digging sticks for tilling the land, the introduction of the plough was a blessing as it offered better agricultural production opportunities. The plough did not only make tillage operations easier, but also added value to the available livestock, particularly cattle as they assumed a new role, which was different from their usual ones. Subsequently, other animal drawn tillage implements were introduced, developed and promoted. Today, Zimbabwe’s animal drawn agricultural implement industry has a range of animal drawn tillage equipment which compares favourably, if not superior to those produced in other countries where similar conditions are encountered.

Most animal drawn tillage equipment of the 1920s was designed for use with large animals. In the early stages, the thrust was directed towards scaling down of existing designs (Spear, 1975) in view of matching them to the available animals and making them affordable to the smallholder farmer. Indications are that the oxen used for draft up to the 1970s would have had live-weights of at least 500 kg in some areas while recent information suggests that typical weights of smallholder farmers’ oxen would have live-weights of around 300 to 400 kg (Mbanje et al, 1997).

The scaling down of equipment was further necessitated by the ever-decreasing proportion of draught animals to farmer household, the increasing use of the equipment by women and children and the recurrent droughts of the 1980s and 1990s which drastically reduced the draught animal power source and compelled farmers to use cows and donkeys. Donkeys proved to survive better than cattle in times of droughts as revealed in a study conducted by Hagman and Prasad (1995) in southern part of the country in which the mortality of donkeys was always lower than that of cattle. This is supported by Nengomasha's study (1994-1998) which concluded that donkeys survive without water for a longer time than cattle.

3. DRAUGHT ANIMALS AND USE

Zimbabwe has a whole range of livestock that comprises cattle, goats, sheep, donkeys pigs, and horses whose proportion in terms of numbers is roughly 500:263:54:32:26:1 (Epidemiology unit Department of Veterinary Services, 1998). The proportion is an indication of how the community values the animals. For draught power purposes cattle, particularly oxen, are mostly used while cows and donkeys are occasionally used. The animals are used for pulling tillage equipment such as ploughs, planters, cultivators, harrows, ridgers and rippers, transport devices such as carts and also logs. Figure 1 and 2 show the trend in cattle and donkey population in various farming sectors since 1992 while figure 3 shows overall cattle and donkey population trends in various sectors since 1992.

The overall cattle population was and remains highest in the smallholder farming sector which comprises over 70 % of total farmers. There was a sharp decrease in cattle population in the smallholder-farming sector from 1992 to 1993 and in 1994 mainly due to the 1992/93 and 1994 devastating droughts (figure 1). However, there were no such decreases in the other sectors, which generally have more and better grazing. In fact, there was a steady increase in cattle population in the commercial farming sectors since 1994 since farmers have better access to related resources. Donkey population in the smallholder-farming sector also dropped drastically during the 1992/93 drought (figure 2), but not as much as cattle. Their ability to tolerate droughts better than cattle led to their sharp increase up to 1997. While the overall cattle population has increased from 1992 to 1998, overall donkey population has almost remained steady (figure 3).

Figure 4. shows the distribution of cattle and donkeys in the country according to province. Although there is a high population of donkeys in Mashonaland East and West, they are not used for tillage purposes as much as in Masvingo and Matabeleland North and South.

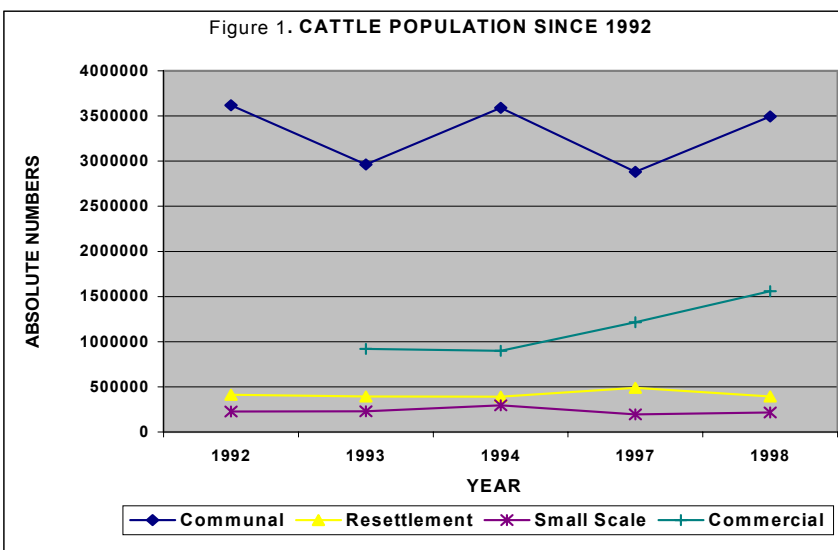


Figure 2. DONKEY POPULATION SINCE 1992

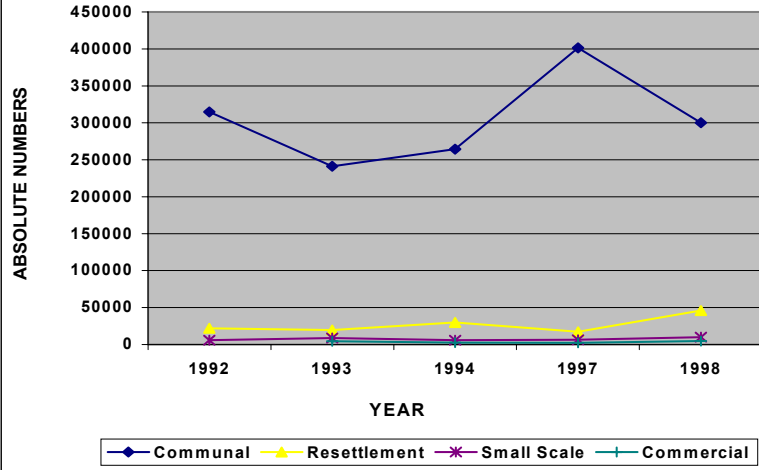


Figure 3. CATTLE - DONKEY POPULATION SINCE 1992

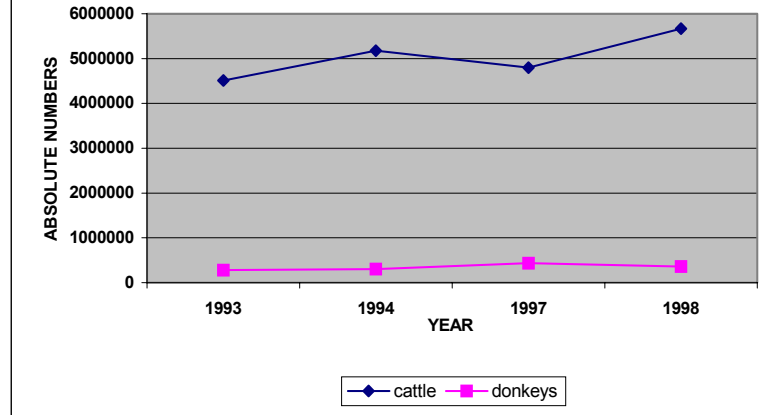
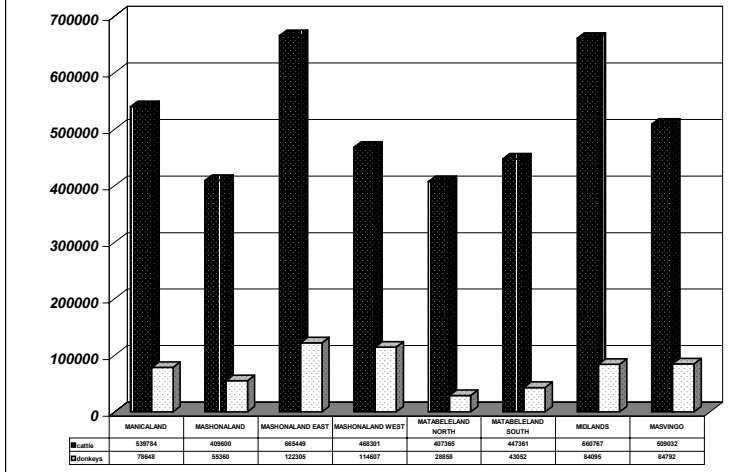


Figure 4. CATTLE-DONKEY POPULATION ACCORDING TO PROVINCE



4. CONSTRAINTS IN ANIMAL TRACTION

Although Zimbabwe has a long history of animal traction, there are number constraints that threaten efficient use of this vital power source. There are outbreaks of diseases almost on a yearly basis. Ill-treatment and mismanagement of draught animals, particularly donkeys, is still rampant in several areas. Most implements available today are too heavy not only for draught animals, but also for the users such as women and children. There is severe shortage and uneven distribution of draught animals which limits the productivity of smallholder farmers. The country still has to overcome cultural barriers such as those, which bar people from using donkeys in some areas and those that make women shy away from using the animals. The land question still remains a puzzle to solve so that the smallholder farmers may have adequate grazing land. Land degradation associated with

animal traction is implicated to have resulted in the siltation of once perennial rivers such as the Sabi. There is still inadequate knowledge on the welfare of a donkey. The animal draught power users lack appropriate planters to ease pressure on women farmers who do the planting using hand hoes.

5. SUPPORT SERVICES AND GOVERNMENT POLICY

The Zimbabwean government is fully aware of the significant role that animal traction plays in agriculture. Its veterinary department has stations in all the provinces to combat disease outbreaks and cater for general animal health. The Vet effort is complemented by the Special Prevention for Cruelty to Animals (S.P.C.A.) organisation, which acts as a Police against ill treatment and misuse of animals. The government fully supports the development and promotion of animal draught power technologies as cited in its Agricultural Policy Framework document, 1994. Its sole Agricultural Engineering Institution collaborates with other stakeholders such as farmers, ZIMPLOW, the giant implement manufacturer, Silsoe Research Institute in U.K, Department of Research and Specialist Services (DR&SS), other Universities and colleges and many other stakeholders in the development of appropriate draught animal power technologies.

