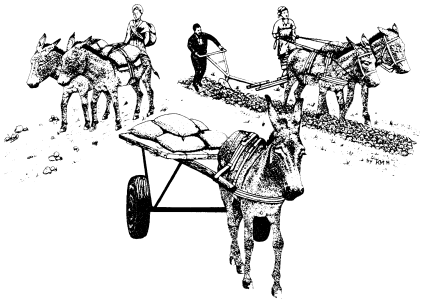
Animal Traction Network for Eastern and Southern Africa
(ATNESA)



Improving donkey utilisation and management

Report of the international ATNESA workshop held 5-9 May 1997, Debre Zeit, Ethiopia

Prepared by
Dr A Aboud, Tanzania
Dr Alemu Gebre Wold, Ethiopia
Mr Martin Bwalya, Zambia
Prof Feseha Gebreab, Ethiopia
Dr Dennis Fielding, UK
Ms Catherine Morris, UK
Dr Pamela Mueller, USA
Prof Paul Starkey, UK
Ms Elizabeth Baslyos, Ethiopia

Edited by
Paul Starkey

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Faculty of Veterinary Medicine (Ethiopia) and collaborating NGOs in Ethiopia
(Farm-Africa, Norwegian Church Aid, Oxfam Canada, Selam Vocational Centre, World Vision)

Animal Traction Network for
Eastern and Southern Africa

ATNESA Secretariat
(Attn Bertha MUDAMBURI)
Agritex Institute of Agricultural Engineering
PO Box 330, Borrowdale, Harare, ZIMBABWE
Tel: + 263-4-860019 /55
Fax: + 263-4-860136
Email: atnesa@interzim.icon.co.zw

Ethiopia Network on
Animal Traction

Donkey Workshop and ENAT Commitee
c/o Dr ALEMU Gebre Wold
Institute of Agricultural Research (IAR)
PO Box 2003, Addis Ababa, ETHIOPIA
Tel: + 251-1-511802
Fax: + 251-1-611222
Email: iar@telecom.net.et

ATNESA contact addresses
A list of ATNESA committee members and national animal traction networks is provided at the end of this report

Responsibility for the information and opinions presented in this report rests with the workshop rapporteurs and editors. The opinions reported do not necessarily reflect the views of ATNESA nor those of the various organisations that supported the workshop and this publication.

Cover picture
Donkeys carrying hay, Ethiopia
Photo: Paul Starkey ©

Document preparation and publication by
Professor Paul Starkey, ATNESA Technical Adviser
Centre for Agricultural Strategy, University of Reading
Animal Traction Development
Oxgate, 64 Northcourt Avenue, Reading RG2 7HQ, United Kingdom
Phone: + 44 (0)118 987 2152; Fax: + 44 (0)118 931 4525
E-mail: P.H.Starkey@reading.ac.uk

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ATNESA

The Animal Traction Network for Eastern and Southern Africa (ATNESA) was formed in 1990 to improve information exchange and regional cooperation relating to animal draft power. The network aims to unite researchers, manufacturers, development workers, institutions and the users of animal traction in the region. Membership of the network is open to all individuals and organisations interested in its objectives.

The ATNESA steering committee, elected during major workshops, includes animal traction specialists from six countries in the region, as well as representatives of interested resource organisations. The committee initiates, coordinates and facilitates a variety of network arrangements.

ATNESA encourages the formation and operation of national animal traction networks, whether formal or informal. Responsibility for implementing ATNESA activities is delegated to these national networks and to ATNESA members in different countries.

ATNESA, in collaboration with national networks and other organisations, has arranged international workshop on several themes including
Improving animal traction technology (Zambia, 1992)
Gender issues in animal traction (Tanzania, 1992)
Design, testing and production of animal-drawn carts (Zimbabwe, 1993)
Weed control using animal power (Tanzania, 1993)
Meeting the challenges of animal traction (Kenya, 1995).
More than 300 people from 35 countries have participated in ATNESA international workshops and several resource publications have been produced.

ATNESA has a small secretariat in Zimbabwe to assist international liaison. Nevertheless, ATNESA encouraged interested people to work with their local national networks and to contact directly their colleagues in other countries.

The addresses of ATNESA national networks, ATNESA committe members and collaborating organisations are given at the end of this publication.

ATNESA Secretariat
(Attn Ms Bertha MUDAMBURI)
Agritex Institute of Agricultural Engineering
PO Box BW 330, Borrowdale, Harare, ZIMBABWE
Tel: + 263-4-860019; Fax:+ 263-4-860136
E-mail: atnesa@interzim.icon.co.zw

Workshop summary

Donkey power in perspective

Donkey power is an important resource whose efficiency of use can be improved. Power (animal, mechanical or human) is required for urban and rural development. In many countries, the donkey is the work animal which has the most to offer in assisting rural people and alleviating poverty. This is particularly true in the difficult circumstances of the arid and semi-arid tropics to which the donkey is naturally well-adapted. Several participants at the workshop reported that the use of donkeys has expanded quite rapidly in East, West and Southern Africa in recent years. This is seen in the growth of donkey populations in most African countries and also higher prices for donkeys. Paradoxically, donkeys are often associated with poverty and hard conditions, whereas they are often used to alleviate such poverty. They are often part of the solution, yet their image is with the problem itself.

While donkeys mainly transport goods and/or people, they assist men, women and children in many ways:

- pack transport of numerous items including water, wood, grain, manure, forage, bricks and even weapons (donkeys helped win wars in Ethiopia);
- cart transport for people or larger quantities of goods which cannot be handled by pack methods;
- soil cultivation and weeding using single donkeys or teams of donkeys.

In several countries donkeys have survived drought years better than cattle. This, combined with the high cost of oxen and/or the effects of animal disease, has caused many farmers to turn to the donkey as an alternative power source. The adoption of donkeys has been mainly a result of farmer innovation and farmer-to-farmer technology transfer and has had little to do with the formal extension services.

The donkey is the work animal which has received least attention. In many instances, it has been totally ignored by extension services, scientists, planners and policy makers. There is little documentation on the present use of donkeys and associated benefits and constraints. Despite the increasing importance of donkeys in Africa, there is still no international research centre with a programme aimed at improving donkey performance and utilisation.

ATNESA and workshop objectives

The Animal Traction Network for Eastern and Southern Africa (ATNESA) aims to unite researchers, manufacturers, development workers, institutions and the users of animal traction in the region. More than 300 people from 35 countries have participated in previous ATNESA workshops, one of which concluded that a workshop was needed on 'Improving donkey management and utilisation'. The objective was to bring together regional specialists involved in research, development and extension relating to the utilisation of donkeys in order to exchange information, critically review donkey technologies, research and extension experiences, identify needs and make plans for action and collaboration.

Location, host, sponsors and participants

The workshop was held from 5-9 May 1997 at Debre Zeit, Ethiopia. The workshop committee included staff of the Institute of Agricultural Research (IAR), the University of Addis Ababa, the Ministry of Agriculture and several Ethiopian-based NGO development agencies. The core costs of the workshop were funded by the Directorate General for International Cooperation (DGIS) of the Netherlands

Participation was open to all involved in research, training, extension and welfare programmes relating to donkeys and who were prepared to produce a paper or poster illustrating their area of special interest and expertise. A total of 85 people from 23 countries were present at the workshop. These included 60 from ATNESA member countries with the rest coming from West and North Africa, Europe, Asia and the Americas. Most participants were sponsored by their own organisations, by DGIS or by the Technical Centre for Agricultural and Rural Cooperation (CTA).

Methodology and participatory approach

Prior to the workshop, papers and abstracts had been circulated in a series of workshop readers. At the start of the workshop, participants mounted their posters, photographic displays and examples of harnessing systems, implements and carts. These were available for viewing and discussion throughout the week. The workshop methodology involved a combination of technical presentations, practical demonstrations, field visits and group discussions. Working in groups, participants were able to reflect on the key points of demonstrations and field visits and to share these with other groups in plenary sessions. Once major issues had been identified specialist groups were set up to examine these issues in greater detail and to report back with recommendations and proposals for future action. Participants commented on the workshop's content and organisation in an anonymous evaluation.

The approach to promoting rural development has evolved over recent years from technology transfer with ready-made prescriptions to one of participation and respect for indigenous knowledge and practices. Farmers (women and men) and rural entrepreneurs (women and men) are now offered choices and options that often complement rather than replace their existing methods. The following summary of the workshop's activities and outputs is presented with the participatory approach as its underlying philosophy.

Nutrition

The importance of nutrition in donkey management is paramount. Without good nutrition a donkey does not grow properly, it remains small and weak, it is

susceptible to diseases and fails to reproduce. Even a small improvement in nutrition can have a considerable impact on the overall efficiency of the donkey as a power unit. Good nutrition results in rapid growth and a strong skeleton that is needed for a high work output. Good nutrition results in an effective immune system which enables the donkey to fight disease organisms, generally overcoming the disease challenge. Sound hooves, regular breeding and overall well-being are also clearly dependent on good nutrition. Unfortunately the benefits of good nutrition tend to be expressed over the medium term and are not so evident in the short-term as compared to for example, the effect of fertiliser on the growth of crops. It is important for researchers and extension workers to understand farmers' existing practices and their logic.

Farmers often know ways to improve the condition of their animals, but they are constrained by lack of resources. Working with farmers to identify affordable ways by which donkey nutrition can be improved is not easy. The technical options include feeding more food, feeding better quality food, using crop by-products, using concentrates, providing minerals and vitamins, ensuring adequate water and using feeding troughs to minimise waste. It may be useful to stimulate discussion amongst donkey users concerning these technical options to help identify affordable and acceptable practices that improve donkey nutrition.

Technology, harnessing and carts

The variety of technology options demonstrated at the workshop was wide. It ranged from the traditional harnessing and carts as used by Ethiopian donkey users through to new and novel plows and carts which used a combination of the old and the new in terms of design and harnessing. The challenge in improving both harness and implement technologies is to improve the efficiency of work output, which will at the same time improve welfare, in a way that is available, affordable and sustainable. This is a huge task for those involved in stimulating discussion on these issues with farmers and in presenting to them the new options. Undoubtedly farmers will only be convinced through observation and trial in their own conditions. Through such trials, farmers and artisans may well suggest modifications and become recognised as active partners in technology development processes. Many of the participants called for such long-term testing in field conditions of the harnessing and carts that were available for examination during the workshop.

Socio-economics, extension and training

Many participants reported unhelpful and negative attitudes towards donkeys in their respective countries, including Ethiopia. However, economic research undertaken in Ethiopia and elsewhere has demonstrated that donkey transport not only reduces drudgery, it also makes major economic contributions to household incomes and to national production and economic development. This exemplifies the paradox encountered in many countries where donkeys make major contributions to people's livelihoods, yet they remain unacknowledged and unsupported. In these circumstances research or extension work involving donkeys is clearly not easy. Fortunately information and data are now accumulating, as through this workshop, so that more effective extension material can be produced in both the written and visual forms.

There is a need to influence national decision makers to create an enabling environment for donkey users and those working with them. Suggestions were made during the workshop as to how decision makers might be contacted and influenced in their thinking and attitudes concerning donkeys and donkey projects through appropriate lobbying activities. Attention was also given to so-called "process skills" for promoting constructive interaction between individuals including how to listen to farmers, how to facilitate farmers and how to help farmers to help each other.

Future actions

The workshop generated much enthusiasm for further action. Most will be carried out at local level by workshop participants working with national networks and cooperating organisations. As a direct result of workshop exchanges and discussions, a wide variety of programmes of cooperation and collaboration will be developed between the many organisations and individuals who were represented at the workshop. Among the countries involved in such follow up proposals were Cameroon, Ethiopia, Kenya, Namibia, South Africa, Tanzania, UK, Zambia and Zimbabwe.

The special place of Ethiopia as a country with a long history of donkey use was stressed and it was proposed that a project be undertaken to record and report the indigenous knowledge of equid use in the country. The Ethiopian Network on Animal Traction (ENAT) will be strengthened and will develop a range of activities.

Although new information needs to be obtained, there is already much knowledge and experience relating to donkeys. This is sufficient to justify a new wave of publicity and training materials in the form of pamphlets, booklets, extension manuals and textbooks. The preparation of these documents within the region should be linked with the development of curricula on donkeys in schools, colleges and universities.

Modern technology has made the video film an effective medium for information dissemination. The videos shown during the workshop demonstrated this clearly. The participants would like to expand the range of titles and topics in this format.

In order to maintain the momentum generated at the workshop and to coordinate follow-up actions, it was agreed to set up three task forces on nutrition, tillage and technology and policy and socio-economic issues. These working and monitoring groups hope to attract support for relevant donkey programmes and activities from sympathetic sponsors. There was also a call for the appointment of an ATNESA harnessing adviser (or advisory group) to work with national networks and assist with harness demonstration and trials.

Preface and acknowledgements

Workshop organisation and support

The ATNESA workshop on *Improving donkey utilisation and management* held in Ethiopia was the culmination of a long process of planning and cooperation. This involved members of the ATNESA steering committee, the workshop committee and resource organisations in several countries. The success of the workshop was only possible due to the good will and hard work of many different people.

The ATNESA steering committee and the workshop reporting team would like to thank all those people who made the workshop possible, and who assisted in the preparation of this report.

The host organisation was the Institute of Agricultural Research (IAR) of the Ministry of Agriculture. Special thanks go to H.E. Ato Getachew Tekle Medlin, Vice Minister of Agriculture, Dr Taddese Gebre Medhin, IAR General Manager and Dr Getinet Gebeyehu, IAR Deputy General Manager (Research) and Ato Tamiru Habte, Head of Rural Technology Promotion.

The workshop was organised by a local committee with representatives of IAR, the Ministry of Agriculture, the University of Addis Ababa, and Ethiopian-based NGO development agencies. The committee comprised:

- Prof Feseha Gebreab, Veterinary Faculty
- Dr Alemu Gebre Wold, IAR
- Kathy Marshall, Oxfam Canada
- Abiye Astatke, ILRI
- Abule Ebro, Adami Tulu Research Centre
- Belete Tefera, Norwegian Church Aid
- Friew Kelemu, Nazaret Research Centre
- Kebede Desta, Ministry of Agriculture
- Kettema Yilma, Farm-Africa (Ethiopia)
- David Roschli, Selam Vocational Centre
- Sisay Zenebe, National Urban Planning Institute
- Yilma Getatchew, World Vision Ethiopia
- Yonas Metaferia, Ministry of Agriculture
- Zahra Ali, Farm-Africa (Ethiopia)
- Dr T E Simalenga, ATNESA Chair
- Prof Paul Starkey, ATNESA Technical Adviser.

Grateful thanks are due to all these people for their dedication and hard work. Particular thanks are due to the Committee Chairman (Prof Feseha Gebreab), the Committee Secretary (Dr Alemu Gebre Wold) and the Liaison Secretary (Kathy Marshall) for their great devotion. Gratitude is also due to the many organisations represented on the committee who provided much practical assistance and logistical support. Special mention is made of the host organisation, IAR, as well as Oxfam Canada, Selam Centre, the Veterinary Faculty, Farm-Africa and Adami Tulu.

The workshop secretariat and other core costs of the workshop were funded by the Directorate General for International Cooperation (DGIS) of The Netherlands which also sponsored some participants. Special appreciation is due to Mr Leen Molenaar for his support and help in securing the funds.

Most participants were sponsored by their own organisations or by agencies within their countries. Appreciation is due to these sponsoring organisations for allowing so many participants to gain from the workshop. Among the organisations sponsoring more than one participant was the Food and Agriculture Organisation of the United Nations (FAO).

The Technical Centre for Agricultural and Rural Cooperation (CTA) based in The Netherlands is thanked for kindly agreeing to sponsor several participants. The UK-based International Donkey Protection Trust not only sponsored some participants, it also kindly allowed one of its staff to assist with the workshop reporting exercise.

The workshop was held at the Debre Zeit Management Training Centre. The management was extremely helpful and provided an excellent service. This was greatly appreciated by the organisers, as well as by the participants who gave very positive evaluation comments.

Workshop reporting and synthesis

During the workshop very many people acted as rapporteurs of plenary sessions, group discussions and evening meetings. In fact the majority of the participants assisted in this way, and all are warmly thanked. Their work was coordinated by Martin Bwalya (Chief Rapporteur) assisted by Catherine Morris. A great deal of the content of this report derives directly from the various rapporteurs.

After the workshop, a team of invited people worked together to condense the activities of the week into a draft report. The team comprised:

- Dr A Aboud, Tanzania
- Dr Alemu Gebre Wold, Ethiopia
- Mr Martin Bwalya, Zambia
- Prof Feseha Gebreab, Ethiopia
- Dr Denis Fielding, UK
- Ms Catherine Morris, UK
- Dr Pamela Mueller, USA
- Prof Paul Starkey, UK.

Ms Elizabeth Baslyo of IAR assisted with computer skills and word processing. The draft report was edited and finalised by Paul Starkey.

Attempting to capture and distil all the information from such an energetic workshop into just 60 pages has not been easy. Sometimes complex ideas and discussions have been oversimplified. For example, one of the optional evening sessions was so stimulating that two separate reports were written to summarise the deliberations, and these had to be condensed and simplified for the purposes of this

publication. The reporters and editor accept responsibility for the limitations and the inaccuracies.

The original intention had been to produce this report within a few weeks of the workshop, but the size of the task and other work commitments caused the schedule to slip. The editor accepts responsibility for this and apologises for the delay. It is hoped that the content and presentation of this publication will make it a valuable resource document for those who attended the workshop and for others concerned with donkey utilisation.

Follow ups

The workshop will be followed up in a number of ways, as outlined in this report. The papers submitted to the workshop are being edited for publication in two resource books. One volume (tentatively entitled Donkeys, People and Development) will include contributions relating to the roles of donkeys in different countries, and to project experiences. The second volume (tentatively entitled Donkeys and Donkey Technology) will include papers relating to the animals (husbandry, health, nutrition, breeding) and associated technologies (harnesses, implements, carts). The Donkey Bibliography, that was circulated as a reader before the workshop will be expanded. These volumes will be published by ATNESA and copies will be sent to workshop participants and supporting organisations.

In line with ATNESA policy and practices, most workshop follow-ups will take place within the context of the national programmes in Eastern and Southern Africa. The contact addresses of the national networks and programmes are given at the back of this report.

Forthcoming ATNESA workshops will build on the conclusions and lessons of this workshop. Planning is underway for the next wide-ranging ATNESA workshop (with General Assembly). This will be held 20-24 September 1999 in Mpumalanga, South Africa with an overall theme of *'Empowering farmers through animal traction'*. For more information please contact SANAT direct (in case of problems contact the ATNESA Secretariat or any ATNESA committee member). Prior to this, there will be a thematic regional workshop on conservation tillage using animal power (donkeys or cattle) and related environmental issues. This will be held in Namibia from 5-10 October, 1998. Please contact the Namibia national programme direct for more information (or ATNESA Secretariat). The contacts and addresses are at the end of this report.

On behalf of the ATNESA Steering Committee and the Donkey Workshop Reporting Team, very grateful appreciation is given to all individuals and organisations that assisted with this Donkey Workshop and warm encouragement is given to all those who are now engaged in the follow-up activities.

Professor Paul Starkey
ATNESA Technical Adviser

Workshop reporting team (Dennis Fielding, Ali Aboud, Pamela Mueller, Alemu G/Wold Martin Bwalya, Feseha Gebreab, Paul Starkey, Catherine Morris and Elizabeth Baslyos)

An overview of the workshop

Workshop background

In recent years, the use of donkeys has expanded rapidly in Eastern and Southern Africa. Donkeys are employed for pack transport, carting, weeding and soil tillage. In several countries donkeys have survived the recent drought years better than cattle. Adoption of donkeys has been mainly a result of farmer innovation and farmer-to-farmer technology transfer and has had little to do with the formal extension services. Few changes in the manner and extent to which donkeys are being employed have been formally reported. In most countries there is little or no documentation on the present use of donkeys, or on associated benefits and constraints.

At recent ATNESA workshops, the present importance and future potential of the donkey has been stressed, notably in connection with donkey-drawn carts, inter-row weeding and their use by women. Despite the increasing importance of donkeys, in most countries in Eastern and Southern Africa there is no formal education or training at any level relating to donkeys. Few people in development projects or research and extension services know anything about donkey utilisation for transport or cultivation, nor about related harnessing, equipment, management, selection, feeding or health care. In several countries in the region, donkeys appear to be routinely used with inefficient and often cruel harnessing systems. They are frequently over-laden. Farmers and extension workers are generally unaware that more efficient and humane systems exist. There is an urgent need to exchange information on systems of donkey use and on ways in which their management and utilisation can be improved.

Ethiopia has the highest donkey population in Africa. Donkeys are mainly used for pack transport. They play an extremely important role in rural marketing and water collection. Thousands of donkeys enter Addis Ababa and other urban centres each day, carrying fuel, forage, food grains and other produce. A generation ago, the use of donkey carts was rare, but cart numbers are rapidly increasing, notably in the Rift Valley. Although oxen are used for plowing, some farmers without oxen have started to use donkeys to plow, despite a lack of appropriate donkey harnesses and suitable implements.

Workshop objectives

The objective of the workshop was to bring together national and regional specialists involved in research, development and extension relating to the utilisation of donkeys in order to:

- exchange information and regional experiences in the field;
- critically review research development and extension messages on the use of donkeys that have been tried in recent years;
- critically review existing donkey technologies (harnesses, carts, pack-saddles, plows, cultivators, etc), management systems (selection, feeding, husbandry), socio-economic issues (profitability, gender, cultural perceptions) and environmental implications (drought effects, grazing systems);
- analyse present and future needs for improving the utilisation and management of donkeys;
- make collaborative, strategic plans for meeting these needs at country and regional levels;
- identify specific needs for resource publications such as practical manuals for training and extension staff and/or farmers as well as guidelines for promoting donkey utilisation and initiate the preparation of such publications.

Workshop theme

The theme was ‘Improving donkey management and utilisation’. The sub-themes included:

- Regional experiences in using donkeys for transport operations.
- Regional experiences in using donkeys for tillage in various farm systems.
- Design requirements for harnesses, implements and carts for donkey use.
- Social and gender issues related to donkey use.
- Economic implications and credit requirements in donkey use.
- Training and extension methodologies.
- Donkey health, management and nutrition.
- Research needs relating to donkeys.

Participants

Participation at this workshop was open to all persons involved in research, training, extension and welfare programs relating to donkeys.

A total of 85 people from 23 countries participated. These included 60 from ATNESA member countries and the rest from West and North Africa, Europe, Asia and the Americas.

Opening ceremony

Workshop speakers (Kathy Marshall, Dr Simalenga, Prof Feseha Gebreab)

Participation was rich, bringing in a very wide representation of organisations and individuals, diverse in experiences, from various disciplines, countries and regions. The names and addresses of all participants are listed later in this report.

Host, location and sponsorship

The workshop was hosted by Ethiopia through a combined team of representatives of the Ministry of Agriculture, the Institute of Agricultural Research (IAR), the University of Addis Ababa, and several Ethiopian-based NGO development agencies, including FarmAfrica, Norwegian Church Aid, Oxfam Canada, Selam Vocational Centre and World Vision. The workshop was held at the Debre Zeit Management Training Centre about 50 km from Addis Ababa. All participants stayed at the Centre. The Centre had good conference facilities and meeting rooms, with comfortable boarding and lodging facilities supported by excellent services.

The workshop secretariat and other core costs of the workshop were funded by the Directorate General for International Cooperation (DGIS) of the Netherlands which also sponsored some participants. Most participants were sponsored by their own organisations or by agencies within their countries. Among the organisations sponsoring participants were the Technical Centre for Agricultural and Rural Cooperation (CTA), based in The Netherlands, the International Donkey Protection Trust, based in the UK and the Food and Agriculture Organisation of the United Nations (FAO).

Methodology

The workshop methodology was built on the experience of previous ATNESA workshops. It involved five days of intense interaction through participatory methods to facilitate in-depth exchange of experiences, whilst at the same time allowing critical, yet constructive discussions.

The programme involved presentation of lead papers, technology demonstrations and visits to farmers and research establishments in Ethiopia. Problem analysis was undertaken in small, multidisciplinary groups. Small specialised output oriented groups also undertook to review key issues raised at the workshop and propose follow-up action plans.

A large, wide-ranging exhibition of posters and photographs had been prepared by the workshop participants. This stimulated much interest and discussion throughout the workshop. The workshop also provided optional evening sessions through which special interest groups met to discuss various donkey related issues.

Opening ceremony

After an introductory briefing by the Chairman of the Workshop Organising Committee, Prof Feseha Gebreab, the Secretary of the Organising Committee, Dr Alemu Gebre Wold delivered a welcoming address.

The workshop was formally opened by the Vice Minister of Agriculture, His Excellency Ato Getachew Tekle Medhin.

The Chairman of ATNESA, Dr T Simalenga (see centre photograph above) then gave a vote of thanks. This was followed by a keynote slide presentation on 'Donkeys and people: a world-wide review' which illustrated many different systems of donkey use and management. This was given by Professor Paul Starkey, ATNESA Technical Advisor.

To conclude the first session, Dr Feseha (Chairman, Workshop Organising Committee - see right photograph above) presented an overview of donkey utilisation and management in Ethiopia.

Day one: keynote presentations and networking review

The emphasis on the first day was on sharing and reviewing existing knowledge of donkey utilisation and management in various parts of the world. To facilitate and stimulate rigorous analysis and in-depth discussions for practical and workable action plans, three technical keynote presentations were made. The presenters highlighted the main points of their subject matter (complete papers were available in the Workshop Readers sent to all participants). Each presentation was followed by a short question and answer session.


Tillage demonstrations

Each of the technical keynote papers had been prepared by teams of specialists from ATNESA countries and Europe. Unfortunately, due to other commitments, not all the authors who had contributed could be present at the workshop. The three broad technical themes were:

- *Health, husbandry and nutrition of donkeys*. Paper prepared by R A Pearson, E M Nengomasha and R C Krecek and presented by Dr R A Pearson
- *Equipment used with donkeys*, prepared by D H O'Neill, A A Wanders and E Mbanje and presented by Dr D O'Neill
- *Social, economic and environmental aspects of donkey utilisation* prepared by P Fernando, G Bwalya, S Croxton, K Marshall, M Moorosi, M Mrema and P Starkey and presented by K Marshall and P Starkey.

The keynote papers were followed by brief presentations from the different countries represented. These summarised the systems of donkey utilisation, numbers and trends as well as animal traction networking activities. Then, in the final session of the day, all participants were invited to introduce themselves and highlight their donkey-related work and interests. Some of the points mentioned in the country papers and announcements made during the introductions are summarised later in this report.

Day two: on-station field demonstrations

The focus of the second day was on practical review of available technologies used in the management and utilisation of donkeys world-wide. This was done through a series of live demonstrations of technologies with the participants going around in small groups and having a chance to actually try out what was being demonstrated.

