Workshop Report
International Workshop on Modernising Agriculture

Visions and Technologies for Animal Traction and Conservation Agriculture

Sunset Hotel and Conference Centre
Jinja, Uganda
19th - 25th May 2002

VOLUME I
Workshop Report

International Workshop on Modernising Agriculture

Visions and Technologies for Animal Traction and Conservation Agriculture

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Jinja, Uganda
19th - 25th May 2002

VOLUME I
FOREWORD

The use of animals, particularly cattle and donkeys as a source of farm power is still extensive in Africa and can only be expected to spread further and get more intensive. Over 25 per cent of cultivated land in Africa is worked with animal traction. Farming is still largely smallholder in character with numerous small plots, the majority only achieving a subsistence production.

In the face of the general stagnation or declining agricultural performance in Africa, attributed to degradation of the natural resource base - soil and water in particular - it is imperative that we re-think the way we farm. A radical revolution is now vital, and considerable efforts are being made throughout the continent to promote Conservation Agriculture as a sustainable means to alleviate poverty while conserving the natural resources of the region. Such an approach has already achieved a dramatic impact in the Americas: in Brazil alone, it is estimated that Conservation Agriculture is now practised on some 17 million hectares.

In most areas using animal power, animal traction for land preparation remains the lifeline for food security and reduction of poverty. Animal power is also a critical resource in rural and peri-urban transport, with marked social and economic benefits. In the application of Conservation Agriculture, draught animal power will find a new role. For the time has now arrived to discard the thinking that animal traction implies use only of the plough and the practice of conventional tillage. We are challenged to revolutionise the idea of draught animal use and let it be a valuable input, and indeed the source of motivation, to apply and adopt widely the principles of conservation farming.

Various experiences in Africa indicate that tractor and other farm power sources have, and will continue to have, an important role in the performance and development of agriculture, and indeed of the economy in most countries. The workshop, therefore, also looked into hand and tractor powered tools and equipment appropriate for application in Conservation Agriculture.

The successful introduction and consequent adoption of Conservation Agriculture (CA) depends upon the availability of suitable and appropriate equipment in the country and the financial and physical access of farmers to this equipment. While the theory of CA is quickly advancing even in Africa, and a wealth of information is already available, the actual introduction of CA into smallholder farming practices is lagging behind. One important reason for this is the lack of, or lack of access to, the appropriate equipment. At present, the major requirements are for direct-planting equipment, for weeding or herbicide application, and for cover crop/mulch management.

For the host country, Uganda, consideration of these matters is timely as the country implements its national Plan for the Modernisation of Agriculture (PMA) and the Poverty Eradication Action Plan (PEAP). It accordingly welcomed the suggestion to host an international workshop at Jinja from 19 to 25 May, 2002 in order to analyse in depth these matters of both national and international concern.

The joint convenors of the workshop were the Uganda Network for Animal Traction and Conservation Agriculture (UNATCA), the Animal Traction Network for Eastern and Southern Africa (ATNES), and the Food and Agriculture Organization of the United...
Nations (FAO), the Africa Conservation Tillage Network (ACT) and the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ).

The workshop was further enhanced by exhibitors of hand-operated, animal drawn and tractor-mounted equipment from Brazil, Ghana, Kenya, Malawi, South Africa, Uganda, Zambia, South Africa and Zimbabwe.

It is my pleasure to present below the report covering the activities and results of this workshop, for which the full proceedings containing the complete papers will be published in a separate volume, Volume II.

J.J. Otim
Presidential Advisor on Agricultural and Veterinary Services
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ACKNOWLEDGEMENTS

The organising committee would like to sincerely thank numerous organisations and companies for their contributions to this workshop. These are as follows:

Sponsors

For support concerning the workshop organisation and arrangements:
- National Agricultural Research Organization (NARO):
- German Agency for Technical Co-operation (GTZ)
- Soroti Agricultural Implements and Machinery Manufacturing Company Ltd. (SAIMMCO)

For sponsoring participants to the workshop:
- Food and Agriculture Organization of the United Nations (FAO),
- Regional Land Management Unit (RELMA),
- Danish Agency for Technical Co-operation (DANIDA)
- Trelleborg
- CIRAD
- GTZ

For sponsoring and donating equipment to the event:
- SEMEATO, Brazil
- FITARELLI, Brazil
- IADEL, Brazil
- TRITON, Brazil,
- HASTT, Zimbabwe,
- Micron, South Africa
- ZAMWIPE/CFU, Zambia.