The Animal Power Network of Zimbabwe (APNEZ) was formed in 1994 to promote animal traction through sharing of information by involved key people, companies and other stakeholders.

6. FUTURE STRATEGIES

There are plans to introduce animal traction studies in the school curricula. The resettlement of communal farmers into larger areas with adequate grazing is already taking shape. Conservation tillage implements development and promotion is to be soon intensified.

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PROSPECTS OF ANIMAL DRAUGHT POWER IN ZAMBIA

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INTRODUCTION

The use of animals for draught power in Zambia has a long tradition, the source of farm power has been mainly oxen which draws as far back as the 1930s when the white settlers started arriving in the country.. The spread has been mostly confined to southern, western, central and eastern provinces of Zambia. These regions have a high densities of work oxen per cultivated hectare. Most of farmers in these areas are also familiar with the training, handling of draught animals and the use of ox-drawn implements.

The northern, copperbelt and north western provinces of Zambia have little or no tradition in cattle keeping. Introducing animal draught power in these areas has been a slow and difficult process, which required considerable investment and development efforts in the area of animal husbandry and health, general extension and training, marketing, distribution and credit.

PRESENT STATUS OF ANIMAL TRACTION

The principal source of animal power in Zambia is cattle. Oxen are the mostly used, though in recent years the use of cows has also been recorded. The use of donkeys in transportation has been observed in southern and western provinces. There is great potential in the use of donkeys as farmers start to appreciate the low maintenance cost and disease resistance as compared to cattle. The the donkey population in the country is estimated at 2100.

In provinces where there are few cattle, there have only been limited transfers from areas of cattle surplus due to veterinary restrictions of livestock movement and high transport costs. In the National ADP survey conducted in 1991 (Starkey.P., Dibbits.H. and Mwenya.E.), shows the number of draught animals as 242,400 with 120,000 ox-drawn mouldboard ploughs, 30,000 ox-ridgers, 20,000 ox-drawn cultivators, 60,000 sledges and 30,000 ox-carts in use. Table 1. Shows cattle populations and trained oxen in various provinces.

**Table.1: Cattle population and trained oxen distribution in Zambia, 1991
(Survey conducted by Starkey, Dibbits and Mwenya)**

Province	Cattle population	Number of trained oxen	% of trained oxen
Southern	1,081,200	105,000	9.7
Eastern	273,600	32,500	11.9
Lusaka	89,500	5,200	5.8
Central	483,400	40,900	8.5
Northern	102,600	3,600	3.5
Luapula	10,800	500	4
Copperbelt	65,000	2,400	3.7
North Western	59,400	2,000	3.5
Western	512,800	50,000	9.7
Total	2,678,300	242,100	9

CONSTRAINTS IN THE USE OF ANIMAL TRACTION

The limiting factors in Animal Draught Power in Zambia development include:

- Poor profitability of small scale farming resulting in lack of money for investment into animal traction.
- Inadquate credit facilities for small scale farmers
- Poor supply and marketing of animal draught power implements
- Inadquate technical knowledge by rural artisans to provide back-up services to animal draught power farmers
- Lack of technical knowledge by farmers and also extension workers
- Inadquate research and demonstration of animal draught power technology

The hindering factor of animal draught power technology adoption in Zambia by small scale farmers is financially and economically constraints. The contributing factor is maize, which is the major crop grown by small scale farmers, and has a poor producer price leading to poor financial resource base which then makes an animal draught power undertaking a high investment technology.

Inadquate credit facilities is another major constraint for would- be- ADP farmers, as in most cases smallscale farmers normally lack the required collateral by most lending institutions to qualify for loans.

In areas where animal traction was recently introduced, lack of technical know-how by farmers, rural artisans as well as extension workers, has hindered more rapid spread of the technology. Even in areas where animal traction has a long history, this lack of technical know-how seems to hinder the spread of ADP technology.

The prevalence of cattle diseases and poor provision of veterinary services have also played a major role in determining the level of use of animal traction technology in the country.

Outbreaks of diseases such as foot and mouth in southern province, trypanosomiasis and tick borne diseases such as east coast fever, have reduced the numbers of work animals available and consequently some farmers are wary of investing in cattle (including oxen) because of the economic risk involved.

THE FUTURE OF ANIMAL TRACTION

A majority of the small-scale farmers in Zambia can not afford to purchase tractors or make use of the tractor hire services due to financial limitations. Nevertheless, small-scale farmers, who make 80-90% of the majority farmers in Zambia, have acknowledged animal traction as the best means of farm mechanisation.

An increase in the use of animal traction will depend largely on the positive growth of the national economy and the continuation of the government's policy towards Animal Traction Development. The five-year Investment Plan identified and focused on Animal Traction constraints, such as research and development, training, implement supply and information and documentation. Since the initiation of Agriculture Sector Investment Programme, which is currently being implemented by the Ministry of Agriculture Food and Fisheries and other co-operating partners, there has been a rapid progress in making trained oxen available to small-scale farmers.

The establishment of The National Animal Draught Power Co-ordinating Unit has brought about better co-ordination of all Animal Traction Programmes in the country. There has been an improvement in information and documentation, ADP problem identification, setting of priorities to assist policy makers and in the provision of technical advisory services.

The establishment of Palabana Animal Draught Power Mechanisation Centre has seen the development of an animal traction technology-training curriculum for agricultural development staff (suitable for governmental and non-governmental organisation). The Centre is also actively involved in running in-service courses for extension workers and Outreach programmes to support trainees, conducts animal traction tillage trials and provides technical advice to other animal traction institutions.

The active participation of the Ministry of Agriculture Food and Fisheries in formulation of a policy towards animal traction programme has helped re-establish the importance of animal traction for small scale farmers in progressing to semi-commercial levels of production. There are however still certain areas in the country where the animal traction technology is still under utilised. In Luapula province for example the Department of Agriculture and Luapula Livelihood Food Security Programme (LLFSP-FINNIDA) are vigorously implementing strategies to assist to use ADP technologies by:

- Importing cattle into the province, due to limited numbers
- Assisting cattle breeders in the province by providing bulls through a bull exchange programme

- Assist in the establishment of the cattle breeding unit, for provision of steers for draught animals and heifers for breeding cattle
- Implementing an intensive, decentralised animal draught power training programme in the villages

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UTILIZATION OF ANIMAL TRACTION IN MALAWI.

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Abstract

With the ever increasing price of petroleum based fuel, imported machinery motorized, dwindling foreign exchange and farmers lack of technical know how in most of the developing countries, the most appropriate step of mechanization for the majority of the small scale farmers is Animal Traction. However, efficient use of Animal Traction (AT) will only be achieved if there is rigorous training of both farmers and extension agents, and a strong and active co-operation between all the parties involved in making Animal Traction. These include research personnel, machinery manufacturers and distributors, credit institutions, extension agents, livestock health personnel and farmers.

This paper describes the history of Animal Traction in Malawi, type and distribution of work animals, equipment used, field operations including the problems that affect this type of technology.

History of Animal Traction in Malawi.

Animal traction refers to the use of animals for ploughing, harrowing, ridging, carting, logging, pumping threshing, planting, digging, pack and pulling sledges. Use of animal power in Malawi started in the 1940s mostly by the people who had worked in Zimbabwe, Swaziland and South Africa. From the start, local Zebu oxen have been the most commonly used animals. At present about 15% of the farmers in Malawi are using animal power. The majority of the farmers are in the north, followed by the centre and lastly in the south of the country. This trend is mostly based on the size of the land holdings that are largest in the north of the country. The number of working oxen in 1987 was 69,718 pairs but these are now decreasing due to a number of problems. The majority of the donkeys that are in use in Malawi are off springs of the 300 donkeys which were imported from Zimbabwe in 1957 (Kulumunyu,1989). In the past all the equipment for use by draught animals were imported from Zimbabwe and South Africa until in the early 1970. In the past training of animals and the handlers has been from farmer to farmer.

Human energy by itself is very inadequate to make a significant impact on agricultural productivity (Dibbits, 1985). Acreages and yields are limited by the slow and heavy toil of hand cultivation especially in Malawi where a farmer is expected to split old ridges and move a lot of soil in the process of making new ridges. A man with a hand hoe can comfortably cultivate 0.4 ha only per year. There are three levels of mechanisation in Malawi and these are hand animal, traction and tractor cultivation. The most common is hand cultivation where farmers use the hand hoe.

The change from hand hoe to motorised power is a considerable one and usually the farmer should be oriented toward commercial farming. The most viable power supplement for a farmer who is in transitional stage between subsistence cultivation and commercial farming is recognised to lie first with the animal traction (Inns 1984).

The advantages of using animal draught power are:

- (a) The cost is within reach of most farmers
- (b) The technique fits very well into existing farming systems, allows mixed cropping and involves all members of the farmer's family including children.
- (c) The animals appreciate in value with time so the farmer gets more money for selling the animals that have provided him with power over several years.
- (d) Technology is within the farmer's capacity to understand it even if not present in an area it could be taught within a short time.
- (e) AT is about five times faster than hand cultivation
- (f) AT can convert crop residues into manure for the field thereby cutting down the fertilizer requirement.
- (g) ADP can be hired out and earn the owner some extra revenue or farm produce.
- (h) There is less drudgery.