The technologies demonstrated were from Ethiopia and other countries and included the following:

- Pack transport systems for various items including water, hay, eucalyptus poles and dried manure.
- Donkey carts, some made by artisans and some produced in a local NGO workshop.
- Tillage technologies, plowing and cultivating with a single donkey, donkey teams and a mixed ox-donkey team.
- Harnesses and harnessing systems for various operations: collars and breast strap harnesses from several countries.
- Animal health and management: issues and locally-available resources.

Most Ethiopian technologies were demonstrated by Ethiopian farmers. This provided the participants with a chance to discuss various issues with these people.

As it was market day in Debre Zeit, as part of the demonstrations participants went to the nearby road to observe pack donkeys going to and from market.

Following the demonstrations, participants reviewed critically the operations and options they had seen and commented on their technical performance, desirability and applicability.

Demonstrations of carts, simple animal health care ingredients and harnesses



Workshop participants

Workshop programme

Sunday 4 May

Arrival of participants, registration, setting-up of posters
1900 Welcoming reception

Monday 5 May

0800 Registration and setting-up posters
0830 Poster viewing and informal networking
0900 Organisational matters and announcements
0930 Opening ceremony
1000 Keynote presentation 1:*Donkeys and people: a world-wide review*
1100 Keynote presentation 2: *Donkey utilisation in Ethiopia*
1145 Invited technical review presentation *Health, husbandry and nutrition of donkeys*
1400 Invited technical review presentations *Equipment used with donkeys* *Social, economic and environmental aspects of donkey utilisation*
1600 Country synthesis presentations followed by an open session of introductions and brief networking announcements
2000 Optional evening sessions including ethnoveterinary medicine discussion

Tuesday 6 May

0800 On-station field demonstrations and hands-on testing in small groups of technologies for transport (carting and packing), tillage, harnessing and animal husbandry operations. Gate study of donkeys on way to Debre Zeit market. Discussion with visiting farmers
1100 Small group discussions critically reviewing morning experiences and the technological options available
1400 Plenary synthesis of conclusions and progress
1430 Outline of field visits and objectives
1500 Departure of long-distance field visit group
2000 Optional evening sessions

Wednesday 7 May

0630 Field visits in small groups to different locations to see donkey-based operations and to hold discussions with farmers and transporters followed by visits to certain Ethiopian institutions working with donkeys
1500 Small group discussions relating to field visit findings (summaries of key issues made by rapporteurs for synthesis report)
2000 Optional evening sessions including Castration of donkeys (IDPT video) Namibia/Palabana donkey training video Discussion on the 'angle of pull' Meeting of the West African Animal Traction Network

Thursday 8 May

0800 Presentation of synthesis reports followed by general discussion of issues raised
1030 Formation of output-oriented working groups to discuss the key workshop themes and topics of special interest
1400 Group work continues
1700 Plenary session reviewing progress of groups with cross-group suggestions and options for any additional group work required to make recommendations or plan follow-up actions
1930 Dinner with Ethiopian coffee ceremony and presentation of donated items and souvenirs
Optional evening sessions including slide presentations about Brooke Hospital and animal transport in Ethiopia Discussion group on cart design Barbecue and Ethiopian dancing

Friday 9 May

0800 Group work
1100 Presentation and discussion of reports of small groups
1500 Invited keynote analysis of workshop findings and conclusions by selected group of participants, followed by final plenary discussion and closing statements
1645 Workshop evaluation
1830 Workshop dinner and closing ceremony

Saturday 10 May

Departures

Field visits to Rift Valley

Day three: field visits

The third day was devoted to field visits. Three multidisciplinary, multinational groups visited three different areas.

One group went to Addis Ababa focusing on pack transport and animal welfare issues. The group observed donkey transport use on the main roads leading into Addis Ababa and at some markets in the city where the group held discussions with some of the farmers and trading transporters. This group also visited the Salem workshop where donkey carts are being made.

The second group focused on rural transport (pack and carts) and visited Alemtena area on the Meki Road. Here members divided into smaller groups to discuss issues with farmers and transporters. The group returned via the Agricultural Research Centre in Nazaret, where there was an exhibition of agricultural implements.

The third group went to Ziway in the Rift Valley where they visited a local market. At the market and on the way the group saw numerous donkeys involved in cart and pack transportation. The group also visited the Adami Tulu Research Station to familiarise themselves with its operations. At the Research Station, demonstrations were conducted on tillage, carting and harnesses with the local farmers. The station also exhibited its current work on determining the power capacity of donkeys. The group also visited a local cart builder.

On return to Debre Zeit the groups discussed and analysed their findings.

Day four: working groups on key topics

The Field Trip groups continued to analyse their observations. The analysis focused on drawing out some general lessons in terms of key observations and recommendations for 'the way forward'. The three groups later presented their synthesis in a plenary session.

Using an active participatory process, the workshop then brainstormed to single out main areas of concern and need. Five such areas were identified (although it was understood that they all overlapped in various ways). The key topics were Transport (carts, harnesses, harnessing and packing systems, etc), Tillage and technology (equipment, operations, harnessing, etc), Animal issues (health, welfare, nutrition, breeding, etc), Training and extension (methodology, materials, curriculum etc) and Socio-economic, policy and planning issues.

Five working groups were then formed for further output-oriented discussions of these topics. The groups were asked to identify specific workable recommendations and/or action plans for follow-up activities. At the end of the day, each group presented its progress report in a plenary session.

Field visits to markets around Addis Ababa

Viewing posters

Day five: working group conclusions

Following a further period of intensive discussion in the same five working groups, the findings and recommendations of each group were presented and discussed in a plenary session. Within the context of the plenary, participants proceeded to develop some specific workable action plans from the groups' recommendations.

Finally a team of rapporteurs of the workshop led by M Bwalya, D Fielding and P Mueller led the workshop in a concluding exercise. Some people were invited to give their personal reflections on the workshop and its significance, prior to the final synthesis and conclusion.

Workshop papers and exhibits

Papers, readers, bibliography

Over 70 papers were prepared for the workshop. Some of these had been included in the four Workshop Readers circulated before the workshop. One of these Readers was a specially-prepared bibliography, containing 280 references relating to donkeys.

The papers prepared around the workshop themes included research findings, survey results and national institutional experiences in donkey traction. Only the keynote papers were actually presented to the workshop. Copies of all papers submitted in advance were given to the participants. Edited versions of the papers will be published in resource books.

Posters and displays

All participants were asked to prepare a poster or display relating to their work and experiences. A wide range of topics and display styles were presented. The posters provided a focus for participant debate and interaction throughout the week. Displays ranged from results of scientific investigations, through organisation presentations to colourful photographic displays of donkey use and management.

Harnesses and equipment:

Also on display were a variety of donkey harnesses and donkey implements from various countries. These included breast band harnesses from Ethiopia, Kenya Niger and Zimbabwe and collar harnesses from Bulgaria, Egypt, Kenya and Pakistan. Implements displayed included plows from Ethiopia, UK and Zimbabwe and cultivators from Cameroon, Ethiopia and Niger. Several carts from Ethiopia were displayed, including one of UK design made for the workshop.

Optional evening programmes

Further networking also went on during the workshop through optional evening programmes. Among the main events were:

- Discussion on ethnoveterinary medicine
- Video on donkey castration (IDPT)
- Video on Namibian farmers' course in donkey use and management, prepared by Palabana (Zambia)
- Discussion on the 'high lift-low draft' harnessing system
- Slide show by Brooke Hospital, Egypt
- A group of participants from West Africa also met to discuss the revival of the Western Africa Animal Traction Network.
- Ethiopian participants met to consider the future of the Ethiopian Network for Animal Traction (ENAT).

Photo exhibitions and posters

Ethiopian coffee ceremony and presented gifts and equipment

Informal networking interactions

The workshop provided an excellent forum for intensive interaction among the participants. Many formal and informal arrangements were independently made between participants. These will result in further collaboration and exchange of information on donkey-related issues.

Evaluation

At the end of the workshop all participants were invited to give their views on all aspects of the programme and logistical arrangements by completing anonymous evaluation forms. The participants were very positive and gave the workshop the highest overall rating of any ATNESA workshop to date. An analysis of this evaluation is presented later in this report.

Workshop outputs

The workshop generated enhanced understanding and increased motivation of participants. This will benefit national and regional programmes working with donkeys. Donkey owners and the donkeys themselves are likely to benefit in the medium to long term from more efficient systems of donkey utilisation, husbandry, harnessing and equipment design.

Some of the technical conclusions of the workshop are reported in the following sections. Proposals for a range of follow-up activities made during the workshop are also reported in this document. These include actions relating to harnessing, extension manuals, specialist workshops and ATNESA panels of specialists. Responsibility for implementing these follow-ups lies with workshop participants and national networks. The ATNESA committee will help to coordinate arrangements.

The papers submitted to the workshop will be edited for publication in two ATNESA resource books. One will include the various case histories prepared. The other will include the more quantitative and scientific studies of relating to donkeys and donkey technologies.

The bibliography relating to donkeys which was provided to workshop participants will be expanded and published (if possible in both traditional and electronic formats).

Donkey utilisation and management in Ethiopia

Points from the keynote presentation by Feseha Gebreab based on the paper prepared by Feseha Gebreab, Alemu G Wold, Friew Kelemu, Abule Ibro and Ketema Yilma

The resource base

Ethiopia has the second largest donkey population in the world, estimated to be in the range of 4-5 million. The majority of donkeys are found in the highlands with the regions of Shewa, Gonder, Tigray, Gojam and Welo having the greatest numbers. There are about 27 donkeys per 100 people, which is a high density by world standards.

Based on average size and coat colour, four types of donkey are recognised: the Jima, the Abyssinian, the Ogaden and the Sennar.

Ownership pattern

Most donkeys are owned by small-scale farmers. Surveys have shown that 85% of the farmers in the highlands of Shewa own donkeys, with an average of 2.7 donkeys per household. In Tigray 49% of farmers keep donkeys with an average number of 1.5 per family. In Dire Dawa and East Oromiya 70% of the small holders keep donkeys, normally just one donkey per family. Female donkeys are the most numerous (70%).

Uses of donkeys

Donkeys are used for over fifteen kinds of pack operation including the transportation of grains, water, fertiliser, fuelwood, building materials and animal feed. Donkey-drawn carts are now common in and around the Rift Valley. Activity patterns and load sizes of pack donkeys have been investigated and some of the results are presented in the keynote paper.

A study by International Livestock Centre for Africa (ILCA) in 1988 revealed that donkeys were utilised for a total of 433 hours a year (average 8.3 hours a week). These figures represent a relatively low utilisation implying the availability of spare donkey capacity. The Ethiopian Highland Reclamation Study reported a similar finding.

Map showing the different regions of Ethiopia.

Note: alternative English spellings exist for many Ethiopian names. For consistency the spellings of this map are also used in the text

Income generation

Donkeys are an important source of income for many families. In many parts of the country, there are people who earn their entire living from cutting wood, collecting animal dung or eucalyptus leaves and transporting the produce on pack donkeys for sale in urban centres. Donkeys and mules also transport salt from the mines in Berhale to Mekele in Tigray. The donkeys contribute to the income of the salt traders as well as to government revenue in the form of an excise tax. In the Rift Valley donkey-drawn carts are rented out for 10 Birr per day (about $1.50), which helps farmers to diversify their income.

In Addis Ababa, as many as 3000 donkeys are found, notably in the Mercato grain market area. Transporters generally own between two and five donkeys. Donkeys each transport about 100 kg. The charge per load is 2-5 Birr for short distances such as the nearest taxi stop or 12 Birr (US$ 2) to areas such as Kotebe which is approximately 10 km away.

Constraints to donkey use

The life expectancy of a working donkey in Ethiopia is 9-13 years. Several major problems have been identified that affect the longevity, welfare, working and reproductive performance of donkeys in Ethiopia. These include disease and poor nutrition. Donkeys suffer from several diseases including gastrointestinal helminthosis, saddle sores and ectoparasitism. Debilitating and potentially fatal worms such as the large strongyles are commonly encountered in large numbers especially in young donkeys. The feeding of donkeys is based on grazing on communally owned grasslands and on roadside verges. Overgrazing is common. Food supplements are sometimes provided. For most of the time donkeys are able maintain good body condition with the exception of the months of March and April. Donkeys survive due to their tremendous capacity to utilise foods of low quality. They normally eat more dry matter per kg live weight than cattle and have an efficient digestive system.

A fact contributing to the neglect and maltreatment of donkeys is the absence of any government policy relating to donkeys and their promotion. Not only is there an absence of appropriate development policies, many institutions have completely negative attitudes towards donkeys.

There is a need to promote cart use in Ethiopia and to develop specialised donkey drawn implements particularly for areas with light sandy soil. Ethiopia should benefit from the experiences of other countries in Africa that are using donkeys for land preparation, seeding and weeding.

Field demonstrations

Pack demonstration

The pack demonstration consisted of eight donkeys carrying different loads. The loads were straw, manure cakes, water, wood, sand, grain and traditional beer. Each material was loaded and secured using the typical Ethiopian methods of pack transport. The straw and manure cakes were first placed on a cow skin and then lifted on to the donkey and fastened with rope under the belly. The water jerrycans were lashed to a basic saddle or the cans were placed on a wooden frame. Water was also carried using an old inner tube. Cans attached to a wooden saddle were used for transporting sand. The loads of wood and grains had the least protection for the donkeys. Traditional pots were used to transport the beer. The pots were fastened to a wooden frame.

Several of the loads were bound and fastened with strips of rubber cut from car and lorry tyres. The workshop participants were impressed by the skilful fastening and balancing of the loads on the donkeys. The rubber strips were especially useful in that they both served to actually secure the loads and at the same time provided a degree of shock absorption when the donkeys were moving and the loads were jolting.

There were few signs of sores or damage to the animals caused by the saddles or loads. General comments and criticisms made by the participants include the following:

- some ropes were too thin
- some loads, for example the grain, rested directly on the spine rather than over the front legs
- the use of fertiliser sacks which makes the skin sweaty and predisposes it to sores
- the use of an unpadded rope under the tail to actually secure the load rather than to act as steadying point when going downhill
- twisted straps that could lead to skin sores
- on one donkey a saddle blanket that was two small resulted in the edge rubbing on the skin under the weight of the load.

Tillage demonstrations

Four tillage demonstrations were undertaken:

- weeding demonstrations (on an open field) with a 3-tine cultivator (*Houe occidentale*) from Niger
- demonstration of Frank Inns' prototype high lift harness and lightweight mouldboard plow using a single donkey
- demonstration involving the Zimbabwean Bulawayo Steel donkey plow using a pair of donkeys and an ox-donkey team
- plowing demonstration involving the Ethiopian maresha plow pulled by a pair of donkeys and an ox-donkey team.

Comments and recommendations

General impressions of the lightweight plow developed by Frank Inss were that, although it appeared light and good for a single donkey, more research is needed, and particularly on-farm trials. There was also discussion on the one-piece share-mouldboard, with many feeling that these should be two separate pieces. It was also noted that the width of the plow share was narrow (hence the working width was narrow), resulting in a low work rate. Some groups also observed that the design depth on this plow was too shallow for many seeds.

By Ethiopian standards the imported all-metal plows and cultivators were expensive compared the local maresha plows which cost just Birr 20 (US$ 3).

The maresha was considered quite appropriate in the circumstances. Among its attributes were being cheap, locally-made, light hence easy to carry, easy to maintain and easily controllable.

The participants felt that the use of a yoke harness on donkeys was inappropriate. It may be a temporary solution to a problem, but it should not be encouraged.

The pairing of oxen and donkeys caused several problems. It involved using the yoke harnessing system which was felt to be inappropriate for the donkey. The ox was often larger and the donkey appeared to be 'labouring' more than the ox. The difference in walking speed between the two animals could have cause discomfort and problems.

Harnesses and harnessing demonstrations

There was a variety of harnesses on display. These were essentially breast bands and collar harnesses for various purposes, notably carting, packing and implement pulling. The main ones included:

- Zimbabwean breast band harnesses made from conveyor belt and canvass materials (mainly for implement pulling).
- Niger collar harness: a ring of soft padded material and nylon rope traces (for implement pulling)
- a simple collar harness made from car tyre material brought by the Niger team (for implement pulling)
- Kenyan (KENDAT) leather '3 pad' collar harness built for implement and cart pulling. The carting system include a back saddle and a breaching strap.
- prototype dorsal yoke for a pair of donkeys hitched to a cart
- Bulgarian collar harness (for cart pulling)
- Egyptian collar harness and saddle (for carting)
- Pack saddle from Kenya Society for the Prevention of Cruelty to Animal (KSPCA) in conjunction with International Donkey Protection Trust (IDPT)
- Ethiopian farmers' own harnesses, mainly packing

Comments and recommendations

Some harnesses demonstrated, especially the collar harness type, were said to be high technology products, hence, costly and not easy to repair. These were also complicated to fit or remove from the animal. This was said to make them inappropriate for

farmer use. However, the workshop participants acknowledged that collar harnesses were durable and technically good, adjustable and providing a good distribution of load.

The collar harness from Niger was said to be a lot simpler and easier to make and use compared to other collar harnesses demonstrated. However, it was felt that it could still be improved by making the collar ring wider and covering the trace ropes with hose pipe.

Participants made various other comments (some of which appear in comments on the other demonstrations), including:

- different harnesses are often suited for one main type of work: this should be clearly specified
- there must be a reasonable compromise between durability and affordability in harness design and manufacturing
- low cost materials should normally be used in harnessing making
- some padding materials used were inappropriate as they did not allow sufficient ventilation on the skin surface hence promoting infection
- the harnesses used by farmers were in a bad state. They were roughly constructed and lacked maintenance

Cart demonstration

Six carts were on display for examination by the participants. These were as follows:

- Ethiopian unraised cart with bearings
- Ethiopian unraised cart without bearings
- Ethiopian raised cart without bearings
- Warwick University's DTU cart
- Selam multipurpose cart
- Selam general purpose cart.

The Ethiopian carts were characterised by the use of local materials and metal wheels. It was pointed out that lashing the poles together to make the carts often led to more durable structures than using nails for fastening the poles together. In the latter case the nails provided a route for the entry of water which encouraged the wooden poles to rot.

Workshop participants appreciated the low cost and durability of the Ethiopian carts. They suggested that rubberised wheels and some sort of suspension would be useful, but recognised that both were likely to be uneconomical.

The prototype DTU cart was demonstrated by Colin Oram. Its major advantage was its speed and ease of construction, albeit from new materials. The only tools required to construct the cart were a hacksaw, a hammer and a welding capability. To minimise the cost of the cart there were no bolts used in its construction. The basic structure consisted of three U-shaped frames of square-section metal tubing to which were welded small pieces of concrete reinforcing bar. The metal frames were linked by planks to form the floor and sides of the cart. The planks were held in place by hammering over the small pieces of reinforcing bar into the planks. For ease of turning, the cart was fitted with two axles to which any car wheel could be attached. The DTU cart had a single draw bar, pulled by two donkeys using a dorsal yoke which rested on small saddles on the donkeys. Participants admired the apparent ease and novelty of the construction method used. However the cart was considered to be too heavy and expensive for the ordinary donkey user. In the absence of any reports of long-term testing of the cart there was concern expressed about its durability under Ethiopian conditions.

Of the two Selam carts one was two-shafted and capable of being used as a specialised water carrier or as a general purpose transporter. The second Selam cart was a general purpose cart with a single shaft. Both carts were equipped with pneumatic tyres. Whilst appreciating the quality of the cart construction it was generally agreed that the carts were too expensive to be of any immediate relevance for donkey users in Ethiopia. It was reported that in one instance a wheel mounting from a Selam cart had been removed from a cart and used on a normal car such was its quality.

Recommendations

- Long-term testing of new carts (and harnessing) is needed under normal, end-user conditions.
- Identify with the farmers which area of cart design (and harnessing) they would most like to improve.

Observations of donkey use in Debre Zeit

Participants observed the donkeys passing by the gate of the Institute on their way to market. All the donkeys were used for packing. No carts were seen in use with donkeys, only horses. The materials taken to market for selling included teff straw, grain, manure cakes, local brew and fuelwood (for methods of attachment see above section on Pack Demonstration). It was noticed that alongside the donkeys women also carried the same produce to market.

Observations were made on the materials and position of attachment of the packs to the donkey. The general opinion was that the straps around the belly were too tight and some used rope which caused rubbing and sores. The workshop participants felt that the donkeys were in good condition, but there were some wounds that could have been avoided if padding and harnessing were improved. To encourage the donkeys to move faster the owners tended to beat the donkeys and it was felt that if the donkeys could be trained properly this would be unnecessary. The donkeys tended to be overloaded and unbalanced, with the load resting on the spine. Some of the owners had made an effort to put some padding on the donkeys, but generally it was not enough.

The participants suggested some solutions to the problems seen:

- encourage donkey owners to use carts
- distribute the load on either side of the spine, and not directly on it
- provide donkey owners with education in primary health care for donkeys.

Field visits

Addis Ababa

Introduction

Addis Ababa, the capital of Ethiopia with a population of 2-3 million people is located on the Central Highland Plateau in the Shewa Zone. Lying at about 2500 to 3000 meters altitude the climate is relatively cool. Annual rainfall is 1000-1500 mm with most of it falling between July and September. There is some farming on the outskirts of the city, where farmers grow teff, vegetables and eucalyptus. Trading (retail and wholesale) is a common occupation for many people in Addis Ababa. Farming households are also involved in trading, which has increased sharply in the last few years following economic liberalisation.

The group visited three market places within Addis Ababa. These were the central grain market *(Mercato)*, the vegetable market *(Mercato)* and a small general merchandise market 20 km north of Addis known as '*Gurd Shola*'.

Key observations

Donkeys are extremely important and large numbers of donkeys are involved in the transport of a wide assortment of goods. Goods carried included agricultural produce such as grain, eucalyptus poles, fuel wood, dry manure, hay and straw. Donkeys were involved in moving goods to and from markets, mills and other retail holdings. Donkeys were only used for pack transport and no donkey carts were seen. Men, women and children were all involved in handling of the donkeys.

At the markets, some donkeys stood for a long time with the loads still on them. Even when load was removed, the saddles remained. Many loads appeared not to be well balanced on the donkeys. Overloading was very common with some small donkeys carrying as much as 60-100 kg. The saddle padding was poor; often a thin layer of grass in plastic feed-bags. These provided limited ventilation on the affected skin area. The tying was mostly done with thin sisal ropes, frequently 'digging' into the animal's belly.

There was no evidence of facilities for donkeys to eat or drink water while at the markets. The donkey owners said that feed and water are provided to the donkeys at the homesteads. Although the overall condition of the donkeys was not bad, pressure sores (on the backs, on the withers and under the tail), hobble sores (on the legs), overgrown hooves, lameness and convex spines were among the husbandry problems observed. Formal veterinary services were said to be almost non-existent. Owners have often to improvise with traditional practices, such as using plant leaves to cover sores to keep away flies and using cow's milk to treat colic.

In the discussion with some farmers and transporters it was noted that donkeys living within Addis would do 3 to 5 trips of about 3 km each in a day. Those doing transportation business charged on average 3 Birr per trip (US$0.50). Donkeys coming from the outskirts have to travel about 10-15 km, taking about three hours. A donkey owners association has recently been established in the market area. It does not yet have government recognition. It aims to provide the members a platform from which to lobby government and local authorities on matters related to donkey use and welfare. Donkey owners said there was no government extension activities or assistance relating to donkey use.

Conclusions and recommendations

Donkeys are playing an important role in the economy of Addis Ababa. They bring important socio-economic benefits to individual households. However, there are some critical constraints needing attention. These encompass both attitudes and technical aspects (health care, feeding and harnessing systems). Therefore, to enhance the performance of pack donkeys, the group made the following recommendations:

- Recognised organisations promoting the interests of donkeys and donkey users are required. The Ethiopian Network for Animal Traction (ENAT) and other interested organisations should lobby government to obtain due recognition to both ENAT and the donkey owners association.
- There is a need for greater awareness of donkeys welfare issues, with improved facilities and services for donkey management, feeding, watering and veterinary care, supported by possible legislation.
- There is a need for training and extension programs targeting on donkey owners. Extension staff need more training related to donkeys and veterinarians need donkey issues to be included in their curricula.
- ENAT should continue to explore harnessing questions and provide donkey users with practical recommendations regarding harnessing options, and their appropriateness, their acceptability (to animals and to people) and their technical qualities. ENAT should also support the socio-economic studies being carried out by staff of the National Urban Planning Institute.

Mid Rift Valley and Adami Tulu Research Centre

Introduction

Ziway is situated about 100 km south-east of Addis Ababa, in what is known as the Mid Rift Valley. The climate is semi-arid, with about 800 mm of rain per annum and the soils are sandy loam. Although altitude varies from 700 m to 2300 m, the terrain within the Rift Valley is relatively flat and suitable for carting. The Adami Tulu Research Centre near Ziway operates under the auspices of the Oromya Agricultural Bureau. Figures provided suggested that 75% of farmers own equids, with most (93%) of these being donkeys which are used for both carting and packing. There are

estimated to be 225,000 donkeys in the Mid Rift Valley (for comparison there are 2,240,000 cattle, 1,700,000 sheep and goats, 87,000 camels and a smaller number of horses).

As the group travelled by bus to Ziway, they saw numerous donkey carts. During frequent stops, participants observed the different kinds of harnesses, carts and saddles as well as the condition of the animals. Participants visited a local market. At the Adami Tulu Research Centre, participants saw demonstrations and talked to local farmers collaborating with the centre's on-farm donkey research programme.

Animals

A small percentage of donkeys in use were seen to have severe wounds either on their backs or under their tails, caused by the cart saddles and by the use of thin, unpadded, sharp belts pulled tight under the tail (cruppers). The true incidence of back wounding, while appearing low, could not be properly assessed since many donkeys were wearing harnesses or packs on their backs. Single donkeys pulled heavy carts, some weighing as much as 750 or even 1100 kg (loads reported by users). Donkeys appeared to spend much of the day at the market without water, shade or food. Hoof care was minimal with no evidence of farriery work. Limping donkeys and many cases of club or boxy feet, ranging from moderate to severe, were seen. Most donkeys were thin, although cart horses were seen to be much thinner. One donkey pulling an ambulance was in excellent condition, possibly suggesting the value placed on this role. Many animals showed signs of internal parasites, and the Research Centre confirmed that 100% of donkeys sampled were infested. The soil pH of 7.9 suggested that mineral deficiencies, particularly of cobalt and copper, might be a problem among donkeys, contributing to the poor body and coat condition observed. Young (under 3 years) and small donkeys were being used to carry heavy loads without apparent regard to their immaturity or size. The comments of local people verified the poor image accorded the donkey.

The group made the following suggestions.