Exhibitors

The following companies or organisations participated in the equipment exhibition:

Brazil
- SEMEATO: Tractor-mounted direct planter
- FITARELLI: Hand and animal traction direct planters (demonstrated equipment)
- IADEL: Ripper/weeder, direct planter, boom sprayer, knife roller for manual and animal traction (demonstrated equipment)
- TRITON: Direct planters, boom sprayers for manual and animal traction (demonstrated equipment)
- KNAPIK: Direct planter, wheel-barrow-boom and shielded sprayer

Ghana
- Kaddai Engineering: Manual planters

Kenya
- Triple W Engineering: Animal draught planter and cultivator, KENDAT: Harnesses and panniers for donkey, animal mulch planter

Malawi
- Chitedze Research Station: Wooden cart

South Africa
- Micron Sprayers: Rotary nozzle sprayers
Uganda
- Design Centre YWAM: Manual planter, donkey cart, harness, Wooden cart cultivators
- SAIMMCO: Animal drawn plough, cultivator, cart, scoop

Zambia
- CFU: ZAMWIPE: Weed wiper
- HÄSTT: Animal traction cultivators

Zimbabwe
- HÄSTT: Animal traction cultivators

Commercial Manufacturers Present
The following commercial equipment manufacturers where present at the workshop:

Brazil
- SEMEATO: André Verardi
- FITARELLI: Ataides Fitarelli
- IADEL: Elias Beltrame
- TRITON: Fausto Centofante
- ZENITH: Tiago Bombasaro

Ghana
- Kaddai Engineering: Appiah Kwame

Kenya
- Triple W Engineering: Thomas B. Muckle

South Africa
- Micron Spayers: Mike Burgess

Uganda
- SAIMMCO: M.B. Asubo

Zambia
- ZAMWIPE: Dutch Gibson

Zimbabwe
- HÄSTT: Ivan K. Savala
- ZIMPLOW: Vimal Naik and Tony Rowland
- SRP Marketing - BAIN New Holland: Peter
- Hickman
# LIST OF ABBREVIATIONS

<table>
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<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACT</td>
<td>Africa Conservation Tillage Network</td>
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<tr>
<td>AT</td>
<td>Animal Traction</td>
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<td>ATNESA</td>
<td>Animal Traction Network for East and Southern Africa</td>
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<tr>
<td>BASED</td>
<td>Broadening Agricultural Services for Extension and Development Programme</td>
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<tr>
<td>CA</td>
<td>Conservation Agriculture</td>
</tr>
<tr>
<td>CIRAD</td>
<td>Centre Internationale en Recherche Agronomique pour le Développement</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agriculture Organization of the United Nations</td>
</tr>
<tr>
<td>GTZ</td>
<td>Deutsche Gesellschaft für Technische Zusammenarbeit</td>
</tr>
<tr>
<td>MOLG</td>
<td>Ministry of Local Government (Uganda)</td>
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<tr>
<td>NAADS</td>
<td>National Agricultural Advisory Service (Uganda)</td>
</tr>
<tr>
<td>NARO</td>
<td>National Agricultural Research Organisation (Uganda)</td>
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<tr>
<td>NEPAD</td>
<td>New Partnership for Africa’s Development</td>
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<tr>
<td>PACODEF</td>
<td>Poverty Alleviation and Community Development Forum (Uganda)</td>
</tr>
<tr>
<td>PEAP</td>
<td>Poverty Eradication Action Plan (Uganda)</td>
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<tr>
<td>PMA</td>
<td>Plan for the Modernisation of Agriculture (Uganda)</td>
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<tr>
<td>RELMA</td>
<td>Regional Land Management Unit of SIDA</td>
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<tr>
<td>SAIMMCO</td>
<td>Soroti Agricultural Implements and Machinery Manufacturing Company Ltd.</td>
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<tr>
<td>SG2000</td>
<td>Sasakawa Global 2000</td>
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<tr>
<td>SIDA</td>
<td>Swedish International Development Agency</td>
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<td>UNATCA</td>
<td>Uganda Network for Animal Traction and Conservation Agriculture</td>
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1. Overview, opening ceremony, introduction and keynote papers

1.1 OVERVIEW OF THE WORKSHOP
This was the first international workshop to link themes concerning both animal traction and Conservation Agriculture. It was organised jointly by ATNES, FAO-ACT and the Ugandan National Agricultural Research Organisation (Ministry of Agriculture, Animal Industry and Fisheries). The workshop brought together ATNES’s plan for a thematic workshop and plans by FAO-ACT to organise an international workshop on Conservation Agriculture equipment.