Distribution of Work Animals and their equipment by ADD.

In Malawi the common animals used by farmers are cattle and donkeys, very rarely are horses used on the farms because they are expensive to buy, harness and maintain. Favourable weather for the horses is found in limited areas like Mulanje, Zomba and Mzuzu. Although the inventory in Table 1. is not complete, it gives a general picture of the available work oxen, the type and number of implements.

Table 1: Inventory of Main Farm Implements and Work Oxen by ADD

ADD	Work Oxen	Plough	Ridgers	Cultivators	Ox-Carts
Blantyre	414	118	110	16	217
Karonga	10375	3581	443	36	495
Kasungu	13613	2977	4253	81	6535
Lilongwe	15000*	1508	1199	156	8500*
Liwonde	802	317	208	17	340
Mzuzu	18494	8698	6037	151	1881
Ngabu	2520	458	189	16	631
Salima	8500*	950	829	82	818
Malawi	69718	18607	13268	555	19417

January, 1987

*Estimated figures

Donkeys that can be estimated to number 500 in the country have a high drought and disease tolerance and low feed requirement making them very useful draught animals especially in arid and semi-arid areas. During severe drought oxen die while donkeys survive. Well-harnessed donkeys can complete with light oxen.

Type of Draught Work.

In Malawi the use of draught animals has been confined to ploughing, ridging, weeding, transport, logging and hiring out.

(a) Ploughing

Ploughing with animal drawn implements is done by using a single furrow plough. This plough throws soil to the right during ploughing. Two common versions of the plough do exist at the moment. The first is a fixed complete unit plough while the other is a single body fitted into a multipurpose tool frame capable of accepting also a ridger, groundnut lifter, a cultivator and a clod crusher.

The recommendation states that farmers should plough immediately after the rains (middle of April to end of June). Maize which is usually last to come to harvest should be cut and stoked as soon as it is ready so that the ground can be ploughed while there is still some moisture in the soil. Farmers who do not plough their fields during this time find that the soil becomes too dry and hard to plough between July and October.

(b) Ridging

New ridges should be made after harrowing during September and October before the rains begin. If the field has been ploughed just after the end of the previous rains and harrowed, ridging will not be difficult. Most farmers ridge their fields after the first rains and this in many cases delays their planting time and limits the total area they can cover within a season.

(c) **Weeding**

Normally weeding has to be done by a cultivator but because farmers grow their crops on ridges in Malawi most of them use a ridger for weeding. Weeding with a cultivator produce best results on the flat but a ridger has the advantage of rebuilding the ridges (banking) that are sometimes damaged by rains. The ridger lifts the soil from the furrow, turns it and throws it on each side of the ridge, smothering the weeds. Light hand weeding along the ridge top may be necessary if the soil thrown by the ridger does not cover the whole ridge.

(d) **Transport**

Animal transport is becoming increasingly important. Farmers use animals to cart manure to the fields, inputs from the market and produce to the market. In some parts of the country the ox-cart is the most common animal drawn implement e.g. Lilongwe (Table 1).

(e) **Hiring**

Farmers who use Animal Traction can hire them out during periods when they are not using them themselves. This applies to both transport and field operation. Payment for such services is either in cash or part of the produce but such payments help to economically empower rural farmers.

Equipment Used.

In Malawi the most common animal drawn equipment used are; plough, ridger and the cart. Use of the cultivator is limited because of the general recommendation that all crops should be planted on the ridges and this implement tends to destroy the ridges as it is being used. Planters are not used because they were designed to plant on the flat but the recommendation is to plant on the ridges. In general utilization of Animal Traction is more intensive in the northern region of the country where ploughs, ridgers and oxcarts are all used. In the central region the cart is the most widely used equipment probably because of the need to transport farm produce to urban markets. In the southern region there is limited use of Animal Traction because the fields are small and in the extreme south the tradition of using AT is not there.

Equipment Manufacturers.

There are few manufactures of animal drawn equipment in Malawi. Most of these are based in the commercial city of Blantyre in the southern region. Chillington Agrimal is the largest manufacturer of animal drawn ploughs, ridgers, cultivators, multipurpose tool frames, planters and trek chains. Petroleum Services limited also located in Blantyre makes oxcarts and donkey carts but rural artisans who are located in peri urban areas also make a lot of implements, spares and carts.

Table 2. List of major manufacturers and their equipment.

No.	Manufacturer.	Equipment.
1	Chillington Agrimal (Ltd), P.O.Box 143, Blantyre. Fax; 265-670-651.	Ploughs, Ridgers, Cultivators, Planters Multi purpose tool frame, Trek chains,Bolts, Nuts and Spares
2	Petroleum Services (Ltd), Ginnery corner, Box 1900, Blantyre. Phone; 265-670-699	Oxcarts Donkey carts Bearing
3	Rural Artisans, Located in several peri-urban areas	Oxcarts, Implements, spares Yoking Equipment

Support Services.

The government has established a number of services to support those farmers who are willing to use AT. There is a medium term credit system for farmers to get the animals, implements or both on loan. A number of training centers have been established where farmers and their animals can be trained. Farm machinery extension agents are being recruited to take up positions in the Agricultural Development Divisions (ADD). Heavy pest and disease control programmes for animals have been launched such as the tsetse-fly control programme near game reserves and forests. The department of animal health and industry run a central veterinary laboratory and all dipping tanks in the country. Research for better implements, usage and better animals is also going on to improve the utilization of AT.

Government Policy.

The Government of Malawi has realized that as the population is growing the size of the farms will continue to become smaller and smaller. Large motorized machinery will not be feasible to work in these small fields. It has put in place some strategies that will enable farmers to have easy access to AT technology. The removal of customs duty on agricultural implements is one step that will enable farmers to buy AT implements at a cheaper price.

There is need for a definite policy direction, strategy and plan of action to critically assess the specific and real needs of the farmers in their various farm sizes and enterprises. Lack of such a policy has resulted into disappointment on the part of research and extension staff that some of the technological innovations are not being adopted or gaining acceptance or are under utilized by those farmers who have acquired them.

The policy on Animal Traction ought to consider that farm technologies are an integral part of technical recommendations that must be incorporated in the technology delivery system. Animal Traction is an aid to production and indeed, to the improvement of the socio-economic conditions of the rural small scale farmers. As such, therefore, extension on Animal Traction utilization should not be treated in isolation from other recommendations where farm aids are essential in the production process, in primary processing, utilization of food and agricultural products.

The strategy on Animal Traction research and extension must also take into account the circumstances of the target farmers in a systematic manner. Requirements in each Agricultural Development Divisions need to be examined in terms of farm sizes, crop and livestock enterprises and the social and economic development needs of farmers. Research and development programmes, should then be planned to address the constraints within the overall agricultural development plans.

Past and Present Programmes.

(a) **Multiplication of oxen.**

The Government has established several centers where farmers can purchase bulls to be trained into work oxen. These centers are at Dzalanyama cattle ranch in Lilongwe, Mpatsa njoka livestock unit Salima, Mikologwe livestock farm in Thyolo, Dwambazi Livestock farm in Mzimba and a few others located all over the country although some are now closing.

(b) **Training of work animals.**

Training of work animals is done either on Government centers or by other farmers who have the knowledge. Government oxen training centers are located through out the country and are manned by qualified ox trainers but due to shortage of draught animals some of these have been closed. Some farmers tend to seek the assistance of fellow farmers in training their animals.

(c) **Increasing the types of animals.**

The population of cattle in Malawi has rarely gone beyond one and half million while that of human beings is well beyond ten million. The small number of cattle within a large population of human beings has created a great shortfall in beef that many farmers have lost their animals to butcher men. In 1986 the Animal Power Utilization Project funded by the FAO was initiated with the aim of enhancing the use of draught animals in the country. This project trained farmers, published handouts, introduced new equipment from other countries and sensitized senior managers in the ministry of agriculture. The project tried without much success to increase the number of donkeys in the country by importing a new breed from Botswana.

The number required was 500 donkeys but after purchasing 250 donkeys it was discovered that most of them were positive to dourine therefore could not be suitable for Malawi. A small number of about 200 donkeys, which were negative, were shipped to Malawi but they were inadequate to have a big impact (Kumwenda and Mateyo 1991).

Potentials for the Future.

a. **Role of NGOs**

Apart from Government efforts, Non Governmental Organizations can also play a big role in enhancing the up take of Animal Traction in Malawi by providing soft loans which should

enable as many farmers as possible to purchase the animals and implements. NGOs can also help in the training of farmers and extension agents.

b. Implements for hire.

The Government has recently introduced a facility for hiring Animal Traction implements through the National Agricultural Mechanization scheme. The implements are purchased by the Government and given to a parastatal organization (ADMARC) to run the hiring scheme in several locations across the country.

c. Formation of farmers clubs.

Farmers that are interested in AT can form groups that can purchase animals and the implements. The package can rotate among the members of the club. This type of arrangement can enable farmers get access to expensive implements. Clubs have a record of high repayment of loans hence most financial houses prefer giving loans to clubs.

d. Intensifying research and extension.

There is need of intensifying research in; Animal Traction especially in feeds and feeding using locally available feeds, implements for land preparation and weeding, control of pests and diseases so that many farmers can adopt AT. Extension personnel have to be trained so that they are knowledgeable in order for them to teach the farmers.

e. Support to Rural Artisans.

At the moment there are several implements that are not in use because of missing parts or parts that are worn out. Rural artisans can help in repairing these faulty implements but they need small loans to help them purchase raw materials for making spare parts for AT implements that have broken down. Research can also assist these artisans by giving them manuals that have specifications for the implements other than making them through guessing.