- Research on donkey nutrition and micronutrient requirements should be carried out, and the results disseminated to local farmers
- In order that problems can be adequately and objectively described, there is need to establish a body condition score and a wound and foot care score. These scoring systems should be explained to research and extension staff and farmers.
- Research and extension staff should be given training in donkey-related primary health care techniques to share with local farmers.
- Introduction of clinics at markets to assist injured donkeys.
- Improve the local image of donkeys through donkey user associations and donkey shows and competitions.

Harnessing

Most donkey cart harnesses observed transferred the tractive force mainly through the back of the animals rather than via the breast and shoulders. Horse cart harnesses employed a very different system (breastband with traces). Wooden neck yokes were in use with some donkeys (directly transferred from oxen). Participants felt this system to be inappropriate.

Back saddles for cart harnesses were made from either wooden frames or metal pipe or bars. The angle of join was often too wide, resulting in all of the load resting on the animal's spine. Sharp ends of the saddles could cause wounds to the abdomens of donkeys. Other sources of injury observed in both packing and carting donkeys were: poor condition of the straps, poor padding, loose straps allowing loads to rub against animals, too tight straps cutting into animal's body and improper strapping material (plastic, sharp rubber).

A number of different harnesses from various countries were shown to farmers. The car tyre collar harness was liked (the examples came from USA and Zimbabwe). Farmers also liked the various simple breastband harnesses. A Bulgarian collar harness (mostly leather) was of great interest but the farmers feared the price would be too high. Farmers also liked the metal dorsal back yoke demonstrated by participant Colin Oram. Although this was designed as a cart harness, the farmers suggested that it might be used to pull a *maresha* plow .

The group made the following suggestions.

- Farmers need more exposure to different harnesses so they themselves can evaluate the effectiveness of each system.
- The Adami Tulu Research Centre should take the lead in undertaking harnessing studies.
- Local harness/pack systems and straps need to be improved (different materials should be used). Saddles should be not be uniform but their size/angle should be set to suit the size of the donkey.

Implements and carts

There is no variety of field implements as most farmers only use the *maresha* plow. Many farmers expressed interest in using donkeys for tillage.

Carts were widespread and functional for transporting goods, water and people. The carts were of local design and manufacture. They comprise a triangle of lashed eucalyptus poles, with a wooden axle and wide but low metal wheels (see photo on page 15). Bearings were available at extra cost. This design differs substantially from the demonstration carts seen at the workshop and Research Centre as well as from carts seen in other countries. The simple local technology has been spreading while uptake of the more 'international' designs has been slow.

The group made the following suggestions.

- There is a need for a greater variety of implements suitable for use by donkeys.

- Those involved in cart design and research should communicate more with farmers, and learn from the obvious popularity of the local cart design. Donkey carts should be appropriate to the donkey's small size and should be used with suitable harnessing.

Socio-economic issues

In this area, both men and women own and use donkeys. Some owners hire out their donkeys and carts. Participants wondered whether those who hire other people's donkeys would care less about them than those who owned them. The role taken by small motorcycles in other countries is fulfilled by donkeys in this society. The market structure is extensively developed, with farmers motivated and with numerous inputs and outputs. The local cart factory was well developed and also made harnesses. Donkeys cost 200-500 Birr (US$30-75), while local carts cost 400-600 Birr (US$60-90). Donkeys cost about half as much as oxen 800-900 Birr (US$120-140).

Way forward

The Adami Tulu Research Centre can be a force for increasing and extending knowledge regarding donkey use in the area. It is already engaged in studies of parasite load, local donkey management and use and the effect of nutritional supplementation on work performance. The Centre's facilities are good, the staff positive and enthusiastic, and relationships with local farmers have been developed. The Centre needs to continue dialogue with farmers, to collect further information on local farming systems and to receive financial and technical support, including appropriate research hardware and staff training.

Alemtena and Nazaret

Alemtena village

Alemtena village is situated some 50 km south-east of Debre Zeit. It is in an area that has been largely settled over the years by displaced persons. Level ground in the area makes it suitable for the use of donkey-drawn carts. Approaching Alemtena, the group saw numerous donkey carts made from eucalyptus poles and fitted with metal wheels. There were many specialised water carts consisting of a 200 litre drum placed above and along the line of the cart axle.

At Alemtena village, the workshop participants divided into two subgroups to interview donkey users about their management practices. This proved to be an interesting and rewarding exercise. Both men and women participated equally in answering questions posed through an interpreter.

Villagers considered that donkeys were of critical importance for the transport of water which usually involved a daily round trip of 10-12 km or more. Both pack and cart methods of water transportation were in use. Carts and donkeys reportedly cost around 500 Birr each (about US$75). Various sharing arrangements were described whereby those with carts and donkeys made them available to those without carts and donkeys, who then provided labour as their contribution to the tasks being undertaken.

There had been few changes involving donkeys during the previous 20 years. Tillage work was considered to be too hard for the donkeys, particularly as they must first transport water every day. However, all the farmers were interested in photographs showing donkeys being used for tillage in other countries, and several offered to try it out, if they could be assisted with appropriate harnesses and implements.

The villagers claimed that everyone knew how to use donkeys, and so there were no 'donkey experts' in the community. Donkeys were generally healthy, but 'bleeding' was a traditional treatment for one condition (that the participants thought was probably trypanosomiasis).

Overall, the visiting group was impressed by the social and economic benefits of donkeys to the community and the caring attitude of the farmers towards their donkeys. This was demonstrated by their reluctance to use donkeys for hard tillage work, the provision of some food supplements when donkeys were lent out to others and the sharing of work amongst all available donkeys.

Nazaret Research Centre

From Alemtena the group travelled first south and then east for some 60 km to Nazaret Research Station. Again working in two groups, the participants visited the collection of implements that the Agricultural Implement Section had collected and tested over recent years. The opportunity was also taken to visit the workshop facilities at the centre where the manufacture of steel mouldboard plows was underway. One of the activities of the Research Station that has been more popular with farmer relates to crop processing equipment. The work on alternative tillage implements has had little impact. The traditional *maresha* remains the main implement and there has been little adoption of any of the alternatives promoted by the Agricultural Implements Section. Little work has been undertaken in relation to donkey tillage. The group concluded there was a need for more time to be spent on to the identifying farmers' real needs. Greater use of participatory processes seemed necessary, since earlier research/extension had tended to be somewhat 'top-down' in its approach.

On the journey back to Debre Zeit in the late afternoon the participants noted the many donkeys that were grazing or resting in the fields, implying good husbandry. Many camels were also seen in apparently good condition. Considering that the participants were visiting at the end of a seasonal period of food shortage it was noticeable that most animals were in reasonable condition. The exception was the transport horses, many of which were in poor condition.

Donkeys and people: a world-wide review

Points from keynote slide presentation by P Starkey

Numbers and importance of donkeys

Photographs from more than forty countries in the world were used to highlight a wide range of social, economic and technical issues relating to donkey use.

Donkeys have been employed for over five thousand years. Egyptian tombs have drawings and carvings of loaded donkeys, dating back 4000 years. The world population of 44 million donkeys is increasing. The country with most working donkeys is China (11 million), followed by Ethiopia (5 million).

Donkeys remain important in Eastern Europe, northern Spain and several Mediterranean countries, but their numbers are gradually declining. In contrast, donkey populations are increasing in many developing countries in Asia, Africa and Latin America. In most African countries in the past twenty years, donkeys have become more important for transport and agriculture, and the trend continues In sub-Saharan Africa, the geographical range of the donkey is spreading. This is most noticeable in West Africa where donkeys are moving southwards, but can also be seen in eastern and southern Africa (eg, northern Namibia, southern Zambia, northern Zimbabwe).

Socio-economic issues

Most donkeys are kept for transport, whether riding, pack transport or pulling carts. They may also be used for farm tillage. Donkeys are generally inexpensive, resistant to disease (in dry zones) and of low risk (they have low meat value and are seldom stolen). They are easy to manage and train. Donkeys have often been associated with poverty (unlike cattle, camels or horses). There are fewer gender restrictions on donkey use than other work animals. In most countries, donkeys can be owned and used by either men or women. Women are often major beneficiaries of donkeys for household and farm transport, riding and/or trading. Women's access to donkeys can be assisted by targeted credit provision. Collecting water using donkeys can be a relatively recreational household duty for children that frees women's time.

Climate changes, deforestation, population pressures and urban migration are having an impact on women's work and traditional gender divisions of labour. Women are increasingly responsible for managing rural households and farming enterprises. The ease of use of donkeys and their (relative) gender neutrality make them popular with some rural women. However, since many societies marginalise both women and donkeys, the benefits of their productive association needs to be publicised with sensitivity.

In many parts of Africa, local production and trade has been restricted by the capacity of people (generally women) to 'head-load' produce and goods. Donkeys can remove such limitations. Rural people with transport donkeys have larger circles of contacts and trade. The enhanced market access allows them to increase their production and trade, increasing profits and overall economic activity. Donkey transport allows greater use to be made of manure and crop residues, and this increases farm production.

In rural areas where modern motor technologies (eg, motorcycles, power-tillers, pickups) are being adopted (mainly by men), overall transport and work capacity may increase and access to animal power may improve for disadvantaged groups. For example, the use of motorcycles by men may release donkeys for women.

Donkeys as pack and riding animals

The load-carrying abilities of donkeys are legendary and sometimes exploited. Donkeys are capable of carrying 100% of their body weight for short distances (this is not recommended). For example, donkeys weighing 130 kg carry 130 litres of water (130 kg). Reasonable pack loads of 40-80 kg are more common. The large number of pack donkeys in Ethiopia fulfil a major economic role in rural and urban trade.

In some parts of the world, adult men and women to ride donkeys, but elsewhere only children ride them. For riding and load carrying, some form of saddle is desirable. Some people hang loads over the back of a donkey without any saddle (eg, two water drums linked only by cords). This puts pressure directly over the backbone. A saddle provides stability and ensures the weight is carried on either side of the spine. A simple wooden frame with broad, smooth boards on either side of the spine can be effective. In the Dominican Republic simple saddles for riding and carrying are made from banana fronds bound with wire and covered with goatskin.

Donkeys for cart pulling

Carts allow donkeys to transport more in areas that are relatively flat and have roads or broad paths. Most donkey carts have two wheels, as these are cheaper, lighter and simpler than four-wheel wagons. Most donkey carts have two shafts. Any weight on the shafts is taken by a back saddle, with pads on either side of the spine. Some carts in use (particularly in eastern and southern Africa) have a single shaft and pairs of donkeys carry the weight on the draw pole through narrow neck straps or rope. These can cause the donkeys discomfort and sores.

The rapid expansion in West Africa of two-shaft donkey carts with pneumatic tyres is one of the most notable successes of recent years. In Mauritania, farmers and traders have recently bought 75,000 carts through private commercial channels.

Donkeys for tillage

Donkeys owned mainly for transport can assist greatly in soil preparation and weeding in small farm plots. In light soil, a single donkey can pull a small plow or cultivator. In West Africa, single donkeys may pull *Super Eco* seeders and *Houe occidentale* tine-cultivators.

Larger implements can be pulled by two or more donkeys harnessed together. In Morocco, pairs of donkeys (or mixed animals) pull long-beamed plows. In Tanzania, some women weed with donkeys in tandem. In Namaqualand (South Africa) teams of eight donkeys pull three-furrow plows.

In The Gambia and Namibia, donkeys have replaced oxen as the main draft animals. Droughts have led to increasing use of donkeys for tillage in Zimbabwe. Farmers may initially use ox technologies, such as yokes, with donkeys. In time yokes should be replaced by breastbands or collars.

Donkeys for other operations

In certain countries, donkeys are used for threshing, raising water, milling or other operations. In Egypt, donkeys turn *sakia* irrigation wheels. In Morocco and circum-Saharan countries, donkeys pull water from wells. In Mozambique, some brick makers use donkeys to turn clay-mixing devices. In some countries, donkeys are used to guard sheep. Donkeys are also used to breed with horses to form mules (or hinnies). In France and USA, very large donkeys breeds were developed specifically for mule-breeding. Donkey-zebra crosses are possible.

Training, education and protection

Few people receive training relating to donkey management and husbandry. Donkeys are seldom included in the syllabuses in schools, colleges or universities. One reason is the poor image of the donkey. Donkeys are associated with simple lifestyles and not with education, advancement and urban development. The problem is self-perpetuating, since urban-based decision-makers have little knowledge of donkeys. A few years ago, the authorities in South Africa ordered donkey populations to be culled as they did not appreciate the value of donkeys to rural people.

Donkeys may suffer because of poor treatment. They may be overloaded, afflicted by pack sores, cut by poor harnesses, damaged by tight hobbles or made lame by inadequate foot care. In most countries, donkey protection legislation is non-existent or ignored.

The future of working donkeys

In most of Africa, donkeys are playing an increasing role in rural trade and transport. In highly urbanised and industrialised areas, donkeys tend to be replaced by other power sources. In countries with both industrialised, urbanised economies and large rural sectors (eg, Egypt, India, Mexico, South Africa, Turkey), donkey populations remain high. Donkeys and motor power complement each other by fulfilling separate and complementary niches. Donkeys continue to be very important in the rural areas (and sometimes for urban transport too). Despite the inevitable world-wide increase in motor power and urbanisation, donkeys will continue to be widely employed as work animals for the foreseeable future. It will be a major challenge to raise the public's appreciation of donkey work while improving the management and utilisation of the donkeys themselves.

Improving the management of donkeys in Africa

Points from keynote presentation by R A Pearson
based on the circulated paper of R A Pearson, E M Nengomasha and R C Krecek

Introduction

A major concern among donkey technology developers is whether or not it is possible to improve donkey utilisation and management in the farmers' circumstances. It could be argued that donkeys are hardy, tolerant of water deprivation and able to survive in such difficult nutritional circumstances that it is impossible to improve their productivity (output per unit of input). However, in the most difficult of circumstances there is always variation, often considerable, in the performance of both donkeys and donkey users. The challenge is to improve the performance of the less efficient by applying the experiences and techniques of the most efficient whilst also taking advantage of introduced technologies if existing methods and practices are inadequate. All of this must be undertaken using a participatory approach, which is currently accepted as the most appropriate methodology. One constraint is that the participatory approach, although effective, is time-consuming and difficult to finance to a level allowing realisation of the method's full potential. One aspect of this methodology is an examination of options. The options discussed below are as follows:

- Nutrition and feeding
- Reproduction and breeding
- Housing and footcare
- Disease prevention
- Harnessing and hitching
- Training and work practices.

Nutrition and feeding

Nutrition and feeding must be determined by the level of work undertaken. Unfortunately rural donkeys, which have good access to food, normally work less than town donkeys whose food supply is difficult to maintain.

Nutrition also interacts with many aspects of animal physiology including disease resistance. Thus one strategy for improving nutrition is supplementation not only for short-term benefits of work output but also for the long-term benefits of health and longevity. Whilst concentrate foods are most easily provided, they can be costly and greater use of good quality forages such as lucerne, groundnut and cowpea hay may be more appropriate. Supplementation is regarded as essential for donkeys used in regular transport work. Other nutritional strategies include:

- providing large amounts of poor quality food to enable the donkey to select a diet of as high a quality as possible,
- using troughs and individual feeding to reduce wastage and make the best use of expensive supplements.

In assessing the various options it is important to be aware of the balance between monetary cost and time cost in deciding which will be the best in any one situation.

Reproduction and breeding

Whilst in some parts of the world there may be control of the mating and breeding of equids, in sub-Saharan Africa mating is generally at random according to the occurrence of oestrus and proximity of a male. If donkeys were to be managed so as to reduce opportunistic breeding, for example by kraaling, as are cattle, there would likely be fewer foals than in the present system where there are no restrictions on movement. Castration of aggressive and dominant males for ease of handling and management would appear to be a selection method which results in smaller and less troublesome animals in the long term. This does not yet appear to have occurred.

The importation of new types of donkeys into a country might be seen as a means of rapid breed change. Experience to date suggests that this can be a high risk strategy because the imported animals will have little or no resistance to the disease organisms in the new environment. The promotion of mules is one option for the quick production of larger animals with increased draft capacity.

Housing and footcare

In many situations housing is worthy of encouragement because it can reduce climatic and environmental stresses. It also reduces the incidence of donkey theft which is an increasing problem in some countries. For whatever reasons donkeys are housed it is important to bear in mind that there may be negative interactions. Poor quality ill -ventilated housing may be more of a stress than being outside, particularly if hygiene is poor. Housing restricts grazing time and this needs to be compensated for by providing concentrated food. Restriction of movement without housing may be achieved by hobbling, which when properly and not cruelly done should allow the donkey to continue to graze.

Disease prevention

Donkey diseases can be classified as 'visible' and 'invisible'. Farmers are unable to appreciate the possible significance of the latter and where any investment in disease control is made it is usually directed at the visible problems such as ticks and saddle sores. Little has been quantified about the effects of disease on the work output of the donkey. Assumptions made on the basis of experience with other animals may not be valid in donkeys. The effectiveness of disease control is also crucial and real

economic problems may exist. For example, in South Africa the cost of replacing a donkey may be the same as one dose of anthelmintic. Possible disease prevention strategies to control internal parasites, which are usually regarded as very important in donkeys, include:

- removal of faeces from grazing areas
- grazing rotation
- use of indigenous remedies eg, anthelmintic plants.

The need for alternatives to anthelmintics is becoming greater not only because of their rising cost but also because of the growing problem of anthelmintic resistance.

Harnessing and hitching

Avoidable skin wounds are a source of continuing frustration for those concerned with donkey health and welfare. There is often a sense of despair that donkey users fail to make a cause and effect link between a protruding piece of wood or metal and a wound on the donkey. Many groups have sought to produce improved harnessing but their cost and complexity has almost always led to their rejection by donkey users. Legislation has also failed in several countries to improve the standards of harnessing. Happily there are examples (eg, Northern Province, South Africa) where breastband harnesses that cause fewer saddle sores have been produced at a lower cost than those normally available for sale in the markets.

Work on improving carts is most likely to be successful where modifications to existing designs are attempted rather than the introduction of a markedly different design. Attention to simple braking systems on existing designs could markedly reduce the number of injuries donkeys suffer in hilly areas.

Awareness and the need for attitude change remain the key issues in making improvements in harnessing and hitching. Education and encouragement centred on the adoption of improved measures remain the way forward!

Training and working practices

There is little information on good working practices with donkeys and farmers may work their animals to the point of a stubborn refusal to work further. Fortunately improved practices need not cost any extra money; examples include:

- working in the cool of the early morning and evening
- regular rests in shade and with water available
- training prior to regular use.

Oxen have been shown to have an increased work output over time despite losing weight. This was attributed to the benefits of training and increasing fitness. It is reasonable to assume that a similar response would be found in donkeys, and donkeys maintained in working condition prior to the plowing season are likely to be less stressed by the work load when plowing starts than those that have been idle.

Good training is also beneficial for general ease of working if it includes complete control by voice commands. Well trained animals can also work more effectively in mixed species teams, which provides insurance in case of animal loss.

Conclusions and future needs

A big factor operating in favour of the donkey is the fact that its price is increasing in many countries in response to increasing demand. Sufficient information now exists to at least start improving management of the donkey and the challenge is to present this in ways which meet the needs of donkey users and complements their existing practices.

Discussion points

Experience in Malawi suggested that donkeys kept in confinement and fed only hay deteriorated over time. Donkeys able to range freely remained in better condition, perhaps because they could obtain certain micronutrients by eating shrubs and bushes.

Experience in Zimbabwe suggested that it was too early in donkey development to consider breeding programmes other than the most simple. It is possible that uncontrolled breeding may be adaptive through the survival of the fittest. Concern was expressed regarding breeding for increased size due to the risk of losing characteristics such as agility which could be important in mountainous areas.

It was suggested that an increased use of mules could be unhelpful since these animals were sterile. However, it was noted that historically mules have played a key role in agricultural development in some countries. Mules were reportedly much faster than donkeys but have softer hooves. Their promotion would thus need to be accompanied by parallel developments in farriery provision. Mules were also associated with less disease tolerance than donkeys and might require increased veterinary attention.

One means of reducing forage wastage involves the use of simple hay nets, which can be weaved simply by children.

The importance of indigenous treatments and the need to promote these wherever possible was stressed.

Donkey management and health issues

Points and recommendations arising from group discussions

Introduction

It was generally acknowledged that there has not been sufficient attention paid to the question of welfare of the donkey. Donkeys in developing countries are almost always left to fend for themselves, even in communities where they are utilised extensively. Questions had been posed during the previous ATNESA meeting in Kenya in 1995 concerning the need for information on nutritional requirements of different classes of donkeys, the role of supplementary feeding, the effect of work on nutrient requirements, the epidemiology of donkey diseases, low cost remedies for common ailments and the physiological limits of work in donkeys. Serious information gaps still exist in all these areas. To accelerate progress, the group decided to work in three sub-groups, each concentrating on one of the major issues identified: nutrition, breeding and health care.

Nutrition

Proper feeding is an absolute essential for all classes of donkeys. The traditional feeding practices in Africa are apparently inadequate, judging from the poor conditions of the donkeys. The important questions to be addressed were: What to feed? How much to offer? How often to feed? Whether and when to supplement? What possible effect supplementation has on long term performance and condition of the donkey? What is the grazing behaviour of donkeys and how does it affect the environment? What are the key policy issues affecting donkey nutrition?

What to feed

Roughage

Stovers of various kinds were listed. Prominent among them were maize and sorghum stovers. Also included were maize cobs, low to medium quality hay and various other crop residues. Agro-industrial residues (eg, sugar cane tops, citrus pulp) were also suggested.

Leguminous roughages appeared not to be commonly used in donkey rations, but their incorporation could lead to substantial improvements in protein nutrition. There is a need for more studies in this area.

National networks should be asked to produce inventories of locally-available feed resources and guidelines on how to use and conserve them.

Concentrates

Concentrates are rarely used in rations for donkeys and it is often assumed that they can do without them. The conventional energy and protein sources used in dairy rations could also be formulated for donkey rations. Some of the possible materials include: maize bran, sorghum bran, wheat bran, brewer's waste, cotton seed cake, sunflower cake and many other oil cakes of local importance.

Protein sources of animal origin were not considered a viable option because of their generally high price However, where possible, low grade fish meal and a limited incorporation of blood meal could be suggested. Legume grains were also not suggested because of their high cost.

How much to feed

Quantities on offer should take account of the quality of the materials. For poor or medium quality roughages donkeys should be offered on a dry matter basis the equivalent of at least 5% of their body weight. This level will allow selective intake by the donkey and should be sufficient to satisfy an intake of some 2-3.5% of the body weight. Adequate quantities can only be judged by the condition of the animal, hence the need for farmers to be trained on condition scoring.

How often to feed

Working donkeys often have little time to feed. This is particularly so for donkeys in urban and peri-urban areas. Allowing enough time for evening grazing and an additional early morning grazing period would seem to be advantageous.

Whether and when to supplement

Monitoring changes in body condition (condition scoring) could be an easy, practical and adaptable tool for judging need for supplementary feeding. Farmers would need to decide whether to supplement to meet the requirement for the work or to limit the work to suit the condition of the animal and the available food resources. Studies on the economics of supplementary feeding are needed.

Effect of supplementation on long term performance and condition

Though it is not certain if supplementation leads to greater work efficiency, better-fed donkeys are more likely to remain in good condition and resist diseases than poorly-fed ones. The value of supplementary feeding should therefore be judged by the lifetime performance of the donkey. At present there is little information on the different requirements for work, pregnancy, lactation and growth.

Grazing behaviour and effect on the environment

There is little information on the grazing behaviour and grazing capacity of the donkey and its impact on the environment. Donkeys are often accused of causing environmental degradation because of their apparent preference for short grasses. Account is not taken of the fact that donkeys are mostly found in fragile ecozones and in numbers exceeded by other stock. There is a need to train farmers on evaluation of grazing land (veldt evaluation). Some research questions were raised :

- Do donkeys really degrade the environment?
- What is the donkey's adaptive capacity?

- What is the physiology/microbiology of the lower gut of the donkey?
- Could faecal metabolites be used as indicators of grazing conditions? If so, which ones?
- Are the common mineral deficiencies in soils also of significance to donkey's nutrition? Which minerals are the most critical?

Policy issues

Donkey nutrition deserves better funding and attention. An action plan for regional subgroups headed by a task group is proposed. This will be coordinated by Dr Aboud (Tanzania) and Dr Ndlovu (Zimbabwe). The primary focus will be initially on the collection of available literature on donkey nutrition and coordination of research work on areas in need of immediate attention, including trace elements, grazing behaviour, feeding to meet nutrient demands of different animal classes and physiological states.

Breeding and reproduction

Donkeys in developing countries have not been systematically selected for any productive function. The surviving types have more or less evolved through natural selection. This has produced adaptation to the environment without necessarily yielding better performing animals. Reproductive performance of the female donkey has not received the attention it deserves. Factors that could influence the reproductive functions have not been sufficiently investigated. Low conception rates (40%) leading to low reproductive rates (20-30%), frequent abortions, high mortality rates of foals, delayed age at first breeding and long interfoaling intervals may account for the slow rates of donkey population growth in many parts of Africa. However, these aspects have not been objectively researched. Guidelines on appropriate age/weight for breeding and for weaning of foals need to be established for the various local populations.

Four main areas in need of attention by scientists were identified, together with possible interventions.

Identification of farmers practices and needs

- Characterisation of donkeys by type and location
- Identification of relationships (if any) between type and use
- Local selection practices and the reasons behind them.

Determination of quantitative aspects

- Determine local supply and demand issues
- Describe and quantify the interactions between reproduction, nutrition, work, climate and other key factors.

National policies on breeding and regional promotion

- Establish national studs in which potential sires could be intensively selected based on agreed attributes
- Sires considered superior could service a broad stock of females through artificial insemination.

Controlled breeding programmes

- Identify ways of reducing the costs of castration
- Identify the economic age of castration

Implementation strategies

There is need for greater collaboration between national programmes and networks. Research efforts should be cooordinated, with collaboration between national networks and partners in developed countries (European Union funding could be requested for this). Students should be involved in the programmes. Farmer awareness of selective breeding possibilities should be enhanced. Shows and competitions can have an important role in both raising farmer awareness and increasing researcher understanding of farmer perceptions. There should be emphasis on indigenous animal types and judging by the merits identified as appropriate by the local community.

Health care

The provision of primary health care requires an integrated approach from both farmers and veterinarians. To achieve this the following four elements are crucial.

Establish farmers needs and practices

Linkages need to be created between farmers and veterinarians by joint participation in community meetings and interest group discussions. Farmers need to be sensitised about nutritional deficiency conditions, prevention and treatment of diseases and options available so they make informed decisions. Veterinarians need to be sensitised as to the needs, priorities and economic constraints of donkey owners.

Basic epidemiology

There is need to understand the basic epidemiology of the common diseases and conditions afflicting donkeys. This will require survey work.