The main theme of the workshop was “Modernising agriculture: Visions and Technologies for Animal Traction and Conservation Agriculture”.

The sub-themes were:
1. Work-animal nutrition, health and welfare management
2. Socio-cultural and gender issues in animal traction and Conservation Agriculture
3. Animal powered transport in rural and peri-urban areas
4. The role of animal traction in the context of Conservation Agriculture
5. Equipment for Conservation Agriculture
6. Organisation of machinery use and other farm services.
7. Entrepreneurship development in manufacturing, marketing and service provision.
8. Micro-finance in animal traction and development of Conservation Agriculture
9. Policy issues related to animal traction and Conservation Agriculture

The workshop addressed themes focused on animal traction use in Conservation Agriculture and rural transport. It also considered the needs for Conservation Agriculture equipment for all the main types of farm power. The workshop reviewed experiences and lessons from the more than 120 participants who attended the workshop. A special selection of Conservation Agriculture equipment from Brazil, and from a number of countries within Africa, were exhibited at the workshop. Some of the equipment was also demonstrated.

Participants included practitioners, regional and international specialists involved in research, rural development, training and extension for Animal Traction (AT), and Conservation Agriculture (CA). Also present were private small and large-scale farm equipment manufacturers from Brazil, Uganda, Zimbabwe and Ghana.

Workshop Objectives
The workshop’s main objectives were to “Develop Animal Traction and Conservation Agriculture Strategies for Modernizing Agriculture through Multi-Sectoral Interaction and Experience Sharing”.

The specific objectives were:
1. Identify, analyse and consolidate information and experiences on AT and CA for the region;
2. Facilitate contacts between African and Brazilian CA implement manufacturers and suppliers;
3. Elaborate on issues and elements in the roles of AT and CA in the modernization of Agriculture in the Region and in Uganda;
4. Propose appropriate strategies and activities on AT and CA.
Workshop Procedure
Interactive discussions, facilitated by a specialized moderator, formed the main process adopted to address the set workshop objectives. The process involved plenary presentation of three keynote papers, a number of thematic papers, a poster and implement exhibition, field visits, demonstrations in the field of some of the equipment, and intensive group discussions. The workshop also facilitated numerous informal contacts and discussions, as well as evening programmes where participants exchanged information. The workshop ended with the development of strategic plans and recommendations in the general context of the sub-region, but also with a specific focus on Uganda.

Problem analysis and intensive discussions were undertaken in small, multi-disciplinary groups, while specialised output-oriented teams tackled the key emerging issues. The workshop identified issues and practical actions for strategic interventions in AT and CA advancement.

Official Opening and Keynote Paper Presentations
Three keynote papers were presented. The three, respectively, addressed animal traction and Conservation Agriculture in the context of modernizing Uganda’s agriculture, animal traction and rural transport in Africa, and Conservation Agriculture in Africa’s development.

The keynote papers highlighted the prime concerns and issues in the development and promotion/application of animal traction and Conservation Agriculture aimed at contributing to the modernization of agriculture in the region. Additionally, eighteen thematic papers were presented in five sessions, each focusing on one element in the workshop theme.

The workshop was arranged in a total of seven sessions. The first and second sessions were devoted to the official opening ceremony and presentation of the keynote papers.

Three other sessions involved field visits, implement demonstration and the implement-poster exhibition. Some briefs descriptions of the sessions follow:

Thematic Session One: Equipment for Conservation Agriculture
Focusing on Conservation Agriculture equipment, four papers were presented during this session. These covered general status and trends in farm mechanisation in general, and more specifically, Conservation Agriculture mechanisation in Africa. The papers also addressed specific CA equipment in smallholder and in large-scale farming systems. A paper was also presented on manufacturing, marketing, and provision of back-up services in an African scenario.