Constraints to Animal Traction.

The major problems affecting efficient utilisation of Animal Traction reported by Kumwenda 1987 are as follows:

(a) Poor Training

Both animals and farmers do not get adequate training either their training period is short or it covers few operations. In some cases training is done at the wrong time for example training someone how to plough when the field is too dry.

(b) Lack of Trained Personnel

At the moment there are few trained personnel to do research on AT and in extension to inform and encourage farmers to use draught animals.

(c) Poor Animal Management

Open roof kholas allow mud to form during the rainy season, farmers cruelty to animals demonstrated by heavy beating, tail twisting, burning and biting them are some of the examples.

(d) Pest, Diseases and High Mortality Rates

It is extremely difficult to keep animals in some parts of the country because of either pests or diseases. Some areas are heavily infested with tsetse flies especially near game reserves. Ticks and endoparasite are rarely controlled.

(e) Lack of Money to Purchase the AT Package

Few farmers can afford to purchase the AT package at the same time they are hesitant to go for a loan either for fear of the unknown happening or because they may not qualify to get the loan (lack of collateral). Another problem has been the rapid increase in the cost of equipment.

(f) Availability of Feeds and Water

In tropical countries where the climate is warm and there are significant weather changes within a year it is difficult for the animals to get all the required nutrients from natural pastures. During the dry season natural grasses dry off, lose their leaves and digestibility becomes very low. Supplementation is necessary during this period. In some areas there is a critical shortage of water for drinking and dipping.

(g) Shortage of trained manpower.

Shortage of trained manpower in both the Research and Extension Departments and a weak linkage in this subject matter field is problem. A number of technologies, which have been developed, tested and adapted to certain farmer conditions and practices have not gone beyond the demonstration stage because of poor training of extension workers and a weak farmer and extension linkage.

(h) Other Problems

A number of other problems include: lack of suitable equipment, uncertain supply of equipment and spare parts, poor harnessing techniques, land shortage and poor terrain, very short marketing calendar and a farmer's inability to use other farm inputs such as fertilizer and improved seed.

Conclusions.

Animal Traction can increase crop production through an increase in the area cultivated, provision of manure as an alternative source of fertilizer, improved timeliness of plowing, planting and weeding. Animal traction can be profitable and sustainable if support services such as credit, extension, and implement supply and repair, cheap sources of drugs to control animal diseases and pests. This source of power will still be the only way to improve production and

reduce drudgery for the millions of farmers on small land holdings through out the developing world.

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An Animal Traction Project in Tete, The experience of VETAID

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Abstract

This paper summarises the AT programme being carried out by VETAID and World Vision in Mutarara, Tete Province. The programme was initiated to address the lack of rural transport and of labour for land preparation identified by farmers. Work began in 1998 with the objective to train and distribute 50 trained pairs of animals to 50 trained farmers along with ox carts and ploughs under a credit system. The training takes place in a specially built Centre. To date, 48 trained farmers have received 48 pairs of trained oxen, 48 ox carts and 47 ploughs. Repayment under the credit scheme is currently 93%. Almost all farmers that received oxen are using them for transport purposes; this is profitable. Most of the farmers are not yet using the ploughs as both animals and farmers are insufficiently trained. The training programme is being decentralised to the villages to ensure farmers receive more practice in land cultivation.

1. Background

VETAID is a British NGO specialising in livestock development. VETAID began work in Tete, Mozambique in 1995 with funding from the European Commission (EC). The major part of field activities take place in Mutarara district, 300 kms from the city of Tete. Mutarara has many cattle before the civil war but the herd was decimated during the conflict. (more than 17,000 head in 1973 to 650 head in 1995)

In the first phase of the work in Tete (95-97) a VETAID, working jointly with Provincial Livestock Services (SPP) restocked 99 farming families in Mutarara with 517 breeding cattle. These cattle are breeding steadily and a further 87 families have received the offspring of the original animals. With the return of the population from Malawi (where they took refuge during the war) and the assistance of the SPP's, the number of animals is growing rapidly. In the 1999 census, 3,000 cattle were counted.

As well as a lack of cattle, in 1996, Mutarara farmers identified other constraints to the development of the agricultural sector in the district, from their point of view. Of these, two of the most important were:

- the lack of rural transport
- the shortage of labour to plough land

To address these problems, the second phase of VETAIDs' work in Mutarara (1997-2000) includes animal traction as one of the principal activities.

2. The Animal Traction Programme in Mutarara

The plan is to train 50 pairs of oxen and distribute them with ploughs and carts to trained farmers. In the first year, AT work was carried out jointly with World Vision. When the programme started in July 1998, the tasks were divided between the two NGOs as follows:

World Vision is responsible for training: the construction of a training centre, the training of trainers, the training of farmers and animals.

VETAID supplies animals and equipment, selects farmers, manages the credit system, monitors farmers, provides technical advice and back up.

The following steps summarise how the programme was initiated between April and September 1998.

- WV built a training centre (local materials) where initial training of animals and farmers would take place.
- WV trained a group of trainers to later train farmers and animals. Persons trained included staff from the SPP Mutarara and some farmers. Some of these persons then became resident trainers at the Centre.
- VETAID/SPP publicised the programme through a series of village and town meetings. Through these meetings, the credit system for the AT component, and the criteria for farmer selection were elaborated.
- A farmers selection committee was formed comprised of staff of VETAID, WV and the SPP
- VETAID purchased the first group of animals and equipment and selected the first group of 6 farmers.
- Training began in August 1998.

2.1 Programme implementation

The AT programme began in August 1998 with the opening of the training centre. The staff at the Centre are as follows:

2 senior trainers
1 carpenter (yoke maker/instructor)
3 assistant trainers
2 herdsman
2 guards

With these staff, and with the presence of the farmers being trained, it is possible to train six pairs of animals simultaneously.

2.2 Selection of farmers

The project tries not to discriminate for or against any social or economic group. The programme is thus (theoretically) open to any family or group of families that:

- a) has the necessary money to pay for the "package"
- b) is resident in the district
- c) has a farm and year round access to water and pasture
- d) presents an acceptable "business" plan to the Selection Committee for the future use of the draught animals and equipment
- e) does not have cattle from VETAID from the first project

Additionally, there are groups for which special conditions exist:

- Interested persons who already have VETAID cattle can form groups of 3-4 persons with those who do not (have cattle) and apply as a group.
- Persons who already have animals suitable for training can get themselves and their animals trained at the Centre and then buy equipment from the project
- Persons too poor to pay for the package themselves may apply as a group and pool their resources

2.3 The credit system

The "package" of a pair of trained animal, plough and ox cart is distributed under a credit system. The animals and ox carts are subsidised 50%; the plough sold for the full price. Details are:

	<u>Meticais</u>	<u>US\$</u>
Pair of trained animals (50% subsidy)	3,000,000	195
Ox cart (50% subsidy)	3,000,000	195
Plough with chain	1,400,000	<u>92</u>
TOTAL	7,400,000 Mts	\$482

The farmer receiving this package may take all or any part of it providing he/she has the money to pay for it.

The payment schedule is:

- One third on reception of the items (2,400,000 mts)
- One third 12 months later (2,500,000 mts)
- One third 24 months later (2,500,000 mts)

After 20 months operation of this system, repayment is currently running at 93%. Money raised is banked to be used later (when the project ends) to support livestock development in Mutarara district.

2.4 Selection of animals

The animals being trained are all males, a mixture of entire and castrated bulls with a live weight of roughly 180-225 kgs and between 2 and 4 years old. The breeds used are landims or improved crossbreds (offspring of restocking animals) and all are purchased locally in Mutarara or in and around the city of Tete. The buying price varies with the weight of the animal from US\$130 to \$180 per head. At present the project is not promoting the castration of bulls because there is still a shortage of good breeding bulls in the area.

2.5 The training programme

The training follows the programme of the Palabana Animal Draught Mechanisation Centre in Lusaka Zambia. The only difference is that Mutarara farmers do not use reins to guide their animals. Initially training courses lasted 4 weeks. It was later noted that this time was too short for farmers and animals to become proficient at ploughing. The training period was thus extended to six weeks to give farmers and animals more time to practice ploughing and use of ploughs.

2.6 AT equipment

The project is experimenting with three types of ox cart:

- a metal cart made at a small workshop in Tete city
- a metal cart made by Zimplow in Zimbabwe
- a wooden cart (metal chassis) made by another NGO (FOS, Belgica) in Cahora Bassa

The most popular of the three with farmers is the one made in Tete city. Farmers say it is strong while not being too heavy. They also like the brightly coloured paint that the manufacturer uses to paint the carts.

Two types of (metal mould board plough) are being used:

- a model produced by Kanex in Maputo
- a model being produced by Zimplow in Zimbabwe

In terms of farmer preference there is not much to choose between the two types. Some farmers say that the steel used in the Zimplow ploughs is of better quality and that the shares do not wear out so quickly.

Spare parts are available for the two models in a shop in Tete city. The project stocks a limited range of spares which are sold to farmers on request.

After a recent evaluation of the impact of the AT project, a cultivator (Zimplow maun donkey cultivator) was included as an optional part of the package to permit inter row weeding. Some farmers are currently experimenting with these implements.

2.7 Monitoring of distributed animals

One of the SPP staff makes a monthly visit to all farmers that have received oxen and equipment. Basic information is collected during visits that provide an idea of the way in which the farmers are using their animals. This includes information about:

- the condition of the animals
- the health of the animals
- the use of the animals for draught purposes
- the use and condition of the, harness, plough and cart

As a condition of entry to the programme each farmer has to submit a short written plan indicating how he/she views the development of his farm with the use of draught animals. This information will form the basis for later evaluation of the project.