Design and deliver interventions:

Interventions suggested must be sustainable. In the first instance, some subsidies may be needed to encourage farmers to try products and see possible benefits. With increasing privatisation of veterinary services there is an increasing need for the primary health care to be delivered within the communities. One option is a village veterinary worker selected from among the farmers and given a short practical-oriented training, concentrating on injury treatment and parasite control in the fashion of the Chinese barefoot doctor. Such village agents should be provided with a basic kit which should be maintained by charging clients at replacement cost.

Monitor the impact

An invaluable tool for monitoring the effect of interventions would be a donkey condition score. This should be coupled with a health score covering items such as wounds, scars and foot condition. It is proposed that colleagues within ATNESA develop a unified condition and health score. This would become a management tool for both farmers and veterinarians.

Technology for donkey utilisation

Points from keynote presentation of D H O'Neill
based on the paper prepared by D H O'Neill, A A Wanders and E Mbanje

The power available from a donkey

Effective utilisation of donkeys requires a technology that matches the animals' size, shape and abilities. Donkeys in sub-Saharan Africa are used increasingly for packing, carting and tillage, all of which demand different technologies. The technology needed for draft applications is less well established but requires consideration. This is especially important as donkeys are increasingly being obliged to take on the role of oxen even to the extent of working with traditional ox-drawn equipment.

To specify what technology and equipment is appropriate for donkeys, the characteristics of the power unit (ie, the donkey) must be defined. Detailed information in the literature is sparse and possibly suspect. However, a 'typical' African donkey weighs about 140 kg. It has a sustainable draft capacity equal to about 17% of this live weight, or 240-280 N draft force (dependent on the specific task being performed). It walks at about 0.7 metres per second while working and can sustain this output for 3-4 hours per day. Such a 'typical' sub-Saharan donkey therefore can develop 170-200 W of sustainable power and perform 1.8-2.8 MJ of work in a day. If implements or carts require more energy input than this, they will not be appropriate for single donkeys.

Out of 64 designs for single-purpose tools proposed in West Africa since 1950, 14 have been adopted by donkey users. A number of these are lightweight, having been specifically developed for horses and donkeys. In southern Africa, in contrast, there is little diversity of equipment available to smallholders, and donkey farmers have had to attempt to hitch 4 to 8 donkeys together to pull heavy ox-drawn implements. Only in 1996 was a light cultivator introduced with a smaller but still heavy donkey plow. This plow (8 inch or 20 cm) requires 700 N of draft force in the heavy soils typical of southern Africa. Therefore, according to the power unit description given above, it *cannot* be pulled by even two donkeys. Either lower-draft plows need to be developed or farmers will need multiple donkey hitches and appropriate harnessing for such hitches. This may explain why donkey plowing is rare in southern Africa compared to West Africa.

Similarly, common donkey carts in southern Africa weigh 250 kg. With a small 100 kg payload, a single donkey could only pull this cart if the road were flat. In contrast, the typical West African cart weighs only about 100 kg, so with an additional small 100 kg load a single donkey can still pull it on roads with up to a 10% slope. This means that carting technology is more effective in West Africa and greater payloads can be accommodated. Carting has a longer tradition in West Africa, but it may be possible to transfer some of this technology to southern African regions. Cart draft can be reduced not only through lessening the weight of the cart but also by reducing the rolling resistance, improving bearings, increasing wheel height or adding tyres, or adding a suspension system (although the benefit in reduced draft from suspension is usually too small to justify the high cost).

Harnessing

The efficient utilisation of animal-drawn implements depends on the effective deployment of the animal's strength and muscular energy. Such deployment is inevitably influenced by the harnessing system. Poor harnessing results in a reduction in animal-implement performance through needless energy losses.

A good harness should be easy to attach and remove and should be simple and cheap (usually made locally). Harness should be adjustable, they should help, not hinder, the control of animals and they must be compatible with the hitching system used. A poor harness is one that injures the animal and/or hinders natural movement, breathing or blood circulation.

To improve poor harnessing, it is better to modify existing equipment rather than promote radical change. When multiple hitches are used, it is generally assumed that the total animal energy available is less than the sum of components in the team.

Discussion points

One participant pointed out that the use of teams of 6-8 animals for pulling carts, wagons and plows has had a long history in parts of Southern Africa. Other participants felt that such large teams were seldom appropriate as farmers cannot afford to own large teams. Encouraging large donkey teams could increase grazing pressure on marginal land. There was a need to develop lighter, low-draft implements for use with one or two donkeys. One participant doubted whether a durable 100 kg donkey cart was realistic.

One option suggested was to increase the available power output of a donkey by breeding for larger size, or by introducing mules. For example, three large donkeys can pull as much as four smaller ones, while eating less food. However, these benefits must be balanced with the farmer's desire to spread risk over many animals (four animals represents less risk than three). There is also the possible loss of agility in larger animals.

It was accepted that the figures from the literature that were presented were of doubtful reliability (this does not invalidate the general conclusions that were drawn). There was a need for further research to determine the actual working capacity of donkeys (the optimal percentage of live weight to pull at different tasks) and their optimal speed of work.

Tillage and technology

Points and recommendations arising from group discussions

Definition of tillage

Tillage is the manipulation of soil to produce crops and may involve primary and secondary cultivation. Primary tillage may involve the complete field or only portions of the field (eg, opening up only planting furrows). Minimum tillage is when only portions of the soil are disturbed or a reduced number of tillage runs are applied in a cropping season. Soil and water conservation practices should be an integral part of any tillage practice. Tillage can be undertaken by hand, animals or machines and various tillage technology systems have been developed for each. The hoe is the most common implement in hand powered systems. Animal powered systems have a range of primary and secondary tillage implements including the single mouldboard plow (the most common implement in eastern and southern Africa), ridgers and cultivators. In Ethiopia, the *maresha* is the main tillage implement.

Objective

During the initial group discussion it was agreed that there was a need to produce a methodology that could be used to compare the different power sources for specified tillage operations within a given farming system. The group noted that currently there was no specific methodology for such comparisons. Therefore, the group developed the methodology described. To use the methodology, it is necessary to specify environmental circumstances and operations. The specified farming system and operations were:

Farming system: Mid Rift Valley, small-scale farmer (2 ha), sandy loam soil, 700 mm ***rainfall***
Tillage operations: Primary tillage with a single ***tine***
Possible sources of power: hand, donkey, oxen, camel, mule, tractor (30 kW), power tiller.

The criteria (variables) used in constructing the matrix were: affordability of the power source, accessibility, availability of implements to match the power source, harness and hitching, soil conservation, timeliness, work rate, user friendliness. Other criteria could be included according to needs and interest. Each point was given a score on a five-point scale from 2 (best) to -2 (worst). The scores were subjective, but the group had to agree each value. Since the area (circumstance) for which the matrix has been developed has to be specified, factors such as soil type and climate have not been included as variables, as these should then be standard for all the power sources involved. The matrix shown in the table below was produced.

Interpretation of the matrix

The criteria which score low (row total) are factors limiting a given power source. These need to be addressed through research, training or policy. In the example, the harness score was 10. This suggests that harnessing is not regarded as a constraining factor. However, affordability, with score of -3 is regarded as a major constraint.

The column totals indicate the appropriateness of the power source under the given variables. For this situation, ox power system comes out as the most appropriate, (with a score of 7). Donkey power and tractor-power systems each with a score of 3 take the second place. The low work rate of donkeys could be remedied by using teams of donkeys although this would also affect affordability and accessibility. Developing matrices for other tillage operations might indicate that different power sources are more efficient than in the one example used here.

Potential and limitations of the matrix

The matrix analysis should be further developed and should be used for macro-level applications. However, the methodology has limitations. The subjective ascribing of assessments may not adequately encompass the complexity of the farming systems. Different people may give different weightings to the criteria. Economists may give a big weight to affordability while farmers may stress the importance of work rate. It would be valuable to undertake the scoring exercise together with participating farmers.

Power source comparison matrix according to various criteria for a smallholder farmer in the Mid Rift Valley of Ethiopia (sandy loam soil, 700mm rainfall) carrying out primary tillage with a tine

System	*Hand*	*Donkey*	*Oxen*	*Camel*	*Mule*	*Tractor*	*Power tiller*	***Total***
Affordability	2	1	0	-1	-1	-2	-2	**-3**
Accessibility	2	2	2	-1	-1	-1	-2	**1**
Availability	2	1	2	2	2	-1	-2	**6**
Harness	1	1	2	1	1	2	2	**10**
Soil	1	0	-1	0	0	-1	-1	**-2**
Timeliness	-2	0	2	1	1	2	2	**6**
Work rate	-2	-1	2	0	0	2	1	**2**
User friendly	-2	-1	0	0	0	2	1	**0**
Total	**2**	**3**	**7**	**2**	**2**	**3**	**-1**	

Scores based on: 2 = best, 1 = good, 0 = OK, - 1 = poor, -2 = worst

Transport systems

Points and recommendations arising from group discussions

Introduction

The use of donkeys as pack animals is a significant feature of many African societies. Transport by pack donkeys, especially of fuelwood, water and grain, plays an important role in both household activities and income generation. Donkey-drawn carts may be used with either single or teamed animals. The distribution of donkey carts is very uneven in Africa. They are often found in isolated local concentrations. There is much scope for encouraging wider use of donkey carts. This is particularly appropriate in locations where donkeys exist but are underutilised, for example when they are only employed for a few activities sporadically during the year.

Whether pulling a cart or a farm implement, working singly or in teams, the draft donkey requires an appropriate harnessing system to allow power transfer from animal to implement. Although pack animals represent a centuries-old technology in much of Africa, the use of donkeys as draft animals is a recent introduction in most African countries. Most farmers are therefore unaware of the practice of harness construction for donkeys. Inappropriate, ill-fitting harnesses represent a major cause of injury to donkeys. Inefficient harnesses can limit power output, cause donkeys to tire easily, and reduce both short- and long-term effectiveness of donkeys. In situations where farmers use donkeys as replacements for oxen (temporarily or permanently), it is common for farmers to transfer ox-yoke technology directly to donkeys. This is an inappropriate harnessing system for both donkeys and horses. Another inefficient and cruel cart harnessing method for donkeys has been dubbed the 'necklace' harness. This comprises a simple rope or strap around the neck. Unfortunately it is seen quite commonly.

'Perfected' but expensive harnesses for donkeys do exist, and can be found in several European countries and elsewhere. At present, however, African situations require low-cost systems using local materials while still achieving durability and flexibility. As an alternative to yokes and necklaces, three different systems are currently in use or being promoted: collar harnesses, breastbands and saddle harnesses. Each type has its advantages and disadvantages.

Collar harnesses

Collar harnesses make use of a rigid structure (the hames) of metal or wood lying along the shoulder blade and supported by thick, durable padding. The hames, to which traces are attached, act as an extension of the bone and this, combined with the large surface area of contact of the harness padding with the animal musculature, provide energy transfer from donkey to cart (or implement). This effectiveness is the chief advantage of the collar harness, but construction of collars often requires a certain level of craftsmanship, and input of materials that may not be available in rural areas. Collars tend to be expensive, difficult to obtain and are perceived as complicated. Collars must fit properly and exactly. Collars that are too small can choke the animal, while collars that are too large reduce effectiveness and cause skin and muscle wounding. Local alternatives to traditional leather and metal collars have been proposed and are in use in some places, including the three-pad collar from Kenya, the car tyre collar from Botswana and Zimbabwe and a cloth and wooden collar from Egypt. Such collars may provide simpler, cheaper alternatives but to date their uptake has been low in sub-Saharan Africa. Cost is not always the limiting factor, because some donkey-cart owners are engaged in profitable commercial enterprises and can afford improved harnessing. Why they do not do so is not clear although possible explanations include lack of information or cultural constraints.

Breastband harnesses

Breastband harnesses are relatively cheap and easy to make from various local materials. They can be made adjustable, or made to fit one animal only. Those fitting a certain donkey only may be desirable in that they will not be changed by the user. However, in this case farmers need to be advised not to swap harnesses between animals. The breaststrap needs to be about 5 to 8 cm wide for a 140 kg donkey. It should be well wrapped in a sweat-absorbing material such as fluffy sheepskin. It should fit so that it passes just above the point of the shoulder. Many farmer-made breastbands are placed either too high, impairing breathing, or too low, limiting energy transfer and causing sores by rubbing over the bone. Innovative and affordable breastbands are currently under production and promotion by the Institute of Agricultural Engineering, Zimbabwe (Agritex) and the Kenya Society for the Protection of Animals (KSPCA). Breastbands are being widely adopted and are a substantial improvement over 'necklaces'. Some scientists believe collar harnesses also represent viable options, and are superior for heavy loads.

Saddle harnesses

Both collars and breastbands can be used for carting and tillage, but any two-wheeled vehicle will require some system of supporting the vertical load on the donkey's back. This is easily accomplished if there are two shafts and one donkey, but carts with only a central draw pole pose a greater challenge. Collar harnesses may be more desirable in this case because with strong, well-fitted collars two (or more) donkeys can use a pole in front of the chest to support the load. Alternatively, in Zimbabwe, Agritex has developed a system with dual breastbands together with a dorsal

yoke, a pole over the backs of the animals attached to saddles. The pull is transferred by the breastband and traces but the cart drawpole is supported by the dorsal yoke. This system has not yet been widely adopted.

A harness arrangement widely used for donkey carts in Ethiopia (but not Ethiopian horse carts) involves a substantial wooden or metal saddle, in the shape of an inverted 'V', on the back. The shafts are attached to the saddle. A strap around the breast serves to hold the saddle in place. This strap may fulfil (in part) a similar function as the chest strap of a breastband harness (but this is not certain as there are no technical reports on this harnessing system). A similar system seems to be in use in Morocco and parts of Kenya for camel harnessing. A modified version for teams of two, involving a dorsal yoke constructed of metal pipe, has been proposed by the University of Warwick. Farmers interviewed found the dorsal yoke concept interesting but complicated. The effectiveness of this type of harness and possible long-term negative consequences for animal health are disputed. Generating much of the tractive effort by the weaker muscles of the back rather than the strong muscles of the chest and shoulder would seem to be ineffective. Additionally, heavy pressure on the back, and a rigid connection between a breaststrap and a back saddle, such as this harness involves, may reduce flexibility of the back, loin and shoulder which is necessary for ease of motion in the donkey.

Donkeys worked in teams will require swingletree and evener arrangements. Diagrams for understanding the principles of multiple hitches are now widely available. Regardless of the type of system used, all harnesses should be:

- Affordable and culturally acceptable
- Properly fitted and comfortable to the animal
- Simple to make and constructed of locally available material
- Simple to use (and hard to put on incorrectly)
- Durable and easy to repair so that the harness maintains its original form

Synthetic materials (nylon, plastic sacking, rubber), while strong, cheap and durable, cause abrasions and impair sweat evaporation. Use of such materials should be discouraged except for portions of the harness not touching the animal directly or when they are well-covered with natural fibres such as jute or canvas. Even cotton webbing, although strong, can cause damage to thin donkeys. Padding materials should be soft to the animal, absorptive of sweat and not liable to form lumps when wet.

Cattle tail hair obtained from slaughterhouses is excellent for stuffing canvas pads. Harness makers need continual assessment of local materials for their availability and suitability within each situation. Well-nourished donkeys, having a good covering of flesh over bones, are more tolerant of poor harnesses; therefore the promotion of proper nutrition and parasite control goes hand-in-hand with harness design and construction. Repairing with wire or stitching so that material overlaps or otherwise causes rough, ridged edges is to be discouraged.

Packing with donkeys

The use of donkeys as pack animals is a simpler, older technology than their use as draft animals. In several cultures such as Ethiopia many owners use appropriate techniques. It can be useful to learn from these successful applications. A good guide is to observe the animal itself. Those that are free from wounds and lameness and maintain good condition despite working hard are an indication of a successful, appropriate, humane technology.

Guidelines for humane packing

Although donkeys are very strong for their size, they should not be overloaded, overworked, or worked at too young an age. Donkeys do not reach skeletal maturity until 5 years of age, and therefore younger animals should carry lighter loads to avoid permanent skeletal damage.

The load a donkey can reasonably be expected to carry will depend on the age and condition of the donkey, the distance and the environmental conditions. Clearly steep, muddy or difficult terrain reduces the maximum load the donkey can carry. Recommended maximum pack loads for an average (140 kg) mature donkey under reasonable walking conditions are:

- 50 kg for trips over 2 hours
- 70 kg for trips of 30 min or less

Heavy loads should always be supported so as not to rest on the spine of the animal by means of a pack frame or saddle, usually of wood. The angle of the frame must be appropriate to the fleshiness of the donkey; usually 90° is sufficient to ensure that the peak of the saddle remains off the spine. Saddles with too large an angle are a common problem and lead to back sores. Thick, soft, absorptive padding (not plastic sacks) should be placed under the saddle. Woven cotton or wool blankets or old clothes work well and have the advantage that they can be washed. Placing padding flat and smooth and extending beyond the end of the saddle helps to reduce chafing and sores.

Pack saddles and loads are held in place principally through a tight girth or belly strap immediately behind the front legs. A second rear belly strap can also be used but should not be placed too far back, where the belly becomes sensitive. Straps under the tail (crupper) and around the chest should serve only to steady the load when travelling up and down hill. They should not act as principal points of load attachment and stabilisation, and therefore they should not be pulled tight. Crupper straps, when used, should be well padded, otherwise serious wounds and infection may develop under the tail. Often a wide breeching strap around the rump can work instead of a crupper.

When using pack donkeys it is important to:

- Ensure loads are balanced front to back as well as side to side
- Ensure loads are not too high or too wide (this takes more energy out of the donkey)

- Ensure load straps are flat against the animal's body and are not twisted
- Clean saddle pads and animals (area under saddle) as often as possible.

Carts and wagons

Four-wheeled vehicles (wagons) are desirable for transporting heavy loads because they eliminate the problem of large vertical forces acting on the back of the animals. However, in the African context such vehicles are usually prohibitively expensive and unsuitable for rough roads. Therefore donkey-drawn wheeled transport will generally involve two-wheeled carts. These may have either two shafts (suitable for one animal) or one central draw pole (suitable for two or more animals). When hitching two animals to a two-shafted cart, it is more efficient to harness them in tandem (one ahead of the other) rather than side by side. Likewise, hitching more than two donkeys to a one-pole cart is best done by putting the additional animals in front. They must then be connected to the vehicle through traces and swingletrees. Ideally, traces should be attached to a swingletree, not the cart shaft or cart body. If no swingletree is available, traces should be attached at the end of the shafts near the cart body and the shafts should move freely through loops attached to the saddle. Animals should not be attached to the front ends of the shafts. Therefore cart manufacturers should be encouraged to place attachment points (hooks) only at the rear ends of the shafts (near cart), not on the front of the shafts. Few cart harnesses are equipped with breeching straps, but this braking system is simple. Breeching straps should always be used on carts that lack wheel brakes (ie, most carts currently in use). Injury and discomfort to animals caused by carts without brakes should be avoided.

The angle at which the shaft or pole leaves the cart makes no significant difference to the draft force necessary to move the load. However, the load box or platform should be set as low as practical to reduce back and forth movement of the load. Such movements can increase the donkey's effort. Attention also needs to be paid to the wheel size and width, which does affect cart draft force, and to the condition of the bearings and degree of wobble in the wheels. Poor bearings and wobbly wheels probably increase draft force as well as causing low frequency vibration, which is disturbing to the animal, and increases tyre wear. The maximum acceptable load of a cart, including the weight of the cart, is about 300 kg per donkey hitched. As in packing, difficult terrain reduces this allowable load, and the long-term condition of the donkey is the best guide to the appropriateness of the load.

Many different designs of carts, of varying degrees of complexity, cost and ease of manufacture are in use around Africa. The Ethiopian triangular, wooden-framed cart with metal wheels seems particularly ingenious, provided the axle is not placed too far to the rear. Carts should be as light as possible (while still remaining durable) to maximise transport efficiency. Further exchange of information regarding carts from around the continent would be beneficial.

Animal selection

Just as there are different implements for different farm tasks, so are there different donkey types suited to different activities such as riding, packing and pulling. In some African nations, farmers recognise the existence of separate donkey types or breeds. However in many countries, donkeys are not classified in this way. Nonetheless, when observing a collection of donkeys, for example prior to purchase, one can notice individual differences that suggest suitability of that animal for a particular task. If farmers can take account of the relevant conformation points when selecting a donkey, they may acquire animals best suited to the demands of their task. Specific breeding for desirable traits could also be considered in future.

Points to look for in pack donkeys:

- Flat withers; neck set low and level
- Good girth hollow (dip just behind front legs)
- Very straight shoulder

Points to look for in draft donkeys

- Neck angled steeply upwards (allows space for breastband)
- Sloping shoulder
- Low centre of gravity (50% of animal legs, 50% body)
- Wide chest
- Square leg set (aids stability)
- Powerful, sloping hindquarters

Recommendations for the future

Animal scientists and engineers need to continue to work together and research appropriate, effective harnesses and cart designs. It is also important to study why certain systems seem acceptable and adoptable while others are do not. A database of locally available, acceptable harnessing material, as well as of cart design, could be developed on a regional basis. Pictorially-based extension pamphlets describing harnessing and packing guidelines should be developed and widely disseminated. Those persons having already developed effective harnessing systems should be willing to share their knowledge and examples with others. Locally-based seminars, demonstrations and training courses can increase the spread and understanding of the guidelines developed here, as well providing input and feedback from end-users. An ATNESA harnessing co-ordinator, if appointed, could facilitate these many actions and help arrange local 'study tours', whereby farmers and artisans could meet for mutual discussion and demonstration of new ideas.

Donkeys and development: socio-economic issues

Points from keynote presentation of K Marshall and P Starkey, drawing on the lead paper of P Fernando, G Bwalya, S Croxton, K Marshall, M Moorosi, M Mrema and P Starkey

Introduction

The socio-economic keynote paper of Priyanthi Fernando and colleagues had been circulated prior to the workshop. The socio-economic presentation combined summaries of key issues raised with participatory exercises. Participants were asked to share sayings from their own countries that reflected attitudes and beliefs relating to donkeys. They were also asked to identify noteworthy lessons and issues needing attention.

Problem of negative attitudes

The present contribution of donkeys to both rural and urban households is substantial, and their future potential to assist is even greater. Yet donkeys often remain underutilised and unacknowledged.The reasons for this include traditional negative attitudes towards donkeys and institutional neglect. In most cultures, there are common local sayings that reflect negative attitudes towards donkeys and ascribe poor attributes to donkeys. Such sayings perpetuate the idea that the donkey is an animal without value or worth. Among the many sayings reported by participants were:

- as stupid as a donkey *(almost universal)*
- a donkey rewards you with a kick
- if a donkey cries in a field, the crop will fail
- the donkey is a poor man's horse
- even honey is not sweet to the donkey
- a donkey husband cannot protect you from hyenas
- a donkey is for today, an ox is for tomorrow.

Institutional neglect

As donkeys have been used for transport for thousands of years, there exists considerable indigenous traditional knowledge regarding them. Most of this information, however, has not as yet been considered worth documenting.

Donkeys and donkey owners are further marginalised by institutional neglect, both official and unofficial. Some authorities consider the use of donkeys to be backward and symptomatic of underdevelopment. Donkeys are seldom mentioned in agricultural or veterinary curricula. They are not the subject of research by major international organisations. There are few official efforts to promote them.

Socio-economic importance of donkeys

Donkeys play an important economic role in many African societies and authorities should not be allowed to ignore this. For example, donkeys carry grain to the central market in Addis Ababa. A recent study found 800-1200 pack donkey owners operating with 2500-3000 donkeys transport 500-700 tonnes of grain per day. Each owner earned approximately 125 Birr (US$20) per month for each donkey (some owned two or three donkeys), which compares favourably with a civil servant's salary of 105 Birr per month. The daily financial turnover from donkey grain transport was estimated at US$5000. This significant economic activity however remains hidden. Most owners operate illegally without permits and they receive no government support or services.

In agriculture, donkeys can help increase production potential and enhance economic and food security. Donkeys enable farmers to cope with labour shortages and chance losses of cattle. Donkeys increase marketing options and allow farmers to gain a higher share of the value of harvested crops. Donkeys can provide opportunities for home consumption or sale of donkey milk or meat. Although consumption of donkey products is taboo in some societies, it is probably more frequent than is commonly admitted.

Women and donkeys

Donkeys can be particularly important in the lives of women. Rural women are often extremely busy with household work ('reproductive tasks'), including the transport of fuel wood, water, food and children. Such transport burdens can be lightened by women's access to donkeys. Women's agricultural crops are sometimes considered to be of low priority by men, and so women may have limited or untimely access to draft oxen. If women have access to donkeys for plowing, the cultivation of their crops for home consumption (or sale) can be increased.

Donkeys may also offer women the opportunity to enter the usually male-dominated income-generating ('productive') sphere. Donkeys can be used to transport materials for financial gain (eg, transport of water, wood, forage, produce for market). The helps women (as well as men) gain money, status and, as a result, power. Although women in many societies do not normally control funds, they may have a right to keep monies earned through donkey labour. Donkeys are an invaluable resource for those struggling to survive in harsh environments with minimal assets.

Male-dominated societies often consider women as low-status citizens, while donkeys are low-status animals. While these two marginalised groups can clearly benefit from their affinity, it is important to ensure that the association does not increase prejudice against women and/or donkeys. There is an African saying that 'donkeys and women can carry anything you put on their backs'.This praises work ability but reinforces the low status of both. The association of women and donkeys needs to be addressed with great sensitivity to ensure that people do not manipulate issues of status to undermine valuable women's programmes (or donkey promotion programmes).

Discussion points

Although donkey ownership has not had the same status as cattle ownership, there are some positive signs. Attitudes to donkeys vary from region to region, and some communities respect donkeys more than others. In some countries, donkeys are assuming a social importance formerly reserved for cattle. For example in some communities donkeys can now be used in dowry settlements. In Zambia, where cattle are a sign of wealth, donkeys are becoming a sign of innovation, and are taking a new social role.

Many Ethiopians recognise the crucial importance of donkeys to the Ethiopian economy and to the Addis Ababa markets. However, workshop participants encountered many negative attitudes towards donkeys, starting with the customs officials at Addis Ababa airport. They heard government officials comment on the desirability of removing all donkeys from Addis Ababa. Clearly the negative attitudes will require much effort to overcome, even in donkey-rich Ethiopia.

Donkey pack transport played a crucial role in the recent war of liberation. Dessalegne, a famous donkey belonging to the Ethiopian Peoples Revolutionary Democratic Front (EPRDF), is remembered for his service in the war effort by a statue in Makele, Tigray. A veterinary drug company is also named after him. Donkeys play an important economic role in Tigray, and salt trading in the Denakil Depression is accomplished using pack donkeys and mules. Nonetheless, Tigray culture still accommodates negative reflections on the worth of donkeys as exemplified by the saying, 'A prayer not from the heart is as worthless as taking a sick donkey for hydrotherapy'.