Thematic Session Two: Machinery Demonstration
A selected number of animal- and hand-powered CA equipment items were demonstrated during this session. Those demonstrated included the Fitarelli animal drawn direct-planter, the IADEL knife-roller, and the Triton pull and animal drawn sprayers. The demonstrations were effected at the Source of the River Nile agricultural showground.

Thematic Session Three: Animal traction in the context of Conservation Agriculture
The session addressed animal issues and management of animal when used for power. The papers presented also addressed the question of integration of livestock in CA cropping systems and the use of animal power in rural and peri-urban transport.

Thematic Session Four: Policy Issues on Animal Traction and Conservation Agriculture
The three papers presented in this session addressed policy experiences and issues in sustaining input and supply systems for farm equipment. The benefits of a liberalised and decentralised development model in enhancing farmers’ access to farm equipment were stressed.

Thematic Session Five: Entrepreneurship Development in Manufacturing, Marketing and Service Provision
The session covered entrepreneurship and micro-enterprise, including the role and the strengthening of rural and peri-urban artisans in the development and supply of animal traction and Conservation
Agriculture equipment. A special paper highlighting the necessary elements to create a conducive environment for internationally operating implement manufacturers and suppliers was also presented.

**Thematic Session Six: Organisation of Machinery Use and Services**
Two papers highlighting farm-level experiences and applications of private multi-farm use, as a way of enhancing farmers’ access to machinery services, were presented. The papers were presented in the form of two case studies: one from the Limpopo province (formally Northern Province) of South Africa and the other from northern Ghana.

**Thematic Session Seven: Micro-finance in animal traction and Conservation Agriculture development**
In this session a paper on the experiences of a World Bank-supported project on micro-financing in Uganda were presented. The paper highlighted issues and concerns related to animal traction and Conservation Agriculture in smallholder farming systems. In particular, the role and factors that would enable micro-finance to play a role in enhancing farmers’ access to farm inputs, including draught animals and equipment, was examined.

**Thematic Session Eight: Equipment and Poster Exhibition**
This involved an exhibition of farm implements, ranging from hand jab-planters to tractor-drawn high-tech no-till planters. These came from Brazil and from a number of countries in the region. Most of the equipment related to Conservation Agriculture. There were also, however, a number of rural transport carts and other items of conventional farm equipment.

Over fifteen attractive and informative posters were also exhibited. Various institutions and organisations that were present distributed an assortment of information sheets, books, flyers, and posters.

**Workshop Discussion Sessions**
Brief plenary discussions were held at the end of each thematic session, both to clarify issues raised in the presentation and to begin to identify and focus on the emerging concerns.

Additional to these, throughout the workshop there were three main plenary sessions. These followed discussions in small working groups as described below. Three of such plenary sessions were held.

It was after the plenary presentations and some discussion in the first day and a half, that the participants went into smaller groups to identify emerging issues of the workshop’s themes and to relate them to the policies, strategies and actions required to enhance farm-level application and adoption of animal traction and Conservation Agriculture.

In the second session of group work, the participants went further to analyse specific issues that had come to light. This involved identifying specific constraints and opportunities in relation to circumstances in the region.

The third and final session of group work came on the last day of the workshop. In this session, the following issues were noted as having emerged in the proceedings of the workshop so far:
- Animal-powered transport in rural and peri-urban areas;
- The role of animal traction in the context of Conservation Agriculture;
- Equipment for Conservation Agriculture - awareness in Uganda and beyond.
- Organisation of machinery use and other farm services - multi-farm use;
- Entrepreneurship development in manufacturing, marketing and service provision - policy issues;
- Micro-finance in animal traction and Conservation Agriculture development.