3 Results and initial observations

The following is based on project records, monitoring information and an evaluation by an independent expert.

- 48 trained pairs of animals have been distributed to 48 families. 43 pairs came from the project while the remaining five pairs belonged to farmers who brought the animals to the Centre to be trained. 48 ox carts and 43 ploughs have been distributed with the animals.
- All families that received animals use the ox carts and these are profitable. The income from carts varies with the agricultural seasons.
- At the beginning some farmers overworked their animals resulting in weight loss, lameness and in some cases death.
- To try to include poorer families in the programme, farmers were offered the option to apply in groups of 3 or 4 families. In this manner 8 groups comprising a total of 29 families received oxen and equipment. The group idea has not generally been successful as the groups tend to be dominated by one of two persons while the rest are left out.
- The majority of families are not using the ploughs because of insufficient training of animals and farmers.

- Those that do use ploughs cultivate 0.9 hectares more than families who cultivate by hand.
- All families that received animals to date have been male headed households.

4. Corrective Actions

To address the problems of overworking the animals, the training programme was modified to give more emphasis on correct use of draught animals.

To address the inadequate training of farmers and animals training has been decentralised to the villages through a mobile team of trainers. This is more practical for farmers as they do not have to spent so long away from their farms.

The gender question is more complex. Mutarara is a district where women traditionally do not own or work with cattle. This contrasts, for example, with nearby Changara district where women do work with cattle. While the project has always encouraged the participation of women it has not created any special conditions to permit the entry of women into the scheme. The recent evaluation of the programme identified several factors which make the entry of women into cattle keeping and animal traction difficult:

- **Cultural factors:** men are the traditional keepers of cattle; women are afraid to experiment
- **Financial constraints:** women are unable to raise the necessary money to enter the scheme
- **Labour constraints:** in many cases women headed households lack the labour to work and manage draught animals

5. Perspectives for the future

- In terms of numbers and quality of animals there is likely to be an abundant supply (of animals) for draught power in the future.
- Draught animal equipment repairs and spare parts may be problematic for farmers living a long way from the district capital town.
- A weak local market for farm produce may limit the expansion of agricultural development and animal traction in Mutarara
- A lack of credit for the purchase of animals and equipment will limit access to draught animals and equipment.

AN EXPERIENCE OF CREDIT FOR THE DEVELOPMENT OF ANIMAL TRACTION IN MOZAMBIQUE

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FOS, a Belgian organisation, initiated an emergency programme in Chitima Valley in 1988. In 1992 the programme continued in the field of sustainable development. In that year a credit programme for the finance of animal traction was established as an early attempt to support animal traction activities. In 1993 an animal traction promotion programme was initiated. The concept resulted in ZOPP seminar with farmers from Chitima valley. Today this programme entails a Community Training Centre for animal traction and animal production, production and repair of carts and equipment, and farmer to farmer extension of animal traction technologies and animal healthy treatments. The project also supports an association of animal traction promoters who are setting up a community shop for the sale of agricultural products and tools .

Until 1998, the credit programme objective was to support investment for animal traction. Today though the credit programme has grown into a programme of community banking and is covering investment in different activities.

Further the project works in the field of organic agriculture and rural development. The project has a comical component of the earnings which are used for covering extra costs of the project. These activities are: Maize mill (produce high quality of maize meal than other local mills), repair of cars and trucks, transport (a small truck runs between the city and other ends of Cabora Bassa district passing Chitima and a tractor for rent).

Credit for animal traction

The Chitima valley is situated along the Cabora Bassa Lake and its mountains in Cabora Bassa district, Tete province. The district counts with 16.000 families of which 15.000 are farmer families (last count 1998).

Most families live from subsistence farming combined with small scale commercial activities on (fishing, wood etc.) The area has a rainfall of 600 - 800mm per year and the area is only suited for extensive agriculture and animal production.

When farmers returned again to their villages after the war many had lost their possessions and animals. Many had a start from zero and capital was lacking. For improved agricultural production there was need of investment in equipment and animal for traction.

To support this investment the farmers were given to buy two oxen and a plough in equipment and animal traction. These investment were repaid with maize, after each harvest. Sixty nine farmers benefited from this credit scheme the repayment was 100%. The programme was success. In 1994 the project did not have any way to sell the repayment maize and it was decided

that the repayment should be in monetary ways. In this year the project also introduced a new credit scheme in which farmers obtained credit to buy oxen and equipment with a repayment period of 1 year instead of 3 years. Forty two farmers received this credit. The result of these changes were a poor repayment of loans.

Why did the programme fail?

In 1998, it was decided to stop giving more credits for animal traction, by then some groups had stopped repaying anything at all. It was then concluded that investment for animal traction was not giving the expected increase of production for the repayment of credit. It was also thought that agricultural production as such does not rent enough to pay back for any credit while the risk is high and income is only received during certain periods of the year.

To run a credit programme with success it necessary to look at its sustainability. In order to attain this sustainability, the programme should be treated as a business not as a development programme. Beneficiaries are clients and interest should be covering the cost. There is the need of building up some capital. Unpaid credits are costs and a high percentage of unpaid credits means reduction of the revolving capital and lesser money will be available for giving more loans.

With sustainability in mind it is not worthwhile to run a credit programme with high risks activities of which one can be sure a big percentage of credit will not be paid back .

Today's credit programme

Today the project is running a credit programme based in the community banking system. The programme gives in the first phase, credits in the range of 1.000.000Mts to 2.000.000Mts to village groups, in a second phase the village groups have organised themselves and have constructed a small community building which will serve as a community bank. This bank is called "Caixa Solidária de Crédito". From here the Caixa will receive a credit from the programme and will pay back the credit with interest in a certain period. The Caixa itself will give credits to individual members on terms stipulated and agreed by the members.

In this moment the programme is in the first phase with twelve village groups of which 7 are about to pass into the second phase. One caixa is functioning in the second phase. The programme covering around 850 men and women and is working with a revolving fund of 500.000.000Mts.

The members of the caixa are using the credits for small business (buying and selling of agricultural and other products), fish and maize trade and fishing. The programme has especially been beneficial for divorced and abandoned women. With the one Caixa in the second phase, it was found that members are also planning other activities than only credit. The caixa is earning an income from the interest and have plans to invest this income in other credits or supporting group activities of members of which, one is buying, storing and selling maize.

No credits are given for agriculture, animals or animal traction equipment because of the low income of these activities.

Consultancy

A consultancy report on animal traction situation of Chitima valley shows however a big need for agricultural credits especially for the buying of equipment like ploughs and carts. In this report it was concluded that based in the fact that farmers were able to repay the value of their credit in from 1992 up to 1994 before the system was changed in to a monetary repayment, it is possible to run an efficient credit programme with high repayment rates. T is not the inability to repay the credit from agricultural production but poor commercialisation of the products that make repay of credits in monetary ways difficult.

Study case

An example of a Village, which is asking the project for support, is a village called Mulange. It is situated a 100km from Chitima village where the project has its base. The roads are bad except for a part which runs along the electric line to Zimbabwe coming from the Cabora Bassa Dam. During the rainy season it is not possible to reach the Village by any transport. Money exist very little in the village and barter system is much used. The production of maize is enormous in the whole year though many farmers also own many goats. Cattle has never been kept because of tsetse infestation even though one farmer has a few cattle without meeting problems with the decease. The farmer uses a traditional but effective storage system for their maize. The village government is trying to attain a maize mill and equipment for animal traction. For the project now there is a need to work with this Village and integrate this Village into the credit programme.

Group work

How could the project be of help to this Village using existing credit system and facilities of the project?

MODELS FOR DISSEMINATION AND COMMERCIALIZATION FOR ANIMAL TRACTION IMPLEMENTS.

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I. INTRODUCTION

According to a number of animal traction studies carried out, it is known that the use and dissemination of the technology is conditioned mainly by the following constraints:

- Lack of credit for the farmer
- Lack of habit and the knowledge of some of the implements by the farmers.
- Lack of technological knowledge by farmers.
- Shortage of transport in rural areas due to poor roads.
- Lack of economical power by farmers.
- High rates of interest practised by the Bank and tough conditions when offering credits.
- Lack of information about AT implements, farmers thus unaware of the places where implements are bought and sold.

Therefore, this programme was perceived with the main objective of providing a mechanism which can address the above constraints relating to AT equipment. Within this framework, it is assumed that a campaign contains 2 seasons of 6 months each. That is, one campaign equals 1 year.

The programme is divided into two parts. The first is dissemination, which is pure research emphasizing the promotion and use of the complete packages of animal traction implements (plough, ridger, planter, cart). The second part of the programme relates purely to commercial aspects. However, it should be noted that the two parts of the programme are complementary.

II. INSTITUTIONS INVOLVED

Financial Institution
Animal Traction Centre
Banks

Businessmen
Farmers
NGO,s
Local Grassroots Authorities

III. FIRST PART OF THE PROGRAMME (DISSEMINATION)

This part of the programme is used to propagate the use of the complete packages of animal traction equipment (some are not used by farmers such as ridgers, weeders and planters).

With the help of local authorities, a group of people who own animals will be selected from the population of farmers. They must be dynamic and honest and willing to learn new techniques. They should be able to pay, at the initial stage, 20% of the cost of the complete package (US\$800,00 to US\$1.200,00 “Maputo price”). These will be pilot farmers for the dissemination of the technology during the implementation of the programme and in the future they will take the role of extensionists.