Participant observations and concerns

Donkeys are versatile, hardy, affordable and beneficial animals. They are especially important in drought-stricken areas. The resource-poor stand to benefit the most from donkey use.

Donkeys can be owned and handled by women. They can help women to relieve drudgery, upgrade their social status and generate income.

Despite their obvious economic value of donkey work, donkeys have seldom been considered in development programmes. Donkeys can be invaluable for income generation for disadvantaged people with few other options. Government, extension and educational authorities are woefully uninformed about the importance of donkeys and this needs to be addressed in order to bring about policy changes to support donkey utilisation.

Donkeys have the potential to provide a good income to many men and women, including those in urban environments. Pack donkeys make a large contribution to the Addis Ababa grain market. The social and transport infrastructure may need to be adjusted to maximise the benefits of donkey transport.

Although many people benefit from donkeys, they remain misunderstood and misrepresented. Social and cultural bias and institutional ignorance operate against donkeys.There are many traditional myths, proverbs, sayings and beliefs that reflect very negatively upon donkeys. It is necessary to change these attitudes, but it will not be easy. Among the suggestions for improving the low status of donkeys were:

- Politicians and local leaders need to be seen with donkeys
- Donkey associations should be formed and donkey competitions held
- Compile sayings and myths about donkeys with suggestions on how to combat the negative attitudes.
- Promote positive images to counteract negative stereotypes, through publications, the media, network activities and the launch of positive donkey proverbs.
- Enact legislation for the protection of donkeys and donkey owners (for example regarding liability in donkey/vehicle accidents).
- Negative attitudes arise from lack of knowledge, and there is need for appropriate education and training in schools and colleges and throughout societies.

Areas needing further study or information

Substantial data on the socio-economic role of donkeys is needed (a few casual observations are insufficient). There is a need for participatory rural appraisals to obtain comprehensive information on the role of donkeys in farming and transport systems. This should include information on the relative merits of oxen and donkeys, and their comparative advantages.

There is a huge repository of traditional knowledge regarding donkeys which should be collected and recorded.

Donkeys in general need more research attention, including health and feeding, donkey size and type, breeding systems, appropriate implements for donkeys and the potential for donkeys to replace (or complement) oxen in certain farming systems.

Other comments made by participants

In Egypt, the government discourages donkeys in towns because they disturb traffic and do not provide a good picture of civilisation for tourists. Therefore police take grazing donkeys away to zoos to be fed to the animals. Similar negative attitudes were reported from South Africa.

There is a need to diversify ways of using donkeys. Transport will be their main role (donkeys have many comparative advantages for transport), but donkeys are increasingly accepted as animals for tillage. It is possible that the value and status of donkeys will change if there is increased consumption of donkey milk and meat.

Socio-economic and policy planning

Points and recommendations arising from group discussions

Perspective and potential

Donkeys are flexible, hardy, multipurpose animals. They can be used in many farming systems and for many transport tasks. Donkeys have the potential to be major economic resources in developing countries. They are already extremely important. Donkeys are used for the transport (packing, carting, riding) of numerous loads of economic and social importance (water, fuelwood, produce, commodities and people). They can also be used for tillage, leisure, milk and meat (in some countries). Donkeys can complement other animal types and other transport systems.

User requirements

To be a viable development resource, donkeys (and associated donkey technologies) need to meet the technical, social and economic requirements of the users and the work.

Technical
Technology needs to be appropriate and effective for the job intended. It must be user-friendly and it must be possible to maintain and service it locally.

Economic
There is a high benefit-cost ratio in using donkeys. Generally donkeys are readily available and affordable so that when the circumstance arises they can be replaced at relatively low cost. Donkeys have an important economic role in alleviating the problem of marketing bottlenecks created by lack of transport.

Social
Donkey utilisation is not generally gender specific (although there are some exceptions). Women can therefore be included in projects involving donkeys. Donkeys provide relief from drudgery and can increase sharing amongst the community.

Organisational
Donkeys often fit into the existing socio-economic structures of everyday life because of their economic, technical and social attributes.

Environmental impact
There appears no conclusive evidence that donkeys cause environmental damage in Africa. Unlike tractors, donkeys consume renewable resources, they reproduce themselves and are biodegradable.

Problems identified in utilising the donkey.

Economic
Donkey users are often poor, with limited income. They may lack labour and access to feed or grazing.

Institutional
Negative government attitudes mean that donkeys are generally not included in the curricula of agricultural and veterinary courses. This has led to limited knowledge of donkey utilisation and management by the professionals who should support donkey use. Donkeys have limited access to healthcare due to lack of veterinary services, lack of training by veterinarians and the relatively high costs of veterinary products.

Cultural
Donkeys have a low image, as a poor person's 'beast of burden'. There is seldom any prestige in owning a donkey. People often prefer to own oxen. There may be limited knowledge on the use and management of donkeys. In some situations there is gender stereotyping in relation to donkey usage, and they are sometimes associated only with women.

Technical
Although technical knowledge and skills regarding donkeys are available, the dissemination of such information is often a major problem.

Policy responses and recommendations

Image and knowledge
It is necessary to improve the image of donkeys. This important step is essential if the education systems themselves are to adopt a more informative and positive position on donkeys. To improve the image and knowledge about donkeys requires lobbying of decision makers and professionals to include donkey utilisation and management at all levels of education from children to veterinarians. It is also necessary to train extension agents to disseminate appropriate information on donkeys. Training programmes should encompass 'international' and indigenous knowledge.

Information gap
There is insufficient information available concerning donkeys. Participatory rural appraisals and formal national surveys are required to produce statistics on donkey numbers, distribution and breed characteristics as well as the role donkeys in the national economies. In addition to technical research (nutrition, health, harnessing) on donkeys, investigations are required on gender issues and environmental impact. Regional networking is needed for both information exchange and collaboration on key issues. ATNESA can play an important role in assisting such regional cooperation.

Poor policy environment
National policies should be adopted, with legislative and regulatory frameworks to address issues such as:

- Donkey welfare and reducing cruelty to donkeys
- Donkey health and the role of para-veterinarians
- Incorporating the needs of donkey users (and Users' Associations) into infrastructure planning and marketing facilitation.

Limited resource base of donkey users
There is need to improve the access of donkey users to financial resources and group credit.

Extension, training and education

Points and recommendations arising from group discussions

Introduction

Extension services in developing countries can be the mediators between the users and the technology developers. Unfortunately, in most cases, extension agents lack the knowledge or the material to pass the training required for the utilisation of donkeys. Extension agents should be provided with the relevant education, training and materials needed to teach donkey users management skills for improving the welfare and health of the donkeys and thereby improving the owners' socio-economic situation. A bottom-up approach is required to assess the users' needs. Extension agents need to be educated in the methodologies of learning from the users and of disseminating the information to the users (some examples of helpful techniques are given below).

Donkeys are rarely addressed in agricultural education (primary, secondary and tertiary) as useful animals in both rural and urban life. This is despite the fact that many people use donkeys for transportation of goods from their farmsteads to the market and for everyday tasks such as collecting water and fuelwood. Governments lack the information required to be aware of the importance of donkeys and therefore do not address the subject. Lobbying of policy makers is the first step to changing the curriculum in education and training to include donkey utilisation and management.

Guidelines for successful lobbying

Developing and promoting donkey usage within a country involves lobbying the policy makers. Primarily lobbying can be done by local animal traction networks to see that the diffusion of knowledge on donkey use and management is in the work agenda of the national extension systems. Lobbying should utilise all available means. A check list on how to go about lobbying policy makers was discussed and produced as follows.

- It is recommended to start with a detailed (but not more than two sides) letter of intent preferably addressed to the minister of the relevant ministry involved. It is important to gain the support and agreement of the authorities if anything sustainable is to be achieved.
- Contact with people in positions of authority is important. Occasions such as national holiday celebrations, sporting events and embassy cocktail parties all give the opportunity to present yourself and your programme. Make sure the minister and senior officials are invited to a function where it is possible to have a few words with them.
- Having got a tacit 'OK' from the very top, leave them in peace. Deal with heads of departments etc. Send them copies of workshop proceedings and,minutes of important meetings. It may still be polite to send these to the minister, but do not expect him/her to read everything.
- The ministries must be made to feel that co-operating with you will not cause them any embarrassment or trouble and also that you will provide some actual advantage to them. Examples of benefits could be sponsored veterinary programmes, provision of quality education materials and/or prestigious meetings and seminars to be held in-country; certain officials might be invited to represent their country (and the programme you are promoting) in international workshops elsewhere.
- Continue networking; develop and cultivate influential friends in important, decision-making positions.
- Prepare written material, including scientific papers, proposals, illustrations in a dossier/folder with the project name and promoter clearly emblazoned on it and present this to officials, ministers and policy makers.
- Continually emphasise the economic advantages and fashionability of your programme. Use fashionable jargon.
- Make use of all media. The editors of newspapers, radio programmes and television are always looking for good stories.
- Publicity materials (calendars, pens, key rings, T-shirts, etc) bearing an attractive logo all help to familiarise people with your name and project. They may also help to give credibility to donkeys if they are featured on the material (but be careful this does not cause rejection).
- It is important to convince the country's professionals (technocrats, doctors, teachers, engineers etc) of the wisdom of your programme. With their support, the programme will have a higher profile, and they may also be a source of funding.
- When working in the countryside, identify the village elders, or respected farmers and use them as a channel to feed information to the rest of the village. Of course, he or she must be convinced first. Use farmers' associations or co-operatives whenever possible to lobby and promote your programme.
- When producing materials, such as booklets, leaflets or calendars, always consult with the local authorities, so that their name/logo can be used alongside yours. Perhaps the minister can be asked to write a preface or endorsement.
- If the president or minister or senior politician makes a major speech, see if any of their statements apply particularly to your programme and then quote their speech. They will be very flattered and it can be used to push particular policies.

Education

Donkey utilisation and management concepts need to be part of the teaching syllabus at all levels of education. For this purpose the preparation of relevant teaching materials must relate to traditional farmer practices and priorities. Therefore incorporating indigenous knowledge, highlighting advantages of donkey utilisation and management in both rural and urban life and improving the image of the donkey is advised. The material used will depend on the target audience (teachers, children, trainers, extension agents, literate farmers or illiterate farmers) and the funding available. Some suggestions include:

- Manuals for extension services
- Teachers' handbooks (these reduce the cost of providing every student with a book)
- Slides, video, films
- Brochures, posters, leaflets, newsletters
- Research materials (journals, workshop proceedings, collection of resource material)
- Songs and story books on donkeys
- Toys, T-shirts, stickers, puppets, artist materials
- Models of donkeys and implements (but always better to use the real thing, if possible).

Training

For the delivery of an effective extension service in donkey utilisation and management farmers, staff of outreach programmes, as well as students of agricultural and development sciences, and the community at large, must be provided with an enabling environment to understand and be versed in the biology, nutrition and care of donkeys plus the technologies associated with their efficient use. To this end it is necessary to design and offer training programmes focusing on key issues such as:

- uses of donkeys
- housing, feeding and general care of donkeys
- primary health care of donkeys, focusing on recognition of sick donkeys, worm control, hoof care and control of parasites
- donkey harnessing and implements.

Extension

Extension agents need to be provided with the techniques necessary to assess the requirements of the donkey owners and users. They require the necessary means to disseminate the information. Emphasis must be put on the interaction between farmers and extension agents. This should be included in their training. Their syllabus should include material on:

- listening techniques
- approaches needed to include participation by women
- communication techniques for different target groups (illiterates, children, farmers, women)
- conducting demonstrations
- organisation of competitions and shows within and between villages
- methods to facilitate and sustain farmers' groups
- managing farmer to farmer interactions and visits
- making use of religious and cultural leaders.

Some of the techniques required are give below in the form of recommendations and check lists.

Extension techniques and checklists

Listening skills

- Allow plenty of time.
- Let the group set its own agenda.
- Ensure people are allowed to express themselves, if possible, in their own language.
- Ask as few questions as possible.
- Clear your mind of your own interests, and try to discover the interests of each speaker.
- If in a group of people, sit at the back, do not stand at the front.

Encourage speakers to make their own summaries, priority lists and records (ensure a meeting has at least one literate participant from the membership community who can be instructed by the others to keep appropriate records). The records may be made in any form (diagrams, map, text, etc.) using any materials. If a record needs to be taken away, take a copy, leaving the original with its compiler(s).

Women's participation

- Sensitise local leaders, both men and women.
- Target activities in which women are engaged.
- Determine a minimum percentage for women participation in activities. If there is a credit scheme have a certain percentage available specifically for women.
- Use a group approach. This allows women overcome shyness and minimises suspicion by men, making it easier for male extension agents.
- If the women are illiterate, assistance from men may be required, but such men should only act as secretaries, leaving the women in control.
- In competitions, consider having a separate category for women to avoid men hijacking women's projects.

Facilitating a farmers' group using cards

Arrange a meeting of farmers with the same problem. Each farmer should put each problem on a card (for illiterate farmers facilitators are needed). The cards are put on a wall in a problem tree, with basic problems at the bottom and problems resulting from core problems further up. Once there is a consensus about the right relationship between the problems, the possible solutions should be put on cards by the farmers. These are then arranged in the same manner. Cards can change position until a consensus has been reached. A list of actions can then be agreed upon with a timetable.

Using pictures to communicate with illiterate farmers

Use simple pictures that are clear and visible with locally-oriented illustrations. Avoid written words. Deliver one message at a time appropriate to the particular time of year.

Demonstrations

- Identify the target group and the type of demonstration needed (desired).
- Determine time of year and time of day for the demonstration (demonstrations should be related to the local farming calendar).
- Determine availability of a demonstration plot and acquire a supply of implements, tools and trained animals.
- Announce the demonstration(s) but limit the number of participants to the resources available. If necessary plan several demonstrations.
- Prepare handouts which can be left in the village for the appropriate target group.

Competition and shows

- Meet with farmers/village leaders to explain and discuss the concept.
- Decide the time of year for competition (6-12 months after initial meeting) and identify a suitable site (accessible to invited guests).
- Assess and monitor work required in the village and possible problems to be conducted in the village (site preparation, fodder supplies, disease prevalence, etc).
- Discuss and organise categories. Have many classes so that so nearly everyone is a winner in something.
- Decide on prizes for incentives (contact producers or sellers of harnesses, implements, healthcare products, feeds, etc, to donate prizes relevant to donkey care, health and management.
- Organise a committee of villagers (including women) to form a panel of judges but invite influential people to present the prizes.
- Photograph winners and give (or sell) copies to winners and provide copies for press/media.
- Provide assistance with information (leaflets, posters, photos). Provide healthcare, including anthelmintic drugs if available.
- On competition day, make it fun (organise songs, dances etc).
- Organise and advertise the next competition as soon as possible, include other classes for equipment, materials. If there are local agricultural shows, send the winners to the shows and/or organise further competitions at them.
- Start competition between villages leading up towards regional and national shows.

Starting and sustaining farmers' groups

Emphasise advantages of group rather than individual effort in influencing policy. Ensure there will be benefits to membership. Members should set up their own rules and constitution. Where possible, farmers' groups should be linked in a bottom-up pyramid structure, local groups linking to national coordination. Where possible, government officials should not be directly involved in setting up groups and committee; they should be advisors only.

Extension workers and national animal traction networks should interact with farmers groups, supporting and empowering them. The emphasis should be on developing the self-reliance of individuals and the group. This will be assisted by enhancing functional literacy and numeracy. Supporting organisations and networks should ensure the availability of information, inputs and credit facilities, perhaps as a package. Exchange visits with other farmer groups should be encouraged. It is important that the value of indigenous knowledge and trade practices is stressed.

Exchanges between farmer groups

Start by building credibility with the various groups (experienced and less experienced). This could take a year or more. Only make promises you can keep. Expect to be tested for your hidden agenda. Work with the community to identify 'good' donkey users and those who would benefit from learning from them. If there are favourable practices to be encouraged, make sure these are being used by more than one farmer.

Gain permission for a visit to a 'good' farmer or donkey-user at place and time of his/her choice. Stimulate request for such a visit from less-experienced farmers/users that have potential for improvement. Agree all details well in advance and use guaranteed transport. Use most experienced extension agents. Plan the visit details with all concerned. A reasonable group size is 5-7 and half a day per visit should be the maximum for a local event. Plan whether visitors should bring their own food, or arrange hospitality.

Be prepared to guide and facilitate during visit. Listen to discussions, be ready for spin-off ideas. Record the visit by photographs and give (or sell) photographs to interested people. Thank all concerned. A small reward for the visited farmer(s) can be good, but not essential.

Capitalising on religion and culture

It is desirable to sensitise the religious leaders and convince them of the programme's value. Discuss with the leaders the economic advantage. Be close to the leaders in order to convince them and where appropriate deliver presents and gifts. Use the leaders to change the attitude of the people during preaching, by mentioning points from religious teachings. Mention the importance of donkeys at every religious holiday, stressing the importance of self reliance.

Recommendations for ATNESA

- Encourage/facilitate the production of professional-quality videos on donkey use.
- Encourage/facilitate and/or fund local writers to prepared leaflets, pamphlets and children's stories about donkeys and to facilitate communication with publishers.
- Establish an ATNESA curriculum development group.
- Review current manuals on donkeys available in the region and promote progress in this area.
- Conduct a survey to record indigenous Ethiopian knowledge about donkeys.

Evening sessions

Ethnoveterinary medicine discussions

It was agreed that many livestock owners in Africa were returning to ethnoveterinary treatments because of the increasing costs o f drugs brought about by actual prices rises and removal of subsidies as a result of moves to privatise veterinary services in many countries. Of the veterinarians attending none were able to report that they had had any formal training in ethnoveterinary medicine despite the fact that throughout Africa it was possibly the most widespread method of disease treatment.

Participants distinguished between the medicinal and spiritual aspects of ethnoveterinary medicine. In a brainstorming session the following heath problems and corresponding treatments were identified:

- *Worms*
  tobacco extract (Ghana, Namibia), aloe (South Africa), garlic (Ghana)
- *Wound healing*
  ash (universal), salt, papaya leaves (Zimbabwe), peach leaf poultice (South Africa), maggots (Jamaica, Pakistan, South Africa, UK), honey (Mexico, Morocco and elsewhere), starch, urea, gentian violet (Egypt).
- *Bleeding wounds*
  nutmeg (Jamaica), sugar (South Africa) snuff (Pakistan)
- *Mastitis*
  coating the udder with sheep fat and fumigating with the smoke from certain birds' nests
- *Skin diseases*
  used engine oil (universal), sulphur and coconut oil (Jamaica), Vaseline (Zimbabwe)
- *Diarrhoea*
  chimney soot (Kenya)

Few spiritual examples of ethnoveterinary medicine were described other than the various practices for keeping away 'evil eyes' such as red ribbons attached to animals or 'stars' on harnessing. It was noted that whilst ethnoveterinary medicine might have rituals involving prayers and dancing, modern veterinary medicine also had rituals such as the wearing of white coats that sought to enhance the status of the particular treatment being administered.

The discussion then moved on from listing treatments to an examination of some of the underlying issues. It was argued that some of what is now regarded as traditional medicine is in fact the 'modern' veterinary medicine of the 1940s ands 50s, for example, the use of potassium permanganate as an antiseptic. It was suggested that early veterinary texts from both East and West could be usefully re-examined for remedies and treatments that might have application in Africa in the current circumstances.

It was agreed that a major limitation of ethnoveterinary medicine was a lack of proper validation of many remedies. In the minds of many livestock owners the validation of such treatments was apparently completed as they were often prepared to pay more for traditional than modern medicines.

The work being done by Nairobi and Natal Universities in establishing botanical gardens of herbal remedies was seen as an encouraging development.

Participants were keen to see ethnoveterinary medicine included in animal science/veterinary curricula. There was concern about the issue of ownership of traditional knowledge and who would be the main beneficiaries of greater research in this area.

IDPT video on donkey castration

The presentation by staff of the International Donkey Protection Trust (IDPT) started with a brief history of the development of castration, from the use of two sharp stones to the emasculator. In many countries non-castrated male donkeys are frequently chosen as the main source of draft power. It was explained that non-castrated donkeys can be more aggressive, have a tendency to stray and put more energy into searching out females than building up their body condition. It was argued that if male donkeys are castrated at the appropriate age (1-3 years) there is a high probability that their behaviour will improve, leading to better body condition and temperament.

In the video, filmed by the IDPT in Mexico, the field techniques and the drugs administered were demonstrated. The completed video is to include a comparison with the hospital technique used at The Donkey Sanctuary in the UK and is to be distributed to veterinary schools and interested parties throughout the world. In response to a question it was explained that the spermatic cord of equines is different from that of bovines and ovines, making closed castration to be of low efficacy and that the use of the burdizzo on the donkey is considered cruel. A further question was raised on the cost of the anaesthetics. It was explained that it is possible to use low cost drugs and to obtain surgical material from hospitals. It was mentioned that the IDPT provides a castration service free of charge in the countries where it is operational.

Palabana video on donkey training and use

A video was shown that had been recorded during the first farmers' course on donkey traction organised by the Palabana Centre, Zambia, with technical input from Peta Jones. The unedited video showed various interesting activities and farmer reactions during the course. The course lasted two weeks and involved the training of donkeys, making breast band harnesses and wooden carrying racks, feeding, health care and housing of donkeys. The participants also had an opportunity to take part in caring for wounds caused in a fight of two stallions.

Workshop participants were impressed by the video and noted that there was need to develop and

disseminate more videos of this type for training and extension purposes.

Namibian video on training of donkeys

A professionally-produced video had been made during a farmer training programme. The video shows farmers training both draft cattle and donkeys. The training of the farmers was conducted by a team from Palabana Centre, Zambia.The video was funded by the French-supported Northern Namibia Agricultural Development Project and was intended to be used for training and extension purposes. To this effect the narration was done in a local language.

The video showed the complete draft animal training programme. It started with an elaborate explanation of the importance of good training of draft animals, the training steps and related guiding principles. The video, produced during animal (cattle and donkey) training sessions revealed a number of unexpected issues in draft animal training.

Angle of pull discussions

This proved to be a very active discussion group. The participants keenly returned to a topic that has interested donkey and mechanisation enthusiasts for some time. The protagonists argued for increasing the angle of pull, ie, setting the implement chain or traces at a steeper angle, with respect to the horizontal, than is normal. This can be achieved on a donkey using a breastband harness together with a hip strap (belt over the hindquarters of the donkey) to hold up the traces to the angle required. Such a harness had been demonstrated by Frank Inns, together with a light (12 kg) donkey plow. The participants supporting this system argued that the high lift harness reduced the draft force requirement of the plow, enabling a single donkey to pull it. Frank Inns used the Tillage Implement Draft Equation to support his argument.

The benefits of this arrangement were questioned by several participants, who argued that the increased angle of pull gave only an apparent reduction in the draft force required to pull the plow. This was because it resulted in a very slightly shallower depth of working. It was argued that the best line of pull, from the animal's perspective, is through the centre of gravity of the animal. This is not the case when the harness is equipped with the hip belt to increase the angle of pull. In a taller animal, such as a draft horse, a steep angle of pull could potentially be achieved while still generating pull from the shoulder or chest of the animal but in the short donkey a steep angle of pull has to come through a hip belt.

The animal biologists in the group argued with the engineers that, because the back, and most especially the loin or hip area, is extremely weak in the donkey, it is inappropriate to ask the animal pull from the hip. Downward pressure over the kidneys, it was argued, is painful to the animal and restricts the free movement of the back necessary for proper forward movement.

The dispute was not resolved. It was agreed that more precise measurements are needed on depth of work, animal performance and force applications under both systems. Two separate reports of the meeting were prepared, reflecting the different conclusions drawn.

West Africa Animal Traction Network

West African participants at the workshop and some interested colleagues from Europe met to discuss the inactivity of the West African Animal Traction Network and to consider its possible rejuvenation. Those present included participants from Cameroon, Ghana, Niger, Nigeria, Tchad, Germany and UK.

After considering many options for restarting the network, the meeting decided to take advantage to the forthcoming meeting on animal traction involving Cameroon, Tchad and Central African Republic to be funded by the French organisation CIRAD. Eric Vall suggested that this meeting could be expanded to include representation from other West African countries. The idea would be to assemble a range of people from the region interested in animal power, and develop a programme of activities and an agenda for restarting the network. The meeting asked Eric Vall and Achendu Lot Ebangi to initiate moves to invite other West African participants to the proposed workshop in Cameroon, and endeavour to develop a programme of West African collaboration. The meeting also requested Paul Starkey to assist the Cameroon initiative as appropriate.

Ethiopian Network for Animal Traction

The Ethiopian Network for Animal Traction (ENAT) was established in 1994 at a major national workshop attended by 120 participants. Shortly after its initiation, the Ministry of Agriculture went through major restructuring which affected ENAT officers, and consequently restricted ENAT development.

In his opening address to the workshop, the Ethiopian Vice Minister of Agriculture expressed a wish that ENAT become an effective organisation. The ATNESA steering committee also hoped that ENAT would join the active animal traction networks in eastern and southern Africa. An ad-hoc committee was formed with professionals from the Institute of Agricultural Research, Ministry of Agriculture, Faculty of Veterinary Medicine, International Livestock Research Institute, Alemaya University of Agriculture and the Oromia Bureau of Agriculture. This committee is expected to prepare the ground for holding a national workshop on the revitalisation of ENAT. Publicity and media coverage from the donkey workshop has led to very senior government officers speaking positively about donkeys. This suggests there are good prospects for the development of ENAT. It is hoped that new funds will be made available for work on the improvement of donkey utilisation and management in Ethiopia, and that ENAT should be involved in this (as well as many other aspects of animal traction in Ethiopia).

Workshop conclusions

After lively discussions in the five working groups, a number of suggestions for action were put forward. Concern was centred on the necessary provisions that would make the donkey best able to deliver the little tractive force it possesses. Some attention was also paid to the welfare of the donkey and the possible ways by which better utilisation and management of donkeys could be promoted in Eastern and Southern Africa.

Improper harnessing appears to be a major cause for concern. Many traditional harnesses used in the region are largely an application of systems appropriate for oxen, systems which are certainly inappropriate for donkeys. A few examples of acceptable harnesses were noted, but in nearly every case there was an urgent call for scientific evaluation and some degree of modification. Information on harnessing technologies tested and proven for effectiveness throughout the world exists, but needs to be disseminated; this task requires positive action by ATNESA.

In most situations, the donkey is not the species of choice for primary tillage operations. However, donkeys can excel in secondary tillage duties requiring less tractive force (eg, weeding and planting). Studies are needed to hasten development of tillage implements better suited for donkeys.