Participants were divided into six smaller groups to work, one each, on these six issues. Using a flowchart framework provided, the groups further analysed the issues, identified at most three priority areas, and made recommendations for general application by the various partners in the region, but with some recommendations specific to Uganda.
Field visits
This was a whole day event designed to expose participants to real-life scenarios experiences in order to ensure a feet-on-the-ground analysis and also to provide learning experiences. Three visits were arranged and participants selected one, according to their interest. These were:

i. A visit to Kawanda Agriculture Research Institute (KARI) and the Agriculture Engineering and Appropriate Technology Research Institute (AEATRI - Namalele) and Makerere University all located in close to Kampala.

ii. A visit to eastern Uganda (Tororo) where the group was able to see farmers’ fields and farming operations. This also included a visit to the one-stop-centre in Iganga.

iii. To Soroti and Kumi where the group visited SAIMMCO - the sole large-scale manufacturer of animal-drawn implements in Uganda. The group also visited a local blacksmith fabricating various steel tools and farm implement parts. After seeing farmers using draught animals in ploughing, the group proceeded to the Steel Rolling Mills Company on the outskirts of Jinja.

More details of the field visits are provided later in this report.

Special participant-organised sessions
Special interest talks, and videos and other materials brought by participants, were presented in informal evening sessions. A number of special interest or thematic group meetings also took place.

Launch of UNATCA
As part of the closing ceremony, the Ugandan Network for Animal Traction and Conservation Agriculture (UNATCA), was launched. The present members (over 40) who had met earlier, selected Mr. Wilfred Odogola as chairperson. The launching speech, presented by the Chairperson of ATNESA, challenged the new Network to work vigorously, in collaboration with others, to effect farm-level development and application of AT and CA in Uganda.

1.2 OPENING CEREMONY
Remarks by the Director General of the National Agricultural Research Organisation, Uganda.
Prof. Joseph K. Mukiibi

Honourable Minister of State for Agriculture, Animal Industry and Fisheries,
Presidential Advisor on Agricultural and Veterinary Services,
FAO Representative in Uganda,
Distinguished Delegates,
Dear Colleagues,
Ladies and Gentlemen.

The message conveyed by agricultural and rural livelihood statistics in Africa does not paint a good picture. In this respect, per capita income for sub-Saharan Africa is very low, and so are the earnings from agriculture. Tools used in agriculture are still largely primitive, resulting in poor labour productivity. Similarly, most smallholder farmers still utilise home-saved planting materials with low production potential. There are weak strategies for conservation of the environment and natural resource base. All these factors aggregate to cause the high level of poverty that prevails in most rural areas in sub-Saharan Africa.

For purposes of this conference however the issues of labour productivity coupled with the environmental impacts of engineering technologies should form the major focus. As regards the former, it is worth noting that there is still predominant use of the hand hoe, machete and axe in most parts of sub-Saharan Africa. According to available statistics, Uganda annually imports nearly three million hand hoes explaining why over 90 per cent of the production in the country is
hand-tool based. Animal traction for tillage accounts for only 8 per cent of the production while tractor use is rather insignificant in most districts of the country.

The main challenge to scientists and workers in AT and CA is making farm tools and implements more efficient, comfortable to use, yet affordable to the majority of our farmers. We must also bring about a significant shift by farmers away from rudimentary technologies towards better and more productive tools and implements.

From your programme, I note that the conference will also focus on conservation farming, which advocates minimal or no tillage of the land and no mechanical weeding. This very concept poses a challenge because agricultural advisors have been telling farmers since time immemorial to till the soil properly prior to planting, and also saying that the field must be perfectly weeded to achieve optimal yield. Now we have to turn completely, through 180°, and begin advising the same farmers not to till and not to mechanically weed. This is a challenge!

Still on CA, throughout Africa there are cases of notorious weeds that have challenged farmers over the centuries, and new ones keep on emerging. Your meeting should also discuss ways and means of handling such weeds. Last but not least, with the introduction of relatively new CA tools and implements, both research and extension workers must ensure a strategy for integrated introduction of the technology so that all major constraints in the CA production processes are simultaneously addressed.

In conclusion, please allow me, Mr. Chairman, to convey NARO’s warm welcome to all delegates to this conference, and in particular to those coming from outside Uganda. NARO is proud to be associated with the hosting of this important conference and wishes you all fruitful deliberations and a pleasant stay in Uganda.

I THANK YOU.

1.3 REMARKS BY THE FAO REPRESENTATIVE IN UGANDA
Delivered by
Mr. Charles Owach,
National Professional Officer, FAO

Honourable Minister of State for Agriculture, Animal Industry and Fisheries,
Presidential Advisor on Agricultural and Veterinary Services,
Director General, NARO,
Distinguished Participants,
Ladies and Gentlemen.