This group will be given a practical course (see annex) by the technical team of the Animal Traction Centre (UEM) at a local site, and following, they will sign contracts with the Centre and pay 20% of the full cost as a deposit in order to receive their implements for a one year trial period.

This group will work for one year under the supervision of the technical team and at the end will have 3 options:

- a) to not buy anything
- b) to buy the complete package
- c) to buy only some of the implements of the package.

Option a)

The farmer will return the package to the Centre and receive the 20% deposit back, minus payment for any damage to the equipment. It should be noted that normal wear and tear will not be considered damage.

Option b)

If the farmer wishes to retain the whole package, he/she will have a year to pay off his/her debt.

Option c)

If the farmer chooses only to remain with certain implements, he/she will immediately pay the balance of the debt. Regarding returned implements, the same policy will be applied as in option (a).

In the case of options (a) and/or (c) being chosen the programme team will investigate the reasons for which farmers returned the implements.

IV. SECOND PART OF THE PROGRAMME (COMMERCIALIZATION)

This part will require sufficient finance to serve as a Fund and will be used to finance businessmen (shop keepers, traders etc) who come to work with the project. This fund will be administrated by a Financing Institution and/or by Animal Traction Centre.

Details of the system to be used available from the authors.

Critical analysis of the programme

This programme will respond positively to the constraints identified in different studies regarding the commercialisation of AT implements as well as the use and dissemination of implements.

The viability of programme depends to the effective and efficient use of the equipment, which will be influenced by the monitoring and training programme to farmers.

Good implementation of the programme will encourage competition which will lead to the reduction of equipment price, thus encouraging the farmer to use a wider range of animal traction equipment.

The programme will have the following foreseen advantages and disadvantages

1 Dissemination

Advantages

This programme will allow the dissemination of the complete packages of AT implements and will allow the farmers who take part to obtain a complete package of implements on credit and without interest, providing they pay the equipment in two years. Other local farmers, will see the pilot farmers operating with the complete package and from there, they will see the advantages which are offered by the same, creating in this sense, the desire to acquire.

The farmers will have the opportunity of prolonging the payment for one more year, in this case they will pay interest for the additional time.

Farmers will benefit from different practical training courses (craftmanship, carpentry etc.).

Other advantage for farmer is the possibility which this has in reurning the complete package or a part of it and receiving a refund of his money. This possibility will induce the farmer to conserve his/her equipment.

Desadvantage

Due to the nature of the intervention and the objectives of this part of the programme, the pilot farmer does not really pay the full cost. Therefore, this phase will create some benefits in near future which at this time will be difficult to quantify.

There is a risk that farmers will exploit the scheme, return the equipment after one year and receive a full refund of their money.

2 Comercialization

The Bank/Financial Institution

The Bank (e.g: Comercial Bank, Credit Institute, Animal Traction Centre) will benefit from the deposit with the possibility of this money remaining there for many years with no risk (this will happen in case when the programme functions 100%).

Advantages

Considering that governmental policy is to maintain a stable rate of exchange to protect the local currency (the Metical), the initial capital sum will not tend to reduce because the businessmen will be paying interest which will accumulate over the years. This money will be available to spread the programme to other areas where there is a demand for AT implements.

Desadvantages

Utilization of the Fund for purposes outside the programme, particularly in the first years, will make the project unsustainable.

The financial institution risks losing money in case the government exchange policy be altered or inflation increase dramatically.

3 Businessman

Advantages

The businessman will have an additional gain in his normal profits (this gain varies according to the amount of the Fund he uses and the profit margins he applies).

The programme will allow the businessman to really know the farmers needs in terms of AT equipment and other inputs. In this way, he will increase his business.

The businessman has the guarantee of profit even if the credit given to the farmer is not paid.

Desadvantages

He will invest and concede credits at the beginning to unknown farmers.

The businessman would run the risk of not being able to sell the equipment which will then be returned.

4 The Farmer

Advantages

The farmer will have access to credit for equipment (with 14% of interest per season). With this equipment, he will become more production, working larger areas of land and hiring his team to neighbours. This will increase his income.

He will gain basic business and financial skills which will help him in the future.

Desadvantages

The farmer will have to find 15% of the initial value of the equipment which in some cases will not be easy.

He will have a risk of remaining without equipment and losing the 30% paid initially if he does not manage to pay subsequent instalment.

5 Intervenient

The intervenient will facilitate and incentivise the development of AT in the region.

6 Animal Traction Centre

The Animal Traction Centre will achieve one of its objectives, that of promoting the use of animal traction in an effective way.

To create a National network which responds to constraints in the use of AT and if necessary modifying the programme to make it more reflective of real conditions.

DRAUGHT ANIMALS PHYSIOLOGY RESEARCH PROGRAMME

By : M. Harun; P. Bagasse; F. Varinde; F. Vilela e F. Macome

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INTRODUCTION:

Animal Traction is very important for the small scale farmers concerning to agriculture and transport. The use of animal traction allows duplication of working areas which has a great impact on agricultural production and alleviates poverty and hunger, also allows the rationalisation of the use of labour force especially woman on her agricultural activities.

The physiology of draught animals is less known mainly the factors which cause fatigue, the resistance of animals to tropical conditions and the utilisation of cows as draught animals without affecting their reproductive activity.

There are indications that the equilibrium of hydride and potassium homeostasis and other electrolytes can be predetermining factors for the reduction of animal resistance to work by the fact of the reduction of hydride stocks, inducing to a diminution of heat dissipation capacity by the animal with high consequence of rectal temperature. It is also recognised that fatigue to physical exercise runs due to accumulation of potassium ions freed during muscles contraction and hydrogen ions resulting in the metabolism of anaerobe.

In certain situations, encouraging animal traction activity is negatively influenced by the existence of a reduced number of male animals available to be trained. By the fact of female animals constituting the major class in the herds, they represent a great potential for those farmers who do not own males in their herds to start with ADP activity. However, interference of physical power within the reproductive life of cows influence negatively the use of cows in animal traction. Current scientific data, believe that inadequate feeding management of cows used in animal traction is the main cause of long intervals between animal delivery. For this reason I do propose you to study the physiology for work animals in both oxen and cows.

The present work intends to give you a brief data of planned activities and recent activities at the Faculty of Veterinary on Animal Traction Physiology Research Area.

Context:

In the range of reinforcement of the existing technical scientific co-operation bond between the Faculty of Veterinary of Maputo and of Utrecht, both are currently preparing an Animal Traction Physiology Research Programme. For collection of preliminary material which helps in the programme preparation, the University of Utrecht delegated a veterinary student for a 3 months of practical training.

Objectives:

The research programme will have the following objectives:-

- to study the density of Sodium and Potassium pumps of animal muscles at cellular membrane level of the main race of cattle existing in Mozambique. (Landim, Angone e Africander), in order to verify the differences existing in the existing adaptability between the Bos taurus and Bos indicus, males and females
- to study equilibrium of hydride, potassium homeostasis and other electrolytes during work in tropical conditions;
- to study the effect and the influence of training, and the hormones in the density of Sodium and Potassium pumps

Benefits:

There is a hope that this programme can contribute to:

- give some practical elements which allow the improvement of handling draught animal specially concerning to the frequency of water ingestion and electrolytes in the different seasons of the year;
- give some elements which allow better understanding of existing interaction between the hormones, the densities of Sodium and Potassium pumps and the reproductive phenomenon of cows;
- provide scientific material for joint publications in newspapers of renown.

Work carried out:

During the practical training of the Holland student (she) and with the funds made available by University of Utrecht, it was possible to effectuate the collection of samples (biopsies blood of the muscles in trained and non-trained animals) at the Faculty of Veterinary and at Angonia and Chobela Research Centres.

Results obtained:

From the samples collected, it was possible to obtain preliminary data on:

- the equilibrium of water and the homeostasis of electrolytes (Potassium, Sodium and Chlorine);
- the density of Sodium and Potassium pumps in the skeletal muscles of three races of cattle (landim, angone and africander)

Following is the presentation of some preliminary results on The equilibrium of water and homeostasis of electrolytes (Potassium, Sodium and Chlorine):