Although it is not uncommon to hear expressions of sympathy for donkeys, the topic of donkey management and welfare does not receive sufficient serious attention. The needs for information on proper feeding, housing and general husbandry of the donkey were highlighted. Suggestions were submitted on establishing the nutrient requirements of and proper ration formulations for different classes of donkeys. There was also need for documentation of existing information on nutrition and feed resources and work on matching the tasks assigned to donkeys to the available feed resources and/or donkey condition.

The conventional body condition scoring was considered to be inadequate on its own unless it is coupled with a 'health score'. It was suggested that ATNESA should coordinate efforts that would lead to the development of a common regional condition scoring system. This should take account of both the physical and the clinical condition of the donkey. Such a score could serve as a management tool which farmers could use in making decisions on supplementary feeding, strategic (not routine) prophylactic treatments and foot care.

As donkeys do not feature in the national livestock policies in most of the ATNESA member countries, the conventional veterinary networks tend to ignore specialised care of the donkey. In some cases (eg, Ethiopia), veterinary attention to the donkey may even be regarded as a malpractice. The need for primary healthcare for donkeys was strongly advocated, with emphasis on an ethnoveterinary approach. Such an approach is likely to be cost effective, easily adaptable and more sustainable than conventional 'western' methods.

The multipurpose use of donkeys warrants attention for scientific evaluation of the suitability of the different strains/breeds for the different functions they perform. It is a common perception is that donkeys of Africa are a uniform population. This is probably wrong. Observations in many places have indicated wide variation, even within national boundaries. Strains need to be identified which could then be systematically selected and bred to match the functions best suited for their dispositions and conformations. Plans in this area would require inter-regional corporation. ATNESA should provide a forum through which information could be exchanged.

Controlled breeding for the purpose of selection is only meaningful when the offspring are likely to possess the desired characteristics. The desirability of controlled breeding for selection or for management purposes was not discussed much during the workshop. The IDPT video on castration that was screened was intended to show the proper way of castration under field conditions. Some participants had reservations about the usefulness of castration of donkeys under current conditions in Africa. Concern was voiced on the postoperative care needed, the costs involved and whether castration actually improves donkey performance as stated. The later remains a controversial issue and requires some study.

The donkey in most societies is poorly regarded, despite the multiple functions it performs. However, recent advances noted in Eastern and Southern Africa may change the bad image of the donkey in many societies. To encourage this trend, efforts are needed in the production and dissemination of information on the merits, use and care of the donkeys. The leaflets such as those produced by KENDAT (Kenya) and the video produced by Palabana (Zambia) are a move in the right direction. Such materials need to be assessed for their suitability to a wider audience. Only a few leaflets were available at the workshop and they were not critically examined by the participants. Resource materials are required on nearly the whole spectrum of donkey training, use and care; on various harnessing and carts options and on the many non-farm activities which donkeys can perform. The instructional video provided by Northern Namibia Agricultural Development Project offers a good example and could be copied for a wider distribution.

Socio-economic and policy discussions during the workshop provided some ideas and encouragement as well as challenges to redress the common apathy of government authorities towards the donkey. It was proposed that well-planned studies should be conducted to demonstrate to the authorities the significant economic contribution of the donkeys in the national economies.

Follow-up actions

Introduction

Each working group listed a number of action-oriented plans. The aim was to have some specific follow-up actions, delegated to specific individuals. These plans were briefly discussed in plenary session, and people volunteered to follow-up the plans. Certain people expressed interest in collaboration, and some individuals were designated as action coordinators. The coordinators would be responsible for taking initiatives and liaising with all interested people and organisations. However, it was understood that all participants (not only those mentioned here) would be free to follow-up the various proposals in their own countries in their own ways. The addresses of all people mentioned are in the participant list.

Action plans on harness and transport

ATNESA Harness Adviser and Harness Task Group
It was recommended that an ATNESA Harness Adviser/coordinator be appointed. This person should, among other duties, serve as a clearing point for information and data on donkey harnesses and harnessing systems.

The following participants were listed as voluntary members of the Task Group nominated to further look into this issue: Mengistu Geza, Oumer Taha and Zelalem Bekele (Ethiopia), J Akumunyo (Kenya), L Oudman (The Netherlands), D Hanekom (South Africa), C Oram (UK), B Mudamburi, S Muneri and P Jones (Zimbabwe). **B Mudamburi** to coordinate.

Harnessing review
The workshop recommended that information from around the world be collected on donkey harnesses and harnessing systems. ATNESA should maintain information and/or samples of as many available options as possible. ATNESA members should have access to such information, through printed literature, databases and/or the Internet. All members should collaborate in this, with appropriate research and/or collection of materials. All interested persons should liaise with the harness task group (see above).

Research on harness performance
Further information on the technical performance of common donkey harnesses is critical to the understanding and application of donkey power. **C Oram** (UK) to initiate studies in collaboration with ATNESA members.

Demonstrations of donkey harnesses
The workshop recommended national level demonstrations of harnesses to increase awareness of available possibilities for improved donkey harnessing systems. The following countries indicated plans to work on this:

Tanzania	TADAP
Kenya	KENDAT
Zambia	Palabana Centre
Ethiopia	Adami Tulu Centre

Donkey power in Ethiopia
There was an urgent need to document donkey traction experiences and available donkey technologies in Ethiopia. Staff of the **Nazaret** and **Adami Tulu Research Centres** of the Institute of Agricultural Research agreed to follow-up this proposal. **Abule Ebro** and **Friew Kelemu** (Ethiopia) to coordinate.

Extension pamphlets
Extension pamphlets relating to donkeys are required. Initial topics for consideration to include:

- Harnesses and harnessing systems
- Donkey carts
- Donkey packing

C McCrindle (South Africa) and S Muneri (Zimbabwe) to work on this. **C McCrindle** to coordinate.

Documentation of existing carts
There is need for reliable information on the different designs of donkey cart in use, and their various characteristics and advantages. Action to be initiated by **D Hanekom** (South Africa).

Training and extension

Extension manuals
There is need to develop one or more Extension Manuals on various aspects of donkey management and draft power applications. The following people will form the core of a working group to develop the material further: L Oudman (Netherlands), Girma Gebresenbet (Sweden), A Aboud (Tanzania), M Bwalya (Zambia), P Jones and B Mudumburi (Zimbabwe). **M Bwalya** to coordinate.

Curriculum development and continuing education
Palabana Centre (Zambia) and AGRITEX (Zimbabwe) are already working in this area. Other national networks were requested to initiate progress in this direction.

Text books
There is need to produce school books relating to donkey power which are local in orientation. IDPT to be approached for funding. **P Mueller** (USA) to supply addresses of other possible donors.

Training video
There is need for one or more training videos on donkey draft power applications. **Palabana Centre** and **M Bwalya** (Zambia) to initiate the work.

Ethiopian indigenous knowledge
There was a need to document Ethiopian indigenous knowledge on donkey utilisation. **Abule Ebro** to coordinate

Survey information
There is a serious information gap relating to donkey numbers and use. The workshop recommended that surveys be undertaken in member countries to establish current status and trends of donkey

populations. The ATNESA Steering Committee will provide a format for undertaking these surveys and will take up responsibility to compile a regional information booklet. The following countries and responsible persons were nominated to be in the initial group to undertake the surveys: Eritrea (Ezedeen Osman), Ethiopia (Feseha Gebreab), Kenya (J Mutua), Namibia (E Mwenya and G Keib), Tanzania (A Aboud), Zambia (M Bwalya and R Mofya) and Zimbabwe (B Mudamburi and L Ndlovu).

Animal issues

Specialist workshop

Available information on donkey nutrition, breeding and health care is very limited. Existing knowledge is scattered and inaccessible to most ATNESA members. A follow-up regional workshop for scientists working in this field is required. The workshop proposed should bring together those involved in the use and care of donkeys to share experiences and exchange ideas. The **ATNESA Steering Committee** should follow this up.

The nutrition of the donkey

There is need for more knowledge relating to the nutrition of donkeys. A Task Group was formed together information on donkey nutrition and husbandry. This initially comprises: Abule Ebro and Alemu Gebre Wold (Ethiopia), A Aboud and A Ngendello (Tanzania), A Pearson (UK) and L Ndlovu and E Nengomasha (Zimbabwe). **A Aboud** and **L Ndlovu** to coordinate and communicate information to ATNESA for compilation and dissemination.

Breeding and reproduction

A task group was formed to coordinate work relating to donkey breeding and reproduction. The group initially comprises: Representatives of Adami Tulu Centre, Mekelle University and Alemaya University (Ethiopia), E Waithanji (Kenya), A Aboud (Tanzania), A Pearson (UK) and L Ndlovu (Zimbabwe). **A Pearson** to coordinate and also investigate the possibility of European Union funding for the activity.

Condition and health score

There is need to develop a combined Condition and Health Score for donkeys. The working group to consider this initially includes: Amsalu Sisay and colleagues (Ethiopia), E Waithanji (Kenya), T Krecek, C McCrindle and M Moorosi (South Africa) and J Kneale (UK). **T Krecek** and **C McCrindle** to coordinate.

Tillage and technology

Appropriate tillage implements suitable for donkeys are not generally available in the region. There is a need to develop and/or disseminate suitable designs. A Task Group was established to work on these issues. The Group initially comprises Ezedeen Osman (Eritrea), Zelalem Bekele (Ethiopia), J Mutua (Kenya), M Lyimo (Tanzania), F Inns (UK), E Mbanje (Zimbabwe). **F Inns** to coordinate.

Policy and socio-economic issues

Socio-economic studies

Socio-economic studies on the contribution of donkeys to local and national economies are needed. Benefit-cost analyses are needed although they tend to be area specific and require frequent updating. The methodology and implications of such studies may have application throughout the region. The initial Task Group comprises: Sisey Zenebe (Ethiopia), R Mofya (Zambia) and L Ndlovu (Zimbabwe).

ATNESA journal on animal power

At present, research information relating to animal power is widely dispersed in a range of journals. However, a proposal to initiate a new independent journal relating to animal power was a contentious issue. Several participants (including N Moyo, Girma Gebresenbet, Azage Tegegne, T Simalenga) expressed a desire to have such a journal and volunteered to serve on a tentative Editorial Board. Others proposed it would be better for all concerned to promote the publication of ATNESA work in existing international disciplinary journals and newsletters. Some people (including Krecek and Mueller) volunteered to help ATNESA members with material suitable for publication. The **ATNESA Steering Committee** will consider the journal suggestion, and in the mean time ATNESA members are encouraged to submit papers to existing publications.

Workshop evaluation

Anonymous evaluation forms were returned by 76 participants out of a total of 85. The first 31 questions asked participants to evaluate programme elements and organisational aspects on a scale of A (very good or very useful) to E (very poor or not useful). Table 1 shows programme elements and organisational aspects ranked by the average evaluation response.

The field visits received the highest evaluation score, followed by the workshop readers and the overall value of the workshop. Also rated very highly were the posters and photographic exhibitions, the field demonstrations and the small group discussions concerning the field visits and the demonstrations. The most popular plenary sessions were the opening ceremony, the Ethiopia keynote and the world review keynote. The least popular programme elements were the country reports and the socioeconomic keynote.

On practical arrangements, the food and accommodation were rated highly, as was workshop liaison and organisation. The least popular aspects of organisation were the reproduction of papers during the workshop and arrival arrangements.

Participants were asked seven open-ended, general questions. The majority felt that the most useful aspect of the workshop was information exchange, making new contacts, networking and becoming aware of new knowledge (44 people referred to these aspects). Some people particularly valued the field visits (17), the field demonstrations (7) and discussions in small groups (8). Other topics mentioned included carts, packing, tillage and the diversity of donkey use.

On the least useful aspect to the workshop, most participants either left the question blank (29) or wrote that all was useful (20). Individuals mentioned a range of programme elements, but there was no consensus. Aspects mentioned more than once were the keynote analyses (5), country reports (2) and files of papers (2).

On how the workshop could have been improved, most suggestions related to time allocation with extra time wanted for poster sessions (5), practicals (4) and field visits (2). Several participants wanted more free time (10). There were suggestions for more interaction with the farmers (3), more focused discussions (3) and the development of funding proposals (2).

Most participants felt the workshop was of acceptable size (58) and mix (52). A few people mentioned there should have been more women, especially from Ethiopia (4), more socioeconomists (4) and more farmer representatives (2). Some people felt that non-Africans should have been less noticeable (4).

Participants were asked about follow-up ATNESA workshops. Some (22) thought the next priority was a general animal traction workshop. Others (11) wanted another general donkey workshop or one focused on harnessing (4) . Some people mentioned health (3), nutrition (3), tillage and implements (3) and national or sub-regional workshops (3).

The final evaluation question, was an open-ended 'any other comments?' Some participants (11) made further positive comments on the workshop, its organisation and hosts. Some participants suggested it would be better if keynote presentations were made by regional persons (5) and some felt that ATNESA should follow up the workshop with support for research projects (4).

In general, the evaluation responses were highly positive, with overall approval ratings comparing favourably to other ATNESA workshops.

Table 1: Average evaluation scores

Programme elements (ranked)	*Score**
Field visits	8.9
Workshop readers (circulated technical booklets)	8.5
Overall value of the workshop	8.4
Posters and photographic exhibitions	8.2
Field demonstrations	7.9
Opening ceremony	7.8
Keynote presentation: Ethiopia	7.8
Overall assessment of workshop programme	7.6
Small group discussions: Field visits	7.6
Keynote presentation: World overview	7.5
Small group discussions: Field demonstrations	7.5
Plenary session: Discussing field demonstrations	7.4
Small group discussions: Friday working groups	7.3
Keynote presentation: Donkey management	7.1
Small group discussions: Thursday working groups	7.1
Plenary session: Discussing field visits	7.0
Plenary session: Discussing final group reports	7.0
Final workshop synthesis	7.0
Plenary session: Workshop conclusions	7.0
Keynote presentation: Equipment	6.9
Evening discussions and videos	6.8
Plenary session: Discussing group progress (Thur)	6.6
Keynote presentation: Socioeconomic issues	6.4
Keynote presentations: Country reports	6.2

Organisational elements (ranked)	*Score**
Accommodation and food	8.3
Pre-workshop communications of organisers	7.8
Overall organisation of workshop	7.8
Workshop announcements and publicity	7.5
Registration and provision of files	6.9
Editorial advice	6.7
Arrangements for airport arrivals, etc	6.5
Reproduction of workshop papers	6.4

* Mean scores based on A=10, B=7, C=5, D=3, E=0
If all participants rated an element as very good, the mean score would be 10. A mean score of 7 represents an overall assessment of 'good and useful'. A mean score of 5 represents 'acceptable'.

Country reports, network announcements and resources

ATNESA countries and national networks

The addresses of the networks and resource organisations are provided at the end of this publication

Eritrea

Newly independent since 1991, Eritrea was attending an ATNESA workshop for the first time. There are approximately 150,000 donkeys and 100,000 horses in the country. Three donkey types are recognised: Atbawi, Mekadi and Reef. The large Reef type donkeys are mainly used by men for riding whilst the other two types are mostly associated with women. There is a lack of awareness of the potential of donkeys for tillage and weeding. Some work is underway on integrated food security involving donkeys (sponsored by the German agency GTZ). Overall there is a need for more research and extension work on donkey use.

Ethiopia

The importance of Ethiopia's 4-5 million donkeys was stressed in the Ethiopia Keynote paper which has been summarised earlier in this report.

ENAT (Ethiopian Network on Animal Traction) was established in 1994 at a major national workshop attended by 120 participants. Plans for the future of ENAT were discussed during this workshop (see report of evening sessions). Among the organisations working with donkeys in Ethiopia is the Adami Tulu Research Centre in Ziway, visited during the field visits. The Faculty of Veterinary Medicine has a donkey welfare project, supported by the International Donkey Protection Trust.

Kenya

Although the total number of donkeys in the country is unknown, the greatest concentrations are in the North and West in Turkana, Kajiado, Mount Elgon, Isiolo and Meru Districts and on the island of Lamu. In the North they are mainly used for pack transport. Some pastoralist communities consume donkey meat and use the milk for medicinal purposes. Constraints to improved use of donkeys include cultural beliefs concerning their roles and a lack of appropriate implements and harnessing.

KENDAT (Kenya Network for Draught Animal Technology) was formed in 1992 to be a forum for the exchange of ideas on draft animals, including donkeys. The secretariat has been based at the University of Nairobi where collar harnesses and other equipment have been developed. KENDAT held national workshops in 1992 and 1995, and it also hosted the second major ATNESA workshop in 1995. KENDAT has produced resource materials on donkeys, manuals on design and construction of harnesses, donkey carts, manure spreaders and other equipment. Joint work has been undertaken relating to donkey transport and harnessing systems with Intermediate Technology and the Kenya Society for the Prevention of Cruelty to Animals (KSPCA).

ILRI (International Livestock Research Institute) is based in Nairobi. It has a second major campus in Ethiopia which was formerly the International Livestock Centre for Africa (ILCA). For many years ILCA was involved with animal traction in Africa, through research programmes, workshops and association with animal traction networks. Some ILCA publications on animal traction are available, through ILRI in Addis Ababa. ILRI has a research interest in the use of work cows and it recognises that animal traction and donkey transport are important components of many livestock systems with which it is associated. However, ILRI is not directly involved with donkeys and its management has expressed reluctance to become involved in this field.

Malawi

Fifteen percent of farmers in Malawi now use animal traction. In addition to many draft oxen, the country has about 2500 donkeys. There was an FAO-supported project in Malawi in 1992 which proposed to import 500 donkeys from Botswana. However, it was only able to bring in 40 animals. Donkeys are increasingly in demand as a result of the decreasing availability of both oxen and mechanised power. Opportunities exist for increased inputs in all aspects of donkey use.

Namibia

The total number of donkeys in the country is unknown but approximately 120,000 donkeys are found in the northern communal areas of Namibia. They are used for transport and plowing. Donkey meat is consumed by some people. A Namibian animal power centre has been established. Tillage implements for donkeys have been imported from both France and Senegal. Those from Senegal have proved to be most appropriate. A Namibian video relating to training work animals was shown during this workshop.

While no formal network has been established in Namibia, much informal networking has been taking place both nationally and internationally. Namibia has been benefiting from close contacts and exchange visits with neighbouring countries, notably Zambia and Zimbabwe. In recent years two ATNESA committee members have been employed by Namibia to assist its animal power programme. Namibia expects to host an ATNESA workshop on conservation tillage in 1998.

South Africa

In South Africa over 200,000 donkeys are in use. They are widely employed for transport, pulling carts and wagons in rural areas. In some provinces teams of donkeys pull plows and/or cultivators. Although donkeys are of great value to smallholder farmers, they are seldom appreciated or respected by the authorities.

SANAT (South African Network for Animal Traction) was launched in 1993 and membership is now 250, including farmers, researchers and extension personnel. Coordination meetings are held 2-3 times per year. Animal power remains important for smallholder farmers because tractors are expensive and/or unavailable when required. However, politicians fail to understand the importance of animal traction. SANAT hopes to change the situation with regular regional workshops and other promotional activities. A policy document is being formulated to enable SANAT to focus more precisely on the important initiatives that need to be undertaken in the future. Close contact is maintained with animal traction colleagues in Lesotho, Botswana and Swaziland. SANAT expects to host the third major ATNESA workshop in 1999.

Tanzania

There are estimated to be about 277,000 donkeys in Tanzania. They are believed to be increasing at the rate of 2.5% per year. There is little government support for animal traction. Farmers in central Tanzania have shown increased interest in donkeys. This has been stimulated by successive periods of inadequate rainfall during which donkeys have survived better than cattle. NGOs are important in donkey promotion. There is field research being undertaken on low-cost carts and better feeding strategies. Donkey diseases are thought to be a problem, as is lack of funds for effective donkey extension.

Tanzania Association for Draught Animal Power (TADAP) was launched in 1991 and legally established in 1996 (initially the name was Animal Traction Network Tanzania). It has held national workshops and published proceedings. TADAP members are actively involved in a range of research and extension activities relating to donkeys.

Uganda

Donkeys are not yet common in Uganda although their use is increasing. At present the greatest numbers are with pastoralists in the north-east. Heifer Project International, which promotes smallholder dairy production in Uganda has introduced donkeys for transporting food and water to the dairy units. As yet there are few donkey carts. Although there is considerable potential for greater donkey use, the existing extension effort is weak. There is a plan to launch a national animal traction network. It is also hoped to start an animal traction training institute.

Zambia

Following independence the number of donkeys in Zambia dropped continuously until 1995. Since then the number has increased to a level of approximately 2000. This is only a crude estimate as donkeys are not yet included in livestock censuses. The major concentrations are in Western and Lusaka Provinces. Some areas have experienced high cattle mortality in recent years, and this has resulted in increased interest in donkeys. A recent survey revealed that cattle and donkeys are now equally valued by farmers whereas two years ago donkeys were only one third the price of cattle. Current issues concerning donkeys are low availability and limited training of extension workers on donkey topics. Although Zambia has no formal network, there is much national and international networking, which has been promoted by the national animal traction research and training centre at Palabana. Palabana has produced many draft animal power publications including national surveys, research reports and workshop proceedings. Palabana Centre has recently developed a detailed training curriculum for donkey traction.

Zimbabwe

Eighty-five percent of farmers in Zimbabwe use animal traction. The 400,000 donkeys are located mainly in the south-west. They are used for all types of agricultural work including some tillage. Zimbabwe has a project aimed at improving draft animal implements. This has been supported by the British Department for International Development (formerly the Overseas Development Administration). The Institute of Agricultural Engineering has developed a new harness system for donkeys but its adoption by farmers has been disappointing. The price of donkeys has recently risen from Z$ 200 to Z$1000 (about US$ 85). This was partly due to interest from Zambia in buying donkeys from Zimbabwe. NGOs are active and the government and relevant university departments are now supporting donkey development.

The Animal Power Network for Zimbabwe (APNEZ) was launched in 1994. Its voluntary secretariat has been based at the Institute of Agricultural Engineering. APNEZ has held several workshops, some arranged in collaboration with other organisations, such as Silsoe Research Institute. Since it was launched, donkey issues have been very important to APNEZ and its members. APNEZ members have assisted other networks and national programmes, including those in Zambia, Namibia and South Africa. They have assisted Zambians to purchase about 90 donkeys from Zimbabwean farmers and have organised training tours for visitors from Namibia, Uganda and other countries. Dr Peta Jones has been providing donkey power teaching and consultancy services in Binga.

Zimplow, based in Zimbabwe, is a major manufacturer of animal-drawn implements. It has taken over **Bulawayo Steel Products** which developed a plow designed for use with donkeys. One of these was used during the workshop demonstrations.

FARMESA is a regional programme to promote participatory methodologies that will facilitate the generation and/or uptake of appropriate farming technologies. Farmesa is supported by FAO and the Swedish International Development Authority (SIDA). Farmesa, which has its headquarters in Zimbabwe, has been closely associated with ATNESA (as was the associated AGROTEC programme). In particular, Farmesa has provided support to ATNESA secretariat in Harare.

North Africa and West Africa

Egypt

Donkeys are widely used for transport in urban and rural areas of Egypt. In Cairo, donkeys are used to transport rubbish for recycling. Common work loads involve two 25 km trips per day. Teams of three donkeys are commonly seen pulling loads of 300 kg or more at speeds of around 7 kph. Constraints include poor harnessing and respiratory problems stimulated by smoke (from burning rubbish and city pollution). The **Brooke Hospital** is active in Egypt in promoting the welfare and husbandry of donkeys and horses.

Cameroon

Donkeys are mainly found in the northern areas where cotton cultivation is popular. Numbers in the country have risen from 1000 in 1975 to over 70,000 in 1995. Most of the increase must be due to imports from neighbouring countries. Donkeys are used for tillage including weeding. Their use for transportation is not common and only 6% are used in this way. One reason for this is that donkey carts are very expensive. Research is underway to characterise donkeys in terms of body weight and power output. Feeding and husbandry practices are being surveyed.

Ghana

There are approximately 13,000 donkeys in Ghana, 86% of which are found in Upper East Region in the north of the country. They are mainly used for carting although there is a noticeable increase in their use for tillage. The University of Accra has a project to promote donkeys in the South and is working with the 3-pad collar harness and with carts (designs with one axle or two). Investigations are underway on the use of carts with variable shaft positions to allow their use by one or two donkeys.

Niger

Donkeys in Niger number about 450,000. There are two groups of owners: nomads and farmers. Amongst the nomads it is the women who are mainly concerned with donkeys whilst among the farmers it is the men and children who work with the donkeys. Animal traction is mainly used for cash crops as subsistence crops are still cultivated by hand. The development of formal animal traction programmes dates back to the 1950s when there was strong government support in the form of subsidies and credit facilities. The end of the 'golden age' came in 1982/83 with the withdrawal of these measures. An organisation, Ardetec, was set up in 1989 to develop agricultural implements but it closed down in 1995 due to a lack of money.

Nigeria

Donkeys are used for pack transport in northern Nigeria but relatively little use is made of them for tillage. The total number of donkeys is estimated at between 700,000 and 900,000, as compared to 300,000 horses. Since 1995 there has been a dramatic increase in the slaughter of donkeys for meat. The current rate of slaughter is approximately 16,000 per year. This has resulted in an increase in the price of donkeys, which should result in them being taken more seriously by the authorities.

The widespread use of animal power for cotton and groundnut production dates back to 1928. Animal traction suffered considerable neglect during the period of oil wealth. Following the failure of numerous mechanisation programmes, animal traction is now receiving renewed attention. International agencies such as UNDP and IFAD are supporting draft animal programmes and there is a move to develop a national manual for draft animal technology. Donkeys are at present only a minor part of this new interest in animal traction, although there is a growing enthusiasm for all aspects of donkey promotion.

Senegal

Sismar, based in Senegal, is a major manufacturer of animal-drawn equipment. Its range includes the popular *Houe Occidentale* cultivator and plow designed for use with donkeys. This was demonstrated during the workshop.

Tchad

There are some 250,000 donkeys in Tchad. Historically, they were mainly used for riding and pack transport by pastoralists. In recent years, they have also been used by smallholder farmers for carting and tillage. Support programmes are few. The biggest problem for donkeys appears to be disease, including trypanosomiasis and internal parasites.

West Africa Animal Traction Network

The West Africa Animal Traction Network (WAATN) was very active between 1985 and 1990 when it organised a series of animal traction workshops and published several books. However, it is currently relatively dormant due to problems with resources and centralisation. Informal networking contacts are still taking place in West Africa and during an evening session at this workshop, proposals to reactivate a formal programme were made.

Asia, the Americas and Europe

Pakistan

The situation in Peshawar was used to exemplify one system of using donkeys in Pakistan. In this town in the North West Frontier Province, donkeys are widely used for the transport of rubbish and bricks. They commonly carry 45-55 bricks per load for 12 hours a day, 6 days a week. Supplements provided include cereal straws and brans. Considerable ignorance exists regarding proper donkey management as evidenced by wet and muddy stables, debilitating parasitism, a high prevalence of saddle sores and the lack of grooming. The **Brooke Hospital** is active in the provision of free treatment in some areas. It mounts education programmes from time to time in the proper use of donkeys and horses.