Allow me, Honourable Minister, to welcome you to this import conference and to recognise the strong leadership your ministry has during recent years provided to the agricultural sector in Uganda in general and to the Plan for Modernisation of Agriculture in particular. It is also a great pleasure for me to welcome all participants to this international conference on Modernising Agriculture - Visions and Technologies for Animal Traction and Conservation Agriculture.

I notice you are all well qualified persons from a wide range of countries, and with a wealth of knowledge and experience ready to be shared at this forum. This is an important element that, coupled with the organised exhibition of technologies, makes this workshop unique.

Mr. Chairman, one of FAO’s original mandates was to fight against hunger. This mandate is still not accomplished. The upcoming World Food Summit in Rome (10-13 June 2002) offers yet further evidence of this. Within the strategic goals to improve food security, and at the same time preserve our natural resource base, FAO considers Conservation Agriculture probably the most promising approach to sustainable agricultural development.

Some people already consider Conservation Agriculture as a new agricultural revolution. This time it is not a green one, but a blue one, for the better use of water is the secret behind it. I am sure we all know why it is a blue one. If not, never mind: we shall all know by the end of the workshop. Water is the resource, which probably causes most problems in Africa. A main theme of this Conference, therefore, is Conservation Agriculture and its optimum use of water. I am reliably
informed that the workshop will also show that animal traction can become an important factor for modernising agriculture in Africa and that it need not be in contradiction at all with more modern technology, especially within the concept of Conservation Agriculture.

FAO is proud of having found, at the very early stage of planning for this workshop, active organisations in Africa that shared the same concerns and interests, and which then joined into the preparations. In this way the workshop, more than being an FAO event, can be considered a true participatory partnership between the Uganda Network for Animal Traction and Conservation Agriculture (UNATCA), the Animal Traction Network for Eastern and Southern Africa (ATNESA), the African Conservation Tillage Network (ACT), the German Agency for Technical Co-operation (GTZ), and last but not least, the Food and Agriculture Organisation of the United Nations (FAO).

I am reliably informed that during the workshop a number of presentations will be given to improve the understanding and knowledge of how to realise the contributions of Conservation Agriculture and animal traction in modernising agricultural technologies. Software and hardware, as well as tools and the socio-economic environment required to implement Conservation Agriculture, will be addressed. I am confident that during the working groups’ discussions, conclusions and recommendations will be developed which will hopefully lead to strategies and policies to accelerate the adoption of Conservation Agriculture in Africa.

An important element of the workshop will be the CA equipment, visible in the exhibition and field demonstrations, but also in the presence of manufacturers representing the private commercial sector. The full integration of all stakeholders, from the farming sector and from the public and private sectors, is the key for successful agricultural development. We are welcome equipment manufacturers for the desired modernisation of agriculture, not only from Uganda, but also from abroad, namely from Brazil and several African countries, reflecting South-to-South co-operation in a highly visible way.

Honourable Minister, on behalf of FAO, I am happy to officially announce that much of the equipment being exhibited during this conference will actually remain in Uganda and will undergo adaptive testing in various agro-ecological zones of the country. It is a challenge to all those scientists who will be handling the equipment to generate useful information that will directly feed into research, extension and manufacturing institutions and collaborators in Uganda and beyond. In this context, the collaboration of the present manufacturers, who have made a special effort to get their equipment to Jinja in time, and who have even donated part of the equipment shown to the workshop, merits special mention. It is an important part of the commitment to the success of this event.

FAO hopes that the workshop will lead to fruitful discussions and produce the expected results to improve rural livelihoods in Africa. With those few words, I wish you all successful deliberations and a happy stay in this fascinating country.

1.4 SPEECH BY THE GUEST OF HONOUR
The Honourable Fabias Byaruhanga,
Minister of State for Agriculture,
(Representing the Honourable Minister of Agriculture, Animal Industry and Fisheries)

Distinguished Delegates,
Workshop Convenors,
Dear Participants,
Ladies and Gentlemen.