Tabela 1

Mudanças do hematócrito durante

o Trabalho

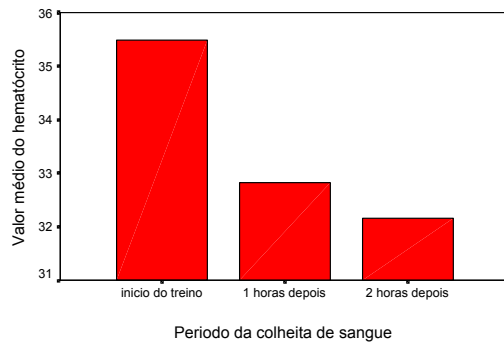


Tabela 2

Change of Potassium during work

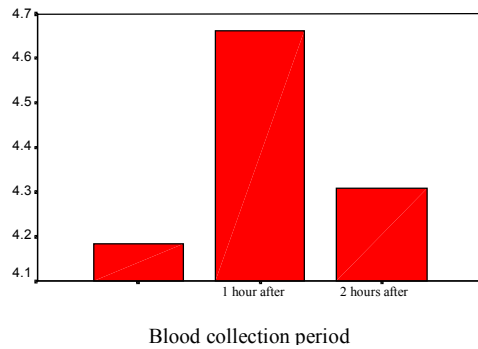


Tabela 3

Mudanças do Sódio durante

o trabalho

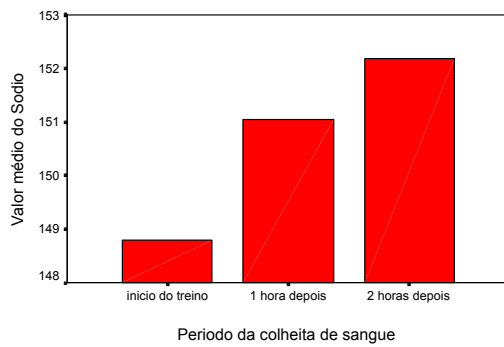


Tabela 4

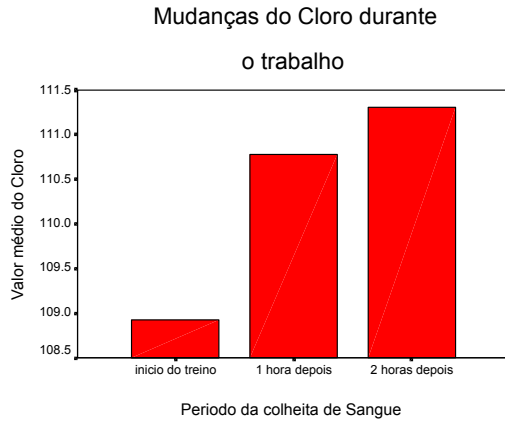


Tabela 5

Mudanças da frequência respiratória durante o trabalho

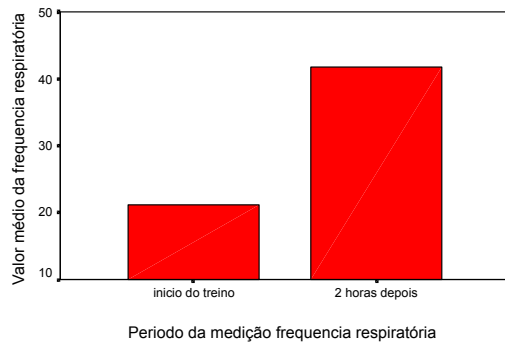
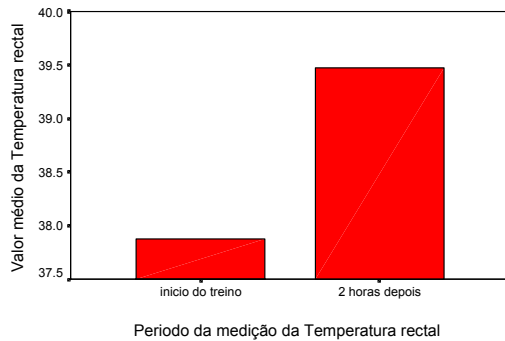


Tabela 6

Mudança da Temperatura rectal durante o trabalho



Future activities:

The main activities being carried out :

to implement the project on: An Investigation of the Equilibrium of Water and Homeostasis of Electrolytes (Potassium, Sodium and Chlorine), which has funds guaranteed by UEM (Universidade de Eduardo Mondlane) in Mozambique to conclude preparation of the scientific article for the publication.

Universidade Eduardo Mondlane

Veterinary Faculty

Research Division

TITLE:

Study of some physiological parameters of draught animal.

**Researchers:
Paulo J.C. Bagasse
Mohamed Harun**

Maputo, May 2000

Na⁺, K⁺-ATPase concentration in skeletal muscle of draught animals in Mozambique: effect of race, gender, age and training

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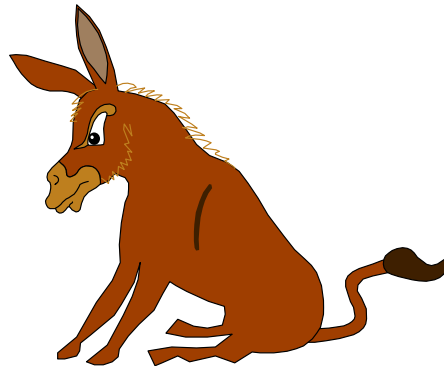
SUMMERISED GUIDELINES

for

TRAINING DRAUGHT ANIMALS



and



THE USE OF ANIMAL DRAWN IMPELEMENTS

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1. ANIMAL DRAUGHT POWER TRAINING

Training of draught animals is a systematic process, which requires trainers to be:

- Calm
- Patient
- Consistent
- Firm

During selection of draught animals the following five criteria should be observed.

- Breed
- Health
- The sex (preferable male castrate or well fed female)
- Age and weight (preferable 18-30 months and 200-300Kgs which ever comes first)
- Well built with straight legs, back strong neck, wide chest and well-developed hump.
- Good temperament

In order to avoid injuries both to the trainer and the animals during training. The four training steps must be adhered to. Only move to the next training step when the last step has been well understood by the animals.

- **First Step:** Rieming and walking (2-3 days for 3-4hrs daily in the Kraal)
- **Second Step:** Yoking and walking (7-10 days for 3-4hrs daily first in the kraal & later in the paddock)
 - **Third Step:** Pulling loads (logs) (7-14 days for 3-4hrs daily in an open fields)
 - **Fourth Step:** Pulling implements (21-30 days for 3-6hrs daily in an open field)

To facilitate and speeding of the training of draught animals make use of training aids. (Kraal, cattle-handling units, training corridors, riems, leader, older trained animal, logs)

2. HEALTH CARE

Health Care of draught animals must be observed at all times by ensuring that:

- The kraal is constructed on a well drained site
 - Observe working times for draught animals (6hrs/day in cooler times of the day)
 - Allow five minutes rest break for the animals every 30 minutes when working
 - Ensure that the harness are kept supple and clean
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- The daily health check for draught animals would include:

- Breathing and chewing of the cud by the animal (should be normal)
 - Observed when the animal is standing up from rest (It should stretch it's rear and front legs and pass dung)
 - It must have a smooth and shiny coat
 - Ears should be alert and moving to and for
 - Eyes should be bright and clear
 - No fresh wounds, swellings or ticks on the animal
 - Muzzle should be cool and moist, but not watery
 - It should walk normally
 - It should show signs of good appetite and not rapid loss of condition
- Draught animals must receive enough time for grazing and should receive supplementary feed

3. HARNESSING

Care should be taken when yoking the draught animals to avoid accidents

- Never yoke the draught animal, whilst standing in front of the yoke (stand at the side of the animal)
- Ensure that you use the right type of yoke for various jobs
 - The ploughing yoke (140-150cm long)
 - The carting yoke (170-190cm long)
 - The cultivating yoke (240cm long)

4. TILLAGE

Land preparation has two stages

- Primary tillage (Initial preparation of soil for crop production)
- Secondary tillage (Creation of a finer tilth for crop germination and seed bed preparation)

Different type of implements are used in various stages of land preparation

- Primary tillage
 - plough (cuts, breaks, loosens and inverts the soil)
 - Ridger (forms ridges, makes erosion control structures)
 - Ripper (open furrows only where planting is to be done)

- Secondary tillage
 - harrow (break clods to finer tilth)
 - cultivator (removes weeds between rows of growing crops)
 - planter (calibrates and plants seeds)
 - ridger (used also for weeding)

5. PLOUGHING

Knowledge in implement handling and setting is vital to achieve good tillage practices. It is recommended when ploughing to reach an optimum depth of 20cm and 5-8cm when weeding.

- Ploughing time is divided into:
 - Autumn (April/May)
 - Early winter (June/July)
 - Late winter (July/August/September)
 - After first rains (October/November/December)
- Adhere to planning rules for ploughing in order to maintain the soil profile.
 - Plough across the slope for all the land with 2-5% slope.
 - Avoid ploughing on the land with slopes above 5-12%, as the contours in this type of land tend to be too close to each other. This type of land would need a lot of earth moving, if it has to be cultivated.
 - Plough the whole area of the field, but only once
 - Plough to the natural boundaries and maintain the edges of the field
 - Avoid trampling freshly ploughed land and contour banks.
 - Alternate the ploughing pattern every year i.e. casting and gathering.
 - Avoid long furrows of over 200m and width of the land over 30m
 - Ensure that the number of finishing furrows are kept to the minimum
 - When ploughing ensure that the furrows are parallel to each other.
- Two ploughing patterns are normally used to maintain the soil profile over years.
 - Gathering (finishing furrow is at the edge of the field)
 - Casting (finishing furrow is at the centre of the field)
- When gathering finishing furrows at the edges create no problem; while during casting avoid deep finishing furrows to prevent water logging and siltation.
- Finishing furrows when casting should be:
 - narrow and shallow
 - gradually sloping soil surface and furrow bottoms from full depth ploughing to finishing furrow.
 - Clean, with no unploughed portions
 - one line of hoof prints on either side of the finishing furrow.

6. USE OF ANIMAL DRAUGHT POWER IMPLEMENTS

Plough setting is important for achieving the required penetration, width of cut, good burial and packing, and clean level furrows with maximum aeration.

- Plough setting is always concerned with:
 - Depth of furrow setting
 - Steadying wheel setting
 - Width of furrow setting
- Plough setting procedures are as follows:
 - Raise the steadying wheel as high as possible
 - Set the required depth by using the hitch assembly, lower the adjusting bar down for a shallow depth and raise it up for a deeper depth.
 - Lower the steadying wheel to just touch the ground when the plough is in the soil.
 - Set the width of cut by using the hitch assembly; slide the adjusting bar bracket to the left for wider cut and to the right for a narrow cut.
 - Try out and re-adjust if necessary.
 - Use the standard 2.9 metres trek chain.
 - Use the correct type of yoke
- When ploughing use both hands, and keep the plough upright and maintain the beam parallel to the ground.
- Avoid ploughing the headland by lifting the plough and lean to the right when reaching the scratch mark.
- Ploughing at 20cm depth gives a suitable crop root development, improves infiltration, Water storage and draught power.