Mexico

Facultad de Medicina Veterinaria y Zootecnia of the Autonomous National University of Mexico (UNAM) is undertaking donkey-related work, part of which is supported by IDPT. It will host the Third International Colloquium on Working Equids in Mexico from 5-10 October 1998.

Nicaragua

RELATA (Red Latin Americana de Tracción Animal) is the Latin American animal traction network which was launched in 1995. RELATA aims to promote and strengthen links, information exchange and collaboration in animal traction research, extension, training and manufacture in Latin America. Its secretariat is hosted by Fomenta, a Swiss-supported animal traction project which operates in El Salvador, Honduras and Nicaragua. RELATA and Fomenta have organised two international workshops and published the proceedings (in Spanish). Fomenta publishes an attractive colour magazine *El Yuntero* (in Spanish) which acts as a diffusion channel for RELATA. Representatives from Relata/Fomenta had planned to attend the donkey workshop, but were unable to do so.

USA

In the United States, donkeys are mainly used in recreational activities including shows and competitions, the transport of camping equipment and even games of basketball on donkeys! Donkeys are especially associated with charity events aimed at raising money for good causes. One interesting and practical use of donkeys is in the guarding and protection of sheep against coyotes. Various centres are using donkeys in basic nutrition and physiological research. Unlike in Africa there is often a problem of overfeeding of pet donkeys which sometimes results in the fatal condition of hyperlipaemia.

WTFE (Working Together for Equines) is a not for profit organisation concerned with the welfare of horses, donkeys and mules. It has worked in a number of countries, particularly Mexico. Among its specialities are training in footcare, farriery, saddlery and harnessing. It is linked with the Scottish charity WTFE (UK). WTFE publishes a newsletter.

Bulgaria

Donkeys have been widely used in Bulgaria for many years where small farms of 0.2-0.5ha are cultivated. Donkeys are used for transporting a variety of loads including people. They provide additional draft power for the harvesting and transport of maize and sunflower. Collectivisation of agricultural production during 1985-1990 was the period when the number of donkeys was greatest (about 350,000). At this time they comprised 70% of all draft animals. Donkeys are particularly associated with older farmers and with areas where grapes, vegetables, potatoes and tobacco are grown. Research work on establishing the morphological differences between horses and donkeys began in 1995.

Germany

GTZ (Deutsche Gesellschaft für Technische Zusammenarbeit) has financed several projects in Africa undertaking work on donkey utilisation. The **German Appropriate Technology Exchange (GATE)** is a specialised division of GTZ that has published several books relating to animal traction, which include information on donkeys. These are normally supplied free-of-charge to people working in developing countries.

Italy

FAO, the Food and Agriculture Organization of the United Nations, has for many years been supporting projects and initiatives in the region concerned with animal traction, as well as supporting services such as rural blacksmiths. Over the years, FAO has produced a variety of animal traction publications, including a *Draught animal power manual* which has several chapters relating to donkeys. This is available from its Animal Production Service. A manual on donkey use had been commissioned by FAO, but a sample was not available at the time of the workshop.

The Netherlands

CTA (Technical Centre for Agricultural and Rural Cooperation), financed by the European Community under the Lomé Convention with ACP (Africa, Caribbean and Pacific) countries is based in The Netherlands. It is actively involved in gathering and disseminating information relating to rural development in tropical Africa and elsewhere. Animal traction is an area of interest of CTA, which has co-sponsored several animal traction workshops in Africa (including this donkey workshop). CTA has co-funded some animal traction proceedings including ATNESA's *Improving animal traction technology* which is available from CTA. It has published a book

entitled 'Donkeys' in its 'Tropical Agriculturalist' series (ISBN 0-333-62750-4).

IMAG-DLO (Instituut voor Mechanisatie, Arbeid en Gebouwen) is an agricultural engineering and environmental institute based in The Netherlands. It has provided technical support to several animal traction programmes in Africa, notably in Zambia. Its staff have a strong interest in donkey technologies, including harnessing, carts and tillage systems.

Sweden

SUAS (Swedish University of Agricultural Sciences) is based in Uppsala. It provides technical support services to several farming systems and agricultural engineering projects in the regional. Dr Girma Gebresenbet has been undertaking research at SUAS relating to animal-drawn plows for oxen and donkeys, and has collaborated with the Universities of Nairobi and Eduardo Mondlane in the development of instrumentation.

UK

Of the estimated 10,000 donkeys in Britain, approximately 1000 animals are believed to be involved in some form of commercial activity. This is usually riding work at holiday resorts and hire for recreational and charity events. About half of the donkeys in UK are maintained by, or are associated with, sanctuaries, such as the Donkey Sanctuary in Devon. Donkeys kept on sanctuaries provide a continuing opportunity to learn more about this animal and define the specific characteristics of donkeys as compared to small horses.

Brooke Hospital for Animals was established in Egypt in 1934 to give free veterinary treatment for working horses, donkeys and mules, and, where necessary to administer euthanasia to end suffering. The Brooke Hospital also aims to improve the condition and well-being of animals by advising and educating their owners and users. It now works in Egypt, Jordan, India and Pakistan. It operates both permanent clinics and mobile teams that visit markets. In recent years, Brooke Hospital has put increasing emphasis on proactive ways of preventing the causes of suffering through training and outreach. While such education is a long-term process, it feels it is essential to complement its treatment programme in this way.

CTVM (Centre for Tropical Veterinary Medicine) of the University of Edinburgh is carrying out research on the nutritional and physiological implications of draft work, using cattle, buffaloes, horses and donkeys. It is one of the leading centres for documentation and research relating to donkeys, and staff of CTVM have been collaborating on donkey-related activities in several countries, including Zimbabwe. Equipment had been developed that allows the measurement and logging of many factors associated with animal work. At CTVM, this equipment can be used with treadmills and climate chambers. Portable versions of the equipment have been used in the field in several countries. Several students from the region have undertaken higher degrees in collaboration with CTVM. *Draught Animal News* is published twice a year by CTVM, and its editor welcomes contributions from ATNESA members.

DTU (Development Technology Unit of the University of Warwick) in UK has carried out research and development work on cart designs and bearings suitable for animal-drawn carts as well as methods of testing and evaluating these. At the workshop a donkey cart was displayed that had been fabricated by Dr C Oram in a few hours from locally-available materials. Information about this and other designs was provided in a poster and a paper. DTU would be interested to test and evaluate these technologies with partner organisations in Africa.

Donkey Breed Society is an organisation concerned with donkey use in Britain. It publishes a number of extension leaflets, which, although British in orientation, may be of interest to ATNESA members.

IDPT (International Donkey Protection Trust) is donkey welfare charity, closely associated with the renowned Donkey Sanctuary in Devon, UK. It has supported donkey welfare activities and (non-invasive) donkey welfare research in many countries, including Egypt, Ethiopia, Kenya and Mexico. It is presently supporting donkey welfare work in Ethiopia implemented by the Faculty of Veterinary Medicine in Debre Zeit. It has published '*The professional handbook of the donkey*' and donkey welfare videos.

IFRTD (International Forum for Rural Transport and Development) aims to be a global network of people and organisations promoting a broad approach to meeting the transport needs of rural women and men in developing countries. IFTRD advocates improving village transport infrastructure, establishing rural transport services and promoting intermediate means of transport to fill the gap between walking/carrying and large-scale motorised transport. Such intermediate means of transport include donkey power for packing, carting and riding. The IFRTD Secretariat based in London publishes *Forum News* (in English, French and Spanish). IFRTD has published an annotated bibliography on rural transport, and is supporting work on gender aspects of rural transport. IFRTD encourages the formation of national networks (National Forum Groups) to act as pressure groups for rural transport. IFRTD and associated national networks would welcome close cooperation with ATNESA, animal traction networks and organisations concerned with donkey utilisation. This might take the form of collaborative studies or joint workshops relating to animal power in rural transport systems.

ILPH (International League for the Protection of Horses) is an animal welfare charity based in UK. It is concerned with donkeys and mules as well as horses. Among its activities, it funds courses in harnessing, saddlery and farriery, with emphasis on appropriate and sustainable local technologies. At the time of the workshop, ILPH was funding a harness-making course

in Ethiopia. It had been planned to have a workshop demonstration of the skills being taught, but circumstances prevented this.

ODI (Overseas Development Institute), based in London, is an independent non-governmental centre for the study of development and humanitarian issues. It aims to be a 'think-tank' and a forum for discussion of the problems facing developing countries. Several ODI staff have been involved in studies relating to animal traction and/or donkeys, and a range of reports, papers and publications are available.

SRI (Silsoe Research Institute) of UK has been working on animal traction topics for many years and has collaborated with many organisations in Africa and elsewhere. It developed instrumentation for logging many mechanical and physiological parameters associated with animal draft power. Recent emphasis has been on integrating engineering principles with environmental and socioeconomic research, notably in hill agriculture and semi-arid farming systems. It has been working with a multidisciplinary research programme in Zimbabwe, where it helped to develop a donkey plow. A number of papers relating to donkey utilisation are available.

SPANA (Society for the Protection of Animals Abroad) is an animal welfare charity which has been active in North Africa for 75 years. It now operates in Tunisia, Algeria, Morocco, Jordan, Syria and Mali. Treatment is provided by both permanent and mobile veterinary clinics. SPANA supports local veterinarians and technicians to regularly visit markets and provide first-aid for as many animals as possible. Most animals are working donkeys, mules, horses and camels, and harness wounds, sores and lameness are common.

SPANA now feels that veterinary treatment is of limited value unless accompanied by education. It is therefore developing education programmes for animal users, veterinary students and children. Courses have been given in farriery and saddlery (including harness making) and the use of humane bits. Leaflets, videos and stickers are produced in local languages to explain basic husbandry techniques. SPANA provides 'hands-on' experience for veterinary students and supports exchange visits and specialist seminars. SPANA considers it is vital to change the attitudes of the next generation. Children are taught that animals such as donkeys are economically important and deserve a better image. SPANA supplies educational materials, teachers' handbooks, posters, videos and curriculum development materials.

TAWS (World Association for Transport Animal Welfare and Studies) is a small British organisation which aims to promote improved management and welfare in work animals throughout the world. Founded by people with veterinary backgrounds, it endeavours to promote scientific studies relating to animal welfare and to improve information exchange. It holds annual seminars in UK, and it is planning a project in Central America. Although it will register as a charity, its main role will be to link actors in this field (ie, networking) rather than becoming a funding or implementing agency.

Tedman Harness is a small company manufacturing harnesses for horses and donkeys in UK. Much use is made of washable synthetic webbing. Tedman Harness recognises that its own high quality products are too expensive for sale to smallholder farmers and transporters in Africa. However, the company was interested to assist ATNESA members develop efficient and comfortable breast-band harness that could be made locally. To this end it donated a set of harnesses to the workshop. While Tedman Harness is not in a position to fund work in Africa, it might be interested in proposals for collaboration in which its harnessing expertise could assist national or regional initiatives.

World Society for the Protection of Animals is an organisation with an interest in enhancing donkey welfare. Among its educational resources are bilingual leaflets (Arabic/English) with excerpts from Islamic teachings on animal welfare.

Summary of abstracts and papers submitted

Aboud A A O, Chenyambuga S W and Kimambo A E. The use of donkey faeces for in-vitro evaluation of dry-matter digestibility of some tropical forages in Tanzania

Aboud A A O, Mutayoba B M and Mollel E L. Effects of plane of nutrition and draft stress on body condition and levels of blood metabolites in donkeys in Tanzania

Aboud A A O, Raymond F M and Fielding D. Studies on voluntary intake and digestibility of buffel grass (*Cenchrus ciliaris) hay* by donkeys

Alemu Gebre Wold, Azage Tegegne and Alemu Yami. Research needs on donkey management and utilisation in Ethiopia

Amsalu Sisay, Abule Ebro, Zelalem Bekele and Mengistu Geza. The effect of supplement on work output of donkeys at Adami Tulu Research Centre, Ethiopia

Koleva S A. An economic analysis of the benefits of donkey utilisation in Bulgaria

Barzev G. Donkey utilisation in Bulgaria

Blench R. The history and spread of donkeys in Africa

Blench R, de Jode A and Gherzi E. Donkeys in Nigeria: history, distribution and productivity

Bobobee E Y H and Dibbits H J. The potential and limitations of donkey traction in Ghana

Buchenau M, Lawrence P and Becker K. Improving the working efficiency and welfare of donkeys in the south-western region of Niger

Bwalya G M. Donkey promotion in Western Province, Zambia

Bwalya M. Extension staff and farmer training challenges in donkey traction applications

Canacoo E A. Utilisation of donkeys in southern Ghana

Catley A and Blakeway S. Donkeys and the provision of livestock to returnees: lessons from Eritrea

Dibbits, H J. Harnessing guidelines for single donkey carts

Dilnesaw Alamirew, Mengistu Geza, Zelealem Bekele, Friew Kelemu and Bekele Mekuria. Improvement of transporting donkey carts in Ethiopia

Djikman J T and Sims B G. From beast of burden to multipurpose power source: changes in, and challenges for the utilisation of equines in Bolivia

Fernando P. Donkeys and development: socio-economic issues in the use and management of donkeys

Feseha Gebreab, Alemu G Wold, Friew Kelemu, Abule Ibro and Ketema Yilma. An overview of donkey utilisation and management in Ethiopia

Fielding D and Hammond J A. Ethnoveterinary medicine: an alternative and sustainable approach to the control of internal parasites in donkeys

Frick T and Koller K. A donkey-drawn seed-cum-fertiliser pocket seeder for millet cropping in Niger

Gebresenbet G and Kaumbutho P G. Power performance of a single donkey for secondary tillage in Kenya

Howe J and Rabira Garba. Farm-level transport and animal dependency in Kaffecho Zone, Ethiopia

Inns F. Single-donkey plowing: an example of the potential for improving the performance of animal-powered systems

Itepu F. Donkeys: an alternative source of draft animal power for rural women in Kavango, Namiba

Jones P. Response to demand: meeting farmers' need for donkeys in southern Africa

Kaumbutho P G, Waithanji E and Karimi A. Donkey power utilisation within the broader context of smallholder mechanisation and agri-business in Kenya

Kingamkono M N. The effect of nutrition on energy status and body condition of donkeys in Morogoro, Tanzania

Kiriama L L. Utilisation of donkeys in the northern part of Tanzania: prospects and problems

Makwanda A. Experiences in using donkeys for tillage in various farm systems in Tanga Region, Tanzania

Marshall K, Zahra Ali and Belete Tefera, Socio-economic issues of donkey use in Ethiopia: a case study of changing relationships

Mbanje E. Implements for use with donkeys in Zimbabwe

McCrindle C, Moorosi LM. Primary animal health care for donkeys in South Africa

Mrema M. An economic analysis of the utilisation of donkeys in Botswana: the past and the future

Mudamburi B. Harnessing systems for donkeys in Zimbabwe

Mujemula F K. Using donkeys for transport and various farm operations: experience from Arusha region, Tanzania

Mutayoba B M, Aboud A A O and Mollel E L. Effect of nutrition and draft stress on reproductive parameters of female donkeys

Mutua J M. Some challenges to the use of donkeys in Kenya

Mwenya E and Keib G. History and utilisation of donkeys in Namibia

Naunyango S, Haufiku N and Rigourd C. Donkey traction: the experience of north-central Namibia

Ndlovu, L R, Bwakura T and Topps J H. The role of donkeys in crop-related activities in integrated crop-livestock systems in semi-arid areas of Zimbabwe

Salah W Fahmy. The health and husbandry of donkeys used by Zabbalin rubbish collectors in Cairo, Egypt

Sieber, N. The economic impact of pack donkeys in Makete, Tanzania

Sisay Zenebe and Tilahun Fekade. The role of pack donkeys in the major grain market (Yehil Berenda) of Addis Ababa, Ethiopia

Sosovele H. Donkeys as working animals in Tanzania: social, cultural and economic perspectives

Starkey P and Starkey M. Regional and world trends in donkey populations

Trawford A F. Castration of working donkeys: advantages and surgical procedures

Vall E and Ebangi L. Impact of endogenous factors on the performance of draft donkeys within the sudano-sahelian region of Cameroon

Waithanji E M, Githiori J B, Olaho-Mukani W, Okech G and Ndung'u J M. Clinical signs and symptoms associated with donkey trypanosomiasis in Kenya

Zelalem Bekele. Traditional sayings about donkeys and their influence to donkey use and management in Ethiopia

Zelalem Bekele, Dilnesaw Alamirew and Mengistu Geza. Local manufacturing and distribution of donkey carts in south Shewa, Ethiopia: lessons and problems

Zelalem Bekele, Mengistu Geza, Amsalu Sisaye and Abule Ebro. Power and work output of donkeys in the Rift Valley of Ethiopia

List of acronyms

AGRITEX	Institute of Agricultural Engineering, Zimbabwe
AGROTEC	Agricultural Operations Technology for Small Holders in East and Southern Africa, Zimbabwe
APNEZ	Animal Power Network for Zimbabwe, Harare
ATNESA	Animal Traction Network for Eastern and Southern Africa, Harare
CIRAD	Centre de coopération internationale en recherche agronomique pour le développement, France
CTA	Technical Centre for Agricultural and Rural Cooperation, The Netherlands
CTVM	Centre for Tropical Veterinary Medicine, University of Edinburgh,UK
DGIS	Directorate General for International Cooperation
	Ministry of Foreign Affairs, The Netherlands
DTU	Development of Technology Unit, Warwick University
ENAT	Ethiopian Network on Animal Traction, Addis Ababa
EPRDF	Ethiopian Peoples Revolutionary Democratic Front
FAO	Food and Agriculture Organization of the United Nations, Rome, Italy
GATE	German Appropriate Technology Exchange, GTZ, Germany
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit GmbH, Germany
IAR	Institute of Agricultural Research, Addis Ababa, Ethiopia
IDPT	International Donkey Protection Trust, Sidmouth, UK
IFAD	International Fund for Agricultural Development
ILCA	International Livestock Centre for Africa (now part of ILRI)
ILPH	International League for the Protection of Horses, UK
IFRTD	International Forum for Rural Transport and Development, London, UK
ILRI	International Livestock Research Institute, Nairobi, Kenya
IMAG-DLO	Instituut voor Mechanisatie, Arbeid en Gebouwen
	(Institute of Agricultural Engineering), Wageningen
KENDAT	Kenya Network on Draught Animal Technology, Nairobi
KSPCA	Kenya Society for the Prevention of Cruelty to Animals, Nairobi
NGO	Non-governmental organization
ODI	Overseas Development Institute, London, UK
RELATA	Red Latin Americana de Tracción Animal, Nicaragua
SANAT	South African Network for Animal Traction, Fort Hare
SIDA	Swedish International Development Authority
SPANA	Society for the Protection of Animals Abroad, London, UK
SRI	Silsoe Research Institute, UK
SUAS	Swedish University of Agricultural Sciences, Uppsala, Sweden
TADAP	Tanzania Association for Draught Animal Power, Morogoro
TAWS	World Association for Transport Animal Welfare and Studies, UK
UK	United Kingdom (of Great Britain and Northern Ireland)
UNDP	United Nations Development Programme
USA	United States of America
WAATN	West Africa Animal Traction Network
WTFE	Working Together for Equines, Alburquerque, USA

Addresses of participants

BULGARIA

Dr Gueorguy BARZEV
Head of Department of Horse Breeding, The Thracian University
Student Campus, Stara Zagora
BG - 6000, BULGARIA
Tel: + 359 42-35942, 77134
Fax: + 359-42-34102 or 72192
Email: barzev@uzvm.uzvm.bg

CAMEROON

Achenduh Lot EBANGI
Institute of Agricultural Research for Development (IRAD)
BP 1073, Garoua, CAMEROON
Tel: + 237-272084
Fax: + 237-272139

Eric VALL
Chercher CIRAD-EMVT
Institute of Agricultural Research for Development (IRAD)
BP 1073, Garoua, CAMEROON
Tel: + 237-272084
Fax: + 237-273220 or 272585

EGYPT

Dr SALAH FAHMY
Brooke Hospital for Animals
2 Bayram El Tonsi Street
Zein El Abdein
11441 Cairo: EGYPT
Tel: + 20-2-364 9312
Fax: + 20-2-364 7344

ERITREA

Ato EZEDEEN OSMAN
Animal Production Officer
Ministry of Agriculture
Gash-Barka Zone
PO Box 3310 Asmara, ERITREA
Tel: + 291-1-181077

ETHIOPIA

ABIYE ASTATKE
Agricultural Engineer
International Livestock Research Institute (ILRI), PO Box 5689
Addis Ababa, ETHIOPIA
Tel: + 251-1-613215
Fax: + 251-1-611892
Email: A.Astatke@cgnet.com

ABEBE BELAYNEH
Agricultural Engineer, Ministry of Agriculture, PO Box 62347
Addis Ababa, ETHIOPIA
Tel.: +251-1-156242

ABULE EBRO
Centre Manager
Researcher and Center Manager
Adami Tulu Research Centre
PO Box 35, Zeway, ETHIOPIA
Fax: c/o + 251-1-611222

Dr ALEMU Gebre Wold
Head, Animal Science, Institute of Agricultural Research
PO Box 2003, Addis Ababa
ETHIOPIA
Tel: + 251-1-511802
Fax: + 251-1-611222
Email: c/o A.Astatke@cgnet.com

Dr ALEMU YAMI
Associate Professor, Debre Zeit Agricultural Research Centre
PO Box 3, Debre Zeit, ETHIOPIA
Tel.: + 251-1-338555
Fax: + 251-1-338061

AMSALU SISAY
Agricultural Research Officer
Adami Tulu Research Centre
PO Box 35, Zeway, ETHIOPIA
Fax: c/o + 251-1-611222

Dr AZAGE TEGEGNE
International Livestock Research Institute (ILRI), PO Box 5689
Addis Ababa, ETHIOPIA
Tel: + 251-1-339566
Fax: + 251-1-338755
Email: A.Tegegne@cgnet.com

Ms BAYUSH TSEGAYE
Researcher, Unitarian Service Committee of Canada
PO Box 5760, Addis Ababa,
ETHIOPIA
Tel.: +251-1-654975, 162272
Fax.: +251-1-654976

BELETE TEFERA
Technical Consultant
Norwegian Church Aid
PO Box 1248, Addis Ababa,
ETHIOPIA
Tel: + 251-1-512922
Fax: + 251-1-518167
Email: ncae@padis.gn.apc.org

Dr FESEHA GEBREAB
Associate Professor
Faculty of Veterinary Medicine
Addis Ababa University
PO Box 34, Debre Zeit, ETHIOPIA
Tel: + 251-1-338314, 338062
Fax: + 251-1-339933

FRIEW KELEMU
Research Officer
Agricultural Implements Section
Institute of Agricultural Research
Nazaret Research Centre
PO Box 436, Nazaret, ETHIOPIA
Tel: + 251-2-112186, 110045
Fax: + 251-1-611222

GEBRE YOHANNES BERHANE
Lecturer in Animal Production
Department of Animal and Range Science
Mekelle University College
PO Box 231, Mekelle, ETHIOPIA
Tel.: +251-3-400811, 400512
Fax: +251-3-400983

GETA KIDAN MARIAM
Team Leader
Combolcha Rural Technology Promotion Centre, Amhara Regional Bureau of Agriculture
PO Box 146, Combolcha
Wello Zone, ETHIOPIA
Tel: + 251-3-111595

Dr GETACHEW MULUGETA
Faculty of Veterinary Medicine
Addis Ababa University
PO Box 34 Debre Zeit, ETHIOPIA
Tel: + 251-1-338062, 338533
Fax: + 251-1-339933

GETACHEW YILMA
World Vision International (Ethiopia), PO Box 3330,
Addis Ababa, ETHIOPIA
Tel.: +251-1-610442, 550
Fax: +251-1-610951

KETTEMA YILMA
Training Officer
Farm-Africa (Ethiopia)
PO Box 5746, Addis Ababa,
ETHIOPIA
Tel: + 251-1-550511
Fax: + 251-1-552143

Kathy MARSHALL
Country Representative
Oxfam Canada
PO Box 11732 Addis Ababa,
ETHIOPIA
Tel: + 251-1-518010
Fax: + 251-1-510211
Email: kmarshall@telecom.net.et

Dr MELAKU TEFERA
Assistant Professor
Faculty of Veterinary Medicine
Addis Ababa University
PO Box 34, Debre Zeit, ETHIOPIA
Tel.: +251-1-338062
Fax: +251-1-339933

MENGISTU GEZA
Assistant Research Officer
Nazareth Research Centre
Institute of Agricultural Research
PO Box 436, Nazareth, ETHIOPIA
Tel: + 251-2-112186
Fax: + 251-1-611222

OUMER TAHA
Agricultural Engineer (Oromia)
Ministry of Agriculture
PO Box 62347, Addis Ababa, ETHIOPIA
Tel: +251-1-150364
Fax: + 251-1-654388

David ROSCHLI
General Manager
Selam Vocational Centre
PO Box 8075 Addis Ababa, ETHIOPIA
Tel: + 251-1-612642, 610388,
Fax: + 251-1-612642

SISAY ZENEBE
Economic Research Department
National Urban Planning Institute
PO Box 2405, Addis Ababa, ETHIOPIA
Tel: + 251-1-150955, 151949
Fax: + 251-1-510545

Dr YOSEPH SHIFERAW
Institute of Agricultural Research
Holetta Research Centre
PO Box 2003, Holetta, ETHIOPIA
Tel: + 251-1-512579

ZAHRA ALI
Farm-Africa (Ethiopia)
PO Box 5746 Addis Ababa, ETHIOPIA
Tel: + 251-1-550511
Fax: + 251-1-552143

ZELALEM BEKELE
Agricultural Engineer
Institute of Agricultural Research
Nazaret Research Centre
PO Box 436, Nazaret, ETHIOPIA
Tel: + 251-2-112186
Fax: + 251-1-611222

Dr ESHETU BEKELE
Head, Dept. Crop Protection
Institute of Agricultural Research
Holetta Research Centre
PO Box 2003, Addis Abeba, ETHIOPIA
Tel.: +251-1-512579
Fax: + 251-1-611222

TAMIRU HABTE
Department Head
Ministry of Agriculture
Land Use Study and Rural Technology Promotion Dept.
PO Box 62312, Addis Abeba, ETHIOPIA
Tel.: +251-1-15-62-42

ETHIOPIA (VISITORS)

Dr TAYE BEKELE
Researcher
Institute of Agricultural Research
Holetta Research Centre
PO Box 2003, Addis Abeba, ETHIOPIA
Tel.: +251-1-511802
Fax: + 251-1-611222

Dr ABERRA DERESSA
Centre Manager
Institute of Agricultural Research
PO Box 2003, Addis Abeba, ETHIOPIA
Tel.: + 251-2-112168
Fax: + 251-1-611222

Dr ALEMAW GETINET
Research Officer
Institute of Agricultural Research
Holetta Research Centre
PO Box 2003, Addis Abeba, ETHIOPIA
Tel.: + 251-1-512579
Fax: + 251-1-611222

Ato ASFAW YIMEGNUHAL
Senior Technologist
International Livestock Research Institute (ILRI)
PO Box Debre Zeit, ETHIOPIA
Tel.: + 251-1-339701

Dr BEREKE-TSEHAI TUKU
Head, Ethiopian Potato Program
Institute of Agricultural Research
Holetta Research Centre
PO Box 2003, Addis Abeba, ETHIOPIA
Tel.: + 251-1-511802
Fax: + 251-1611222

Dr GETACHEW TILAHUN
Dean, Faculty of Veterinary
F.V.M Addis Ababa University
PO Box 34, Debre Zeit, ETHIOPIA
Tel.: +251-1-338450
Fax: +251-1-339933

Ato REZENE FESSEHAIE
Research Officer
Institute of Agricultural Research
Holetta Research Centre
PO Box 2003, Addis Abeba, ETHIOPIA
Tel.: +251-1-511802
Fax: +251-1-611222

MESFIN AYELE
Livestock Officer
Save the Children Fund (SCF)
SCF Office-Woldia., ETHIOPIA
Tel: + 251-3-111007
Fax: + 251-3-111007
Email: 100440.1465@compuserve.com

ZEWDU AYELE
Animal Production Expert
Eastern Hararghe Agriculture Department
PO Box 950, Harar, ETHIOPIA
Tel: + 251-1-550511
Fax: + 251-1-552143

YONAS METAFERIA
Land Use Study & Rural Technology Promotion Dept
Ministry of Agriculture
PO Box 9937 Addis Ababa, ETHIOPIA
Tel: + 251-1-152187, 150364
Fax: + 251-1-654388

RABIRA GARBA
Department of Civil Engineering
Addis Ababa University, ETHIOPIA

TILAHUN FEKADE
National Urban Planning Institute (NUPI)
PO Box 2405, Addis Abeba, ETHIOPIA
Tel: + 251 1 51 57 13
Fax: + 251 1 51 05 45

GERMANY

Ms Meike BUCHENAU
Institute for Animal Production (480), Universität Hohenheim
D-70593 Stuttgart, GERMANY
Tel: + 49-711-459 3646
Fax: + 49-711-459 3702
Email: meike@uni-hohenheim.de

Thomas FRICK
Institute for Agricultural Engineering in the Tropics and Subtropics
Universität Hohenheim, Garbenstrasse 9
D-70599 Stuttgart, GERMANY
Tel: + 49-711-459 3644
Fax: + 49-711-459 3848
Email: frick@uni-hohenheim.de

GHANA

Emmanuel CANACOO
Research Officer, University of Ghana Agricultural Research Station
PO Box 38 Legon, GHANA
Tel: +233-21-302254, 500150
Fax: + 233-21-501135
Email: canacoo@ug.gn.apc.org

ITALY

Dr Jeroen DIJKMAN
Animal Production and Health Division, Food and Agriculture Organization (FAO)
Via delle Terme di Caracalla
00100 Rome, ITALY
Subsequent address
International Livestock Research Institute (ILRI)
PO Box 5689, Addis Ababa
ETHIOPIA
Tel: +251 1 613215
Fax: + 251 1 611892
Email: J.Dijkman@cgnet.com

KENYA

John AKUMONYO
Senior Inspector
Kenya Society for Protection of Animals (KSPCA)
Langata Road, PO Box 24203,
Nairobi, KENYA
Tel: + 254-882500, 890809
Fax: + 254-882565

Dr Pascal KAUMBUTHO
Lecturer in Agricultural Engineering
University of Nairobi
PO Box 30197, Nairobi, KENYA
Tel: + 254 2 593465
Fax: + 254 2 593465
Email: Kendat@ken.healthnet.org

Dr Joseph MUTUA
Senior Research Officer
Kenya Agricultural Research Institute (KARI)
NARC-Mugugua, PO Box 57811,
Nairobi, KENYA
Tel: + 254-154-33026
Fax: + 254-154-33026
Email:
jmutua@users.africaonline.co.ke

Dr Elizabeth WAITHANJI
Clinical Studies Department
University of Nairobi
Faculty of Veterinary Medicine
PO Box 29053, Nairobi, KENYA
Subsequent address
Oxfam UK & I, SSS Program
PO Box 40680, Nairobi, KENYA
Tel: + 254-2-445159 or 445168
Fax: + 254-2-442123

LESOTHO

Joseph R KOTSOKOANE
Chairperson, South Africa Network on Animal Traction (SANAT)
PO Box 1015, Maseru 100,
LESOTHO
Tel: + 266-316830, 312913
Fax: + 266-310104, 310056

MALAWI

Wells F KUMWENDA
Chief Agricultural Engineer
Ministry of Agriculture, Farm Machinery Unit
Chitedze Research Station
Box 158, Lilongwe, MALAWI
Tel: + 265-767222 (or 225 or 217)
Fax: + 265-781184 (767293)

NAMIBIA

Nestor HAUFIKU
Agricultural Extension Technician
Ministry of Agriculture, Water & Rural Development
Directorate of Extension & Engineering Services
Private Bag 5556, Oshakati,
NAMBIA
Tel: + 264-756-40685
Fax: + 264-756-40685

Frans Sikaki ITEPU
Principal Agricultural Extension Technician, Ministry of Agriculture Water and Rural Development
PO Box 523 Rundu 9000,
NAMIBIA
Tel: + 264-67-255666
Fax: + 264-67-255846

Gottfried KEIB
Agricultural Training Technician
Ministry of Agriculture, Water and Rural Development
P/bag 2096, Rundu, NAMIBIA
Tel: + 264-61-221733
Fax: + 264-61-3029111

Emmanuel MWENYA
National Draft Animal Power Coordinator, Mashare Agricultural Development Institute
P/bag 2096, Rundu, NAMIBIA
Tel: + 264-67-255917
Fax: + 264-67-255846

Sylvanus NAUNYANGO
Agricultural Extensionist
Northern Namibia Rural Development Project
Ministry of Agriculture
PO Box 498 Oshakati, NAMIBIA
Tel: + 264-6751-30284
Fax: + 264-6751-30578

Chrisophe RIGOURD
French Cooperation
Ministry of Water, Agriculture and Rural Development
PO Box 498, Oshakati, NAMIBIA
Tel.: + 264-6751-30284
Fax: + 264-6751-30578

THE NETHERLANDS

Luurt OUDMAN
Stoevenweg 10 A
8141 MP Heino
THE NETHERLANDS
Tel.: + 31-572-391159
Fax: + 31-572-391159
Email: oudman01@worldaccess.

NIGERIA

Yinka S ADEMILUYI
Research Engineer, National Centre for Agricultural Mechanisation
PMB 1525, Ilorin
Kwara State, NIGERIA
Tel: + 234-31-224831, 223209

Mabayoje A LADEINDE
Assistant Chief Engineer
Federal Agricultural Coordinating Unit, PO Box 325 Sheda
Abuja, NIGERIA
Tel: +234-9-8821032, 35, 51

PAKISTAN

Dr Shahabat KHAN
Veterinary Officer, Brooke Hospital for Animals, 9/295 Sarwar Road
Lahore Cantt, PAKISTAN
Fax: + 92-42-6661765
Subsequent address
Brooke Hospital for Animals
Koragh Chowk, Sugar Mills Road
Mardan, PAKISTAN
Fax: + 92-931-66693
Tel: + 92-931-66692

SOUTH AFRICA

Dirk HANEKOM
Mechanical Engineering Technician
Institute for Agricultural Engineering, Agricultural Research Council, Private Bag X519,
Silverton 0127 SOUTH AFRICA
Tel: + 27-12-842 4000
Fax: + 27-12-804 0753, 548 0753
Email: WKT8@ing1.agric.za

Professor Tammi KRECEK
Veterinary Tropical Diseases
University of Pretoria
Private Bag X04, 0110
Onderstepoort, SOUTH AFRICA
Tel: + 27-12-529 8022
Fax: + 27-12-529 8312
Email: TKrecek@op1.up.ac.za

Dr Maki MOOROSI
Department of Agriculture
University of the Orange Free State
PO Box 339, Bloemfontein 9300,
SOUTH AFRICA
Tel: + 27-51-401 2700
Fax: + 27-51-448 0692
Email: Moorosi@landbou.uovs.ac.za

Dr Cheryl McCRINDLE
Associate Professor, Vet. Faculty
Production Animal Medicine
Medical University of Southern Africa (MEDUNSA)
Internal box 170
Medunsa 0204, SOUTH AFRICA
Tel: + 27-12-5214446
Fax: + 27-12-521 4270
Email: cmemvet@mcd4330.medunsa.ac.za

Nick SEOBI
Director Central Region
Department of Agriculture, North West Province, Private Bag X2039
Mmabatho 2735, SOUTH AFRICA
Tel: + 27-140-895758
Fax: + 27-140-21105

Dr T E SIMALENGA
Senior Lecturer, Faculty of Agriculture, University of Fort Hare
Private Bag X1314, Alice 5700, SOUTH AFRICA
Tel: + 27-404-22232
Fax: + 27-404-31730
Email: TIM.S@ufhcc.ufh.ac.za

SWEDEN

Dr Girma GEBRESENBET
Department of Agricultural Engineering, Swedish University of Agricultural Sciences
Box 7033, Ultuna, S-750 07
Uppsala, SWEDEN
Tel: + 46-18-671910
Fax: + 46-18-673529
Email: Girma.Gebresenbet@lt.slu.se

TANZANIA

Dr Ali A O ABOUD
Department of Animal Science and Production, Sokoine University of Agriculture, PO Box 3004,
Morogoro, TANZANIA
Tel: + 255-56-4617
Fax: + 255-56-4562
Email: DASP@sua.ac.tz

Ally M NGENDELLO
Livestock Research Officer
Ukiruguru Agricultural Research Institute, PO Box 1433
Mwanza, TANZANIA
Tel: + 255-68-40596, 7
Fax: + 255-68-41726
E-mail: andello@tanz.hehlthnet.org

Mark LYIMO
Agricultural Engineer, Ministry of Agriculture and Cooperatives
PO Box 9071 Dar es Salaam
TANZANIA
Tel.: + 255-51-112235
Fax: + 255-51-112235

TCHAD

Mahamat Seleh BAHARAM
Coordinateur Cellule Elevage
Secours catholique et développement (SECADEV)
BP 1166, Ndjamena, TCHAD
Tel: + 235-524453, 514084, 523445
Fax: + 235-524060

UGANDA

John OLUPOT
Animal Traction Officer
Ministry of Agriculture, Animal Industry and fisheries
PO Box 102, Entebbe, UGANDA
Tel: + 256-42-120981
Fax: + 256-42-21047

Mrs Lilian SSERUWO
National Animal Traction Coordinator
Ministry of Agriculture
PO Box 102, Entebbe, UGANDA
Tel: + 256-42-20690, 20981
Fax: + 256-42-20757, 21047

UNITED KINGDOM

Dr Roger BLENCH
Research Fellow, Overseas Development Institute (ODI)
Portland House, Stag Place
London SW1E 5DP, UK
Tel: + 44-1223-560687
Fax: + 44-1223-560687
Email: R.Blench@odi.org.uk

Carl BOYDE
Chairman, World Association for Transport Animal Welfare and Studies (TAWS)
Hardwick Court Farm
Hardwick Lane, Chertsey
Surrey, KT16 0AD, UK
Tel: + 44-1932-562072
Fax: + 44-1784 457232

Dr Denis FIELDING
Senior Lecturer
Centre for Tropical Veterinary Medicine, University of Edinburgh,
Easter Bush, Roslin, Midlothian
EH25 9RG, UK
Tel: + 44-131-650 6259
Fax: + 44-131-445 5099
Email: denisf@lab0.vet.ed.ac.uk

Jeremy F HULME
Chief Executive
Society for the Protection of Animals Abroad (SPANA)
15 Buckingham Gate, London
SW1E 6LB, UK
Tel: + 44-171-828 0997
Fax: + 44-171-630 5776

Professor Frank INNS
Consultant Agricultural and Mechanical Engineer
53 Alameda Road, Ampthill
Bedford, MK45 2LA, UK
Tel: + 44-1525-402508
Fax: + 44-1525-633100

Julia A KNEALE
Veterinary Officer
Headquarters Defence Animal Centre (MOD)
Welby Lane, Melton Mowbray
Leics LE13 0SL, UK
Tel: + 44-1664-411811 x 8686
Fax: + 44-1664-410694

Catherine MORRIS
Research Assistant, International Donkey Protection Trust
Sidmouth, Devon EX10 0NU, UK
Tel: + 44-1395-578222
Fax: + 44-1395-579266
Email: 100731.3407@compuserve.com

Dave O'NEILL
International Development Group
Silsoe Research Institute
Wrest Park, Silsoe, Bedford MK45 4HS, UK
Tel: + 44-1525-860000
Fax: + 44-1525-862140
Email: dave.oneill@bbsrc.ac.uk

Dr Colin E ORAM
Senior Teaching Fellow
Development Technology Unit
Department of Engineering
University of Warwick, Coventry
CV4 7AL, UK
Tel: + 44-1203-523135
Fax: + 44-1203-418922
Email: esceo@eng.warwick.ac.uk

Dr Anne PEARSON
Senior Research Fellow
Centre for Tropical Veterinary Medicine
Easter Bush, Roslin, Midlothian
EH25 9RG, UK
Tel: + 44-131-650 6217
Fax: + 44-131-445 5099
Email: anne.pearson@ed.ac.uk

Professor Paul STARKEY
ATNESA Technical Adviser
Animal Traction Development
Oxgate, 64 Northcourt Ave
Reading RG2 7HQ, UK
Tel: + 44-118-9872152
Fax: + 44-118-9314525
Email: P.H.Starkey@reading.ac.uk

Andrew F TRAWFORD
Director of Veterinary Services
International Donkey Protection
Trust, Sidmouth, Devon
EX10 0NU, UK
Tel: + 44-1395-578222
Fax: + 44-1395-579266
Email: 100731.3407@compuserve.com

USA

Dr Pamela MUELLER
Department of Physiology
UCLA School of Medicine
10833 Le Conte Avenue,
Los Angeles
California 90095-1751, USA
Tel: + 1-310-206 5661
Fax: + 1-310-825 6076
E-mail: donkeys@ucla.edu

ZAMBIA

Given M BWALYA
Joint Coordinator, Livestock
Development Programme
Department of Agriculture
PO Box 910428, Mongu, ZAMBIA
Tel: + 260-7-221481, 414
Fax: + 260-7-221755
Email: ldp@zamnet.zm

Martin BWALYA
Head of Programme, Palabana Farm
Power and Mechanisation Centre
Private Bag 173, Woodlands,
Lusaka, ZAMBIA
Tel: + 260-1-611179
Fax: + 260-1-252824

Rhoda MOFYA
Farm Management Officer
Palabana Farm Power and
Mechanisation Centre
Private Bag 173, Woodlands,
Lusaka, ZAMBIA
Tel: + 260-1-611179
Fax: + 260-1-252824

ZIMBABWE

Dr Peta JONES
Chilangililo Cooperative Society Ltd
Private Bag 5713, Binga,
ZIMBABWE
Tel: + 263-15-2407

Ephraim MBANJE
Research Officer, Agritex Institute
of Agricultural Engineering
PO Box BW 330, Borrowdale,
Harare, ZIMBABWE
Tel: + 263-4-860055
Fax: + 263-4-860136
Email: Atnesa@harare.iafrica.com

Nokwazi MOYO
Director, Indigenous Commercial
Farmers Union (ICFU)
8 Cleveland Ave, Milton Park
PO Box CY 610, Causeway
Harare, ZIMBABWE
Tel: + 263-4-706710, 303211
Fax: + 263-4-723888, 303211
Email: NoMoyo@zimbix.uz.zw

Ms Bertha MUDAMBURI
Agritex Institute of Agricultural
Engineering
PO Box BW 330, Borrowdale
Harare, ZIMBABWE
Tel: + 263-4-860019 /55
Fax: + 263-4-860136
Email: Atnesa@harare.iafrica.com

Silas MUNERI
Instructor, Agritex Institute of
Agricultural Engineering
PO Box 330, Borrowdale, Harare,
ZIMBABWE
Tel: + 263-4-860019, 860055
Fax: + 263-4-860136
Email: Atnesa@harare.iafrica.com

Professor Lindela R NDLOVU
Dean, Faculty of Agriculture
Department of Animal Science,
University of Zimbabwe
PO Box MP167, Mount Pleasant
Harare, ZIMBABWE
Tel: + 263-4-303211 x 1402
Fax: + 263-4-333407, 335249
Email: LNdlovu@agric.uz.zw

Addresses of some resource organisations mentioned

Brooke Hospital for Animals
21 Panton Street
London SW1Y 4DR, UK
Tel: + 44 171 930 0210
Fax: + 44 171 930 2386
Email: info@brooke-hospital.org.uk
URL: http://www.brooke-hospital.org.uk

***CTA** (Technical Centre for Agricultural and Rural Cooperation)*
Postbus 380, 6700 AJ Wageningen
THE NETHERLANDS
Phone + 31-317-467100
Fax + 31-317-460067
E-mail: cta@cta.nl
URL: http://www.cta.nl

***CTVM** (Centre for Tropical Veterinary Medicine)*
Easter Bush, Roslin, Midlothian
EH25 9RG, UK
Tel: + 44-131-650 6217
Fax: + 44-131-445 5099
URL: http://www.vet.ed.ac.uk/ctvm

Donkey Breed Society
The Hermitage, Pootings
Edenbridge, Kent TN8 6SD, UK

***FAO** (Food and Agriculture Organization)*
Animal Production Service
Via delle Terme di Caracalla
00100 Rome, ITALY
Tel: + 39 6 57055579
Fax: + 39 6 57055749
URL: http://www.fao.org

Facultad de Medicina Veterinaria y Zootecnia -UNAM
Tercer Coloquio Internacional Sobre Equidos de Trabajo
Division de Educacion Continua
Apdo 21085 CP, 04000 Coyoacan
Mexico DF, MEXICO
Fax + 52 5 622 5851
Email: aline@servidor.unam.mx

FARMESA
PO Box 3730, Harare, ZIMBABWE
Tel: + 236 4 75 8051-4
Fax +263 4 75 8055
E-mail: fspzim@harare.iafrica.com

IDPT (International Donkey Protection Trust)
Sidmouth Devon EX10 0NU, UK
Tel: +44 1395 578222
Fax: + 44 1395 579266
E-mail: 100731.3407@compuserve.com
URL: http://www.vie.gla.ac.uk/donkey

***IFRTD** (International Forum for Rural Transport and Development)*
New Premier House (2nd Floor)
150 Southampton Row
London WC1B 5AL, UK
Tel: + 44-171-278-3670
Fax: + 44-171-278-6880
Email: ifrtd@gn.apc.org
URL: http://www.gn.apc.org/ifrtd

***ILPH** (International League for the Protection of Horses)*
Anne Colvin House, Snetterton
Norfolk NR16 2LR, UK
Tel: + 44 1953 498682
Fax:+ 44 1953 498373

***ILRI** (International Livestock Research Institute)*
PO Box 30709, Nairobi, KENYA
Tel + 254 2 631499
Fax + 254 2 631499
URL: http://www.cgiar.org/ilri

IMAG-DLO
Mansholtaan 10-12, Postbus 43
6700 AA Wageningen
THE NETHERLANDS
Tel: + 31-317-476363
Fax: + 31-317-425670
E-mail: h.j.dibbits@imag.dlo.nl

***ODI** (Overseas Development Institute)*
Portland House, Stag Place
London, SW1E 5DP, UK
Tel: + 44 171-393-1613
Fax: + 44 171-393-1699
Email: odi@odi.org.uk
URL: http://www.oneworld.org/odi

***RELATA** (Red Latinoamericana de Tracción Animal)*
FOMENTA
Apdo 95 Telcor Douglas Mejía
Managua, NICARAGUA
Tel: + 505 266 4084, 505 268 3126
Fax: + 505 266 8617
E-mail: relata@ibw.com.ni

Silsoe Research Institute
(International Development Group)
Wrest Park, Silsoe
Bedford MK45 4HS, UK
Tel: + 44-1525-860000
Fax: + 44-1525-862140
Email: dave.oneill@bbsrc.ac.uk
URL: http://www.sri.bbsrc.ac.uk

SISMAR
BP 3214, Dakar, SENEGAL
Tel: + 221 212430
Fax: + 221 534109 or 228604

***SPANA** (Society for the Protection of Animals Abroad)*
15 Buckingham Gate
London SW1E 6LB, UK
Tel: + 44 171 828 0997
Fax: + 44 171 630 5776

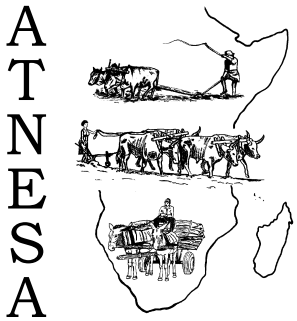
TAWS
(World Association for Transport Animal Welfare and Studies)
Hardwick Court Farm
Hardwick Lane. Chertsey
Surrey, KT16 0AD, UK
Tel: + 44 1932 562072
Fax: + 44 1784 457232

Tedman Harness
PO Box 121, Garsington
Oxford OX44 9EB, UK
Tel: + 44 1865 875016
Fax: + 44 1865 368163

Working Together for Equines
PO Box 1102, Albuquerque
New Mexico 87103, USA
E-mail: WTFE@msn.com
URL: http://www.dsrtweyr.com/wtfe

World Society for the Protection of Animals
2 Langley Lane
London SW8 1TJ, UK
Fax: + 44 171 793 0208
E-mail: wspa@wspa.org.uk
URL: http://www.way.net.wspa

Zimplow Ltd
(and Bulawayo Steel Products)
PO Box 1059, Bulawayo
ZIMBABWE
Tel: + 263-9-71363 (-4)
Fax: + 263-9-71365



ATNESA Contacts

ATNESA Secretariat
Agritex Institute of Agricultural Engineering
PO Box BW 330, Borrowdale, Harare, ZIMBABWE
Tel: + 263-4-860019
Fax:+ 263-4-860136
E-mail: atnesa@interzim.icon.co.zw

ATNESA Chair
Dr T E SIMALENGA
Senior Lecturer
Faculty of Agriculture
University of Fort Hare
Private Bag X1314, Alice 5700, SOUTH AFRICA
Tel: + 27-404-22232
Fax: + 27-404-31730
Email: TIM.S@ufhcc.ufh.ac.za

ATNESA Treasurer
Dr Pascal KAUMBUTHO
Lecturer in Agricultural Engineering
University of Nairobi
PO Box 30197, Nairobi, KENYA
Tel: + 254 2 593465
Fax: + 254 2 593465
Email: Kendat@ken.healthnet.org

Committee Members
Dr ALEMU Gebre Wold
Head, Animal Science, Institute of Agricultural Research
PO Box 2003, Addis Ababa
ETHIOPIA
Tel: + 251-1-511802
Fax: + 251-1-611222
Email: c/o A.Astatke@cgnet.com

Ms Bertha Mudumburi
Agritex Institute of Agricultural Engineering
PO Box BW 330, Borrowdale, Harare, ZIMBABWE
Tel: + 263-4-860019
Fax:+ 263-4-860136
E-mail: atnesa@interzim.icon.co.zw

Mr Emmanuel Mwenya,
Mashare Agricultural Development Institute
P/bag 2096, Rundu, NAMIBIA
Tel: + 264-67-255917
Fax: + 264-67-255846

Mr Nick SEOBI
Director Central Region
Department of Agriculture, North West Province, Private Bag X2039
Mmabatho 2735, SOUTH AFRICA
Tel: + 27-140-895758
Fax: + 27-140-21105

ATNESA Technical Adviser
Professor Paul STARKEY
Oxgate, 64 Northcourt Ave
Reading RG2 7HQ, UK
Tel: + 44-118-9872152
Fax: + 44-118-9314525
Email: P.H.Starkey@reading.ac.uk

Other Committee Members

Mr Goolam OODALLY
Agricultural Engineering Service
Food and Agriculture Organization
Via delle Terme di Caracalla
00100 Rome, ITALY
Tel: + 39-6-52254614
Fax: + 39-6-52256798
Email: Goolam.Oodally@fao.org

Lotta SYLWANDER
Embassy of Sweden, PO Box 1664
Pretoria 001, SOUTH AFRICA
Tel: 27 12 211 050
Fax: 27 12 323 2776
E-mail: lotta.sylwander@sida.se

National Networks

APNEZ *(Animal Power Network for Zimbabwe)*
Agritex Institute of Agricultural Engineering (Attn B Mudumburi)
PO Box BW 330, Borrowdale, Harare, ZIMBABWE
Tel: + 263-4-860019
Fax:+ 263-4-860136
E-mail: atnesa@interzim.icon.co.zw

ENAT *(Ethiopian Network of Animal Traction)*
(Attn Dr ALEMU Gebre Wold and Ato FRIEW Kelemu)
Institute of Agricultural Research (IAR), PO Box 2003, Addis Ababa
ETHIOPIA
Tel: + 251-1-511802
Fax: + 251-1-611222

KENDAT *(Kenya Network for Draught Animal Technology)*
(Attn Dr Pascal KAUMBUTHO)
Department of Agricultural Engineering
University of Nairobi
PO Box 30197, Nairobi, KENYA
Tel/Fax: + 254 2 593465
E-mail: Kendat@ken.healthnet.org

Namibia Animal Power Programme
Mashare Agricultural Development Institute
P/bag 2096, Rundu, NAMIBIA
Tel: + 264-67-255917
Fax: + 264-67-255846

SANAT *(South Africa Network on Animal Traction)*
(Attn: Bruce JOUBERT)
Faculty of Agriculture
University of Fort Hare
Private Bag X1314, Alice, 5700
SOUTH AFRICA
Tel: + 27-4060-22085, 22125
Fax: + 27-4065-31730
Email: SANAT@ufhcc.ufh.ac.za

TADAP *(Tanzania Association for Draught Animal Power)*
(Attn Dr Nuhu HATIBU)
Department of Agricultural Engineering, Sokoine University of Agriculture
PO Box 3003, Morogoro, TANZANIA
Tel + 255-56-3259
Fax + 255-56-4562
E-mail: dasp@sua.ac.tz

Zambia Animal Power Programme
(Attn: Martin BWALYA)
Palabana Farm Power and Mechanisation Centre
Private Bag 173, Woodlands, Lusaka, ZAMBIA
Tel: + 260-1-611179
Fax: + 260-1-252824