The harrow is mainly used to break the clods to finer tilth, uproot weeds, and rake off excess trash, grass, weeds and micro levelling of the top layer of the ploughed field.

- The harrow is set to reduce and increase the working depth
- To increase the depth
 - Add weight onto the frame (use sand bags or logs)
 - Reduce the number of teeth (reduces the clod breaking)
 - Put the teeth inclined forward
- To reduce the depth
 - Remove any extra weight
 - Increase the number of teeth
 - Put the teeth inclined backwards
- Use a suitable yoke (ploughing or carting) to ensure that the harrow covers the hoof prints of draught animals.
- Harrow across the slope and across the furrows after ploughing

- Use the aid of the riem attached to the rear of the harrow to facilitate lifting the harrow when it becomes clogged with clods or thrash
- Deposit the collected thrash, weeds and grass by the harrow at the end of the field.

Cultivators are normally used to remove weeds between rows of growing crops, but could be also used for seedbed preparation.

Cultivators work well in crops with weeds still fairly small and under fairly dry conditions, early weeding and weeding on sunny days is recommended.

- When preparing a cultivator for weeding task always consider the following points:
 - selecting suitable tine holders
 - selecting suitable number and type of tines
 - depth setting
 - support wheel
 - length of chain
 - angle of attack
 - type of yoke (depends on the row width)
- Two types of tine holders are available.
 - spring (working depth varies due to vibrations of tines)
 - rigid (working depth is maintained)
- Cultivators are set to reduce, increase the depth and the operational width.
- To increase working depth. (normally 5cm)
 - lengthen the chain
 - put the wheel higher
 - steepen the angle of attack (adjust the tines backwards)
- To decrease working depth.
 - shorten the trek chain
 - lower the wheel
 - reduce the angle of attack (adjust the tines forwards)
- Width adjustment is only possible with adjustable cultivators.
 - use the handle to adjust the width operations according to row distances
- Use the right type of yoke and choose the spiral pattern in blocks of five rows to avoid sharp turns and animals trampling on the weeded rows before the grass is dry.

The ridger is used for inter-row cultivation, harvesting of root, tuber crops, form ridges, and beds on which to plant crops. This tends to shape the surface of the field and improve soil and water conservation. They can also be used to channel irrigation water and creating better growing environment for crops.

- The ridger is set to reduce, increase penetration, width setting and the cutting depth of the rudder.
- To increase the penetration.
 - lift the hitching point
 - raise the steadying wheel
 - possibly lengthen the chain
- To reduce the penetration
 - lower the hitching point
 - lower the steadying wheel
 - possible shorten the chain
- Width setting
 - to move more soil sideways, open the wings (this also tends to reduce the height of the ridge)
 - to move less soil sideways, close the wings (this also tends to increase the height of the ridge)
- Firstly do the width and the depth settings, and then proceed to set the rudder to cut at 3-5cm deeper than the share.
- The yoke to be used for ridging should be double the width of the ridge.

7. MAINTENANCE OF ANIMAL DRAUGHT POWER IMPLEMENTS

To achieve a long lifespan with animal draught power implements great care must be taken by ensuring that daily and seasonal maintenance are carried out frequently.

- **Daily maintenance**
 - **scrape off soil in the field**
 - tighten all bolt and nuts
 - check wearing parts
 - wash and oil the implements if not to be used within five days
 - store under shed away from livestock

N.B: Never oil the wheel axle
- **Seasonal maintenance**
 - check the body parts and wheel for wear and obtain replacements if necessary
 - strip the implements completely
 - clean all the parts and paint them if possible
 - replace worn out nuts and bolts
 - assemble the implements and oil them if there were not painted
 - store the implements in the safe, dry place

N.B: Always keep in stock important spares parts for each implement

8. TRANSPORT

The animals offer a more efficient way of moving goods over short distances

- **Different type of animal propelled mode of transport are:**
 - **ox-carts**
 - **sledge**
 - **trailers**
- **Animals can also be used as pack animals (transporting loads individual on their backs)**
- Pack animals and other animal propelled mode of transport have higher carrying capacity than humans do.
- Animal based transport can alleviate time constraints on agricultural production and domestic activities on seasonal peak periods.
- Rural transport can facilitate other income generating activities and can bring social or health benefits to the household.
- Pack animals and carts can operate on lower quality tracks and paths than motor vehicles and do not require fuel.
- Farmers tend to neglect the carrying capacity of animals for financial gains.

The table below shows different carrying capacities of various modes of transports

Means of Transport	Load Capacity (kg)	Typical Speed (km/hour)	Load Carrying Capacity (tonne per km per hour)
Human (head)	25	4	0.1
Donkey (pack-load)	50	5	0.25
Ox-cart	1000	4	4
Two wheel tractor	1000	10	10
Tractor/trailer	3000	20	60
Truck	10000	50	500

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PART-IV. FIELD VISITS

Afternoon 13.6.2000: work groups visit farmers who use AT in the area of Selva, Manica Province.

A questionnaire was used for the field visit, adapted from the original by Mr Paul Starkey.

1. What kind of people use animal traction?
Why?
2. What kind of people do not use animal traction?
Why?
3. For what purposes people use AT?
Why?
4. What type of animal traction equipment do people use?
Why?
5. What type of AT equipment do people not use?
Why?
6. What breeds and sex of animals do people use for AT?
Why?
7. Who in fact use animals, men/women/boys/girls/youths/elders?
Why?
8. Who benefit from using AT, men/women/boys/girls/youths/elders?
Why?

9. What do people think are the main benefits of AT?
(List according to importance)

9.1

9.2

9.3

Other:

10. What do people think are the main problems associated with animal traction?

10.1

10.2

10.3

Other:

11. What do people think have been the main changes in AT in the past 20 years?

12. Which are technological changes people think will happen in using AT in the next 20 years?

13. What do farmers think can be done to improve the practise and adoption rate of AT in the next 5 to 10 years?

14. What specific knowledge or lessons did members of the group obtain in their discussion with farmers?

14.1

14.2

14.3

14.4

14.5

Other:

15. What other knowledge or lessons have members of the group obtained from farmers today?

PART-IV: Presentation and discussion of the findings and recommendation of work groups from the field visits.

- Cattle are the main animals used for AT.
- Both oxen and cows are used for AT.
- Animal traction is mainly used by youths.
- AT is mainly used for ploughing, weeding and transport.
- Animals have adequate health support.
- There is a need to increase technological packages.
- AT is an alternative source of safe energy.
- Women participate in AT.
- AT facilitates work.
- Cultivation of bigger portions of land.
- Great income.
- Reduces labour force.
- Need of credit access for animal traction.
- Training is done in the Village (by the villagers) that is reason why there is no new technological package.
- The use of Animal Traction has reduced substantially the use of the hoe in the region.
- Those who practise AT have a higher level of well being than others.
- Farmers with animal traction invest their income in other business.
- Farmers have a hiring system of animals as the way to maintain their herds of cattle.
- Farmers supplement their animals.
- There are few spare parts and implements at the local shops.

Basing on the findings of the farmers visit, three new groups were formed to discuss the following themes for the development of animal traction in Mozambique.

1. Animal traction policy.
2. Technical aspects.
3. Steps to be followed.

Basing on the work in groups the following final workshop statement was prepared

WORKSHOP ON ANIMAL TRACTION IN MOÇAMBIQUE

A Promising Technology For Small Scale Farmers

Final Statement

More than 70 delegates from different areas of the country, and from neighbouring countries participated in a Seminar on Animal Traction in Moçambique, held at the Instituto Agrário de Chimoio from the 12th to 14th June 2000, promoted by VETAID and funded by the European Commission:

- Considering the importance of the use of AT and the need for the dissemination of AT for agricultural development in Mozambique, based on the experiences of Africa and the rest of the World.
- Considering that, in the past 10 years, no special attention has been given to this technology with all the associated negative consequences.
- Taking into consideration the needs of the farmers and the small scale farming sector and the strategy for increasing food production, in the battle against hunger and the relief of poverty.
- Taking in account the historical background of animal traction in Moçambique, of its practical experiences and initiatives and the current animal traction activities in several areas of the country.
- Recognizing the need for multi-sectorial and inter-institutional involvement aiming to promote animal traction.
- Recognizing the benefits brought by animal traction to its users in terms of the improvement in well being.

Encourage:

- a) The government, the Private Sector, the NGOs, Donors and the interested parties, to support and give importance to the use of animal traction in Moçambique.
- b) Specially the Government, to:
 - ensure the definition and approval of a governmental policy in relation to animal traction and a national strategy for the development of this technology.
 - institute within the appropriate governmental department, a sector responsible for agricultural mechanization which includes Animal Traction.

- To promote the involvement of the public sectors: agriculture, industry, commerce science and technology, transport and the rural development in the process of re-launching animal traction throughout the country.
- c) Agricultural technicians at all levels, to accept the challenges related to publicity, training and dissemination of animal traction technology in the districts and rural areas.
- d) Researchers and academicians to give their contribution in the development of research activities of improved techniques, equipment and working conditions in the use of animal traction.
- e) Private sector to study conducive ways to improve the commercialization of livestock, agricultural products and equipment and facilitate credit conditions for animal traction.

The participants reiterate the principle that, only with the active involvement of all the above mentioned intervenients, will it be possible to achieve progress which will benefit local economies and promote the improvement of the rural life conditions, the well-being of farmers and the progress of the country.

Chimoio, 14th June 2000.