I am greatly honoured to officiate in the opening of this very important International workshop on Modernising Agriculture with particular emphasis on Visions and Technologies for Animal Traction and Conservation Agriculture

Allow me, Mr. Chairman, to welcome all of you distinguished delegates to Uganda and to Jinja Town - the source of the Great River Nile. You are assured of peace and tranquillity while you are
deliberating in this workshop. Please, you are cordially invited to visit our rich traditional tourist sites during your stay in this country.

Ladies and gentlemen, Ugandan agriculture, just like in many other developing Africa countries, was unavoidably affected by the political and economic instability that characterised post-independent Africa. In the 1960s the agricultural sector in Uganda grew by ten per cent per year. However, the sector declined dramatically during 1970s and 1980s as a consequence of gross economic mismanagement, political and social disturbances, price and marketing disincentives, and shortage of farm inputs. The agricultural sector annual output declined by an average of two per cent.

When the present Government came to power in 1986, we launched the Economic Recovery Programme with the aim of rehabilitating the dilapidated infrastructure and production sector. Furthermore, Government implemented the Agricultural Sector Adjustment Programme (1991-1995) to support financial stabilisation and to promote agricultural growth and diversification. These interventions resulted in agricultural growth of above 3.7 per cent per annum. Currently the sector contributes about 42 per cent of GDP; however, it still registers low farm yields, which are at 30 per cent of the potentials demonstrated by research. This is due to low level technologies, lack of skills, inadequate extension services, and low farm gate prices. Consequently 40 per cent of Ugandans are poor with 26 per cent living below the lower poverty line of US$ 15 per month, as compared to the national per capita annual income of about US$ 330.

Government of Uganda recognises that the agricultural sector is still the main source of household livelihood for 85 per cent of the population. As in most countries in Africa, the economy needs a vibrant agricultural sector to provide food security, raw materials for industries, poverty eradication through cash earnings to rural people, and ready markets for industrial goods such as fertiliser, herbicides, pesticides and farm equipment, including those for animal traction and Conservation Agriculture. In order to address the abject poverty in rural areas, Government has designed its Poverty Eradication Action Plan (PEAP). The Modernisation of Agriculture, Primary Health Care, Universal Primary Education, and infrastructure development are key pillars in the plan to eradicate poverty.

The Plan for the Modernisation of Agriculture (PMA) has broad strategies and principles designed to transform agriculture from subsistence to commercial farming. The plan has identified priority areas for intervention. They include, among others, Research and Development, private extension services delivery through the National Agricultural Advisory Services (NAADS), and sustainable use of national resources.

This International workshop on Animal Traction and Conservation Agriculture has, therefore, come at a time when Uganda is implementing its Plan for Modernisation of Agriculture. We are also deepening and consolidating the implementation of the principles of decentralisation and devolution of power to the people at appropriate levels, where they can best manage and direct their own affairs.

The National Agricultural Research Organisation (NARO), which was solely mandated to spearhead agricultural research, is being reviewed, together with other agricultural research systems. The review aims to formulate a decentralised, farmer-owned and demand-driven National Agricultural Research System (NARS). It is hoped that all research concerns on animal traction and Conservation Agriculture will be farmer-owned and demand-driven and will address poverty eradication while also protecting the environment.

As regards linkages and networking in animal traction, Uganda has followed the developments of the Animal Traction Network for East and Southern Africa (ATNESA) since its inception in 1990. ATNESA has advocated for improved exchange of information and regional co-operation pertaining to animal draught power. This has provided a platform for researchers, manufacturers, development workers, institutions, donors, NGO’s, and users of animal traction.

Today’s workshop has attracted wider participation including advocates for conservation agriculture. This is a very important event in the context of the New Partnership for Africa’s Development (NEPAD). Africa Leaders advocate for Africa’s advancement in which all our people can fulfil their potential with effective participation in the global economy as equal partners.
Our colonial masters came and found us with our crude farm implements. However, the situation has not significantly improved since independence. Out of 17 million ha of arable land in Uganda, only about 5 million ha are under cultivation. The main reason is lack of access and capacity to utilise appropriate farm mechanisation. Consequently, about 90 per cent of farm power requirements are derived from human muscle with hand hoes, 8 per cent from animal traction, and 2 per cent from tractors.

The Government’s strategic objective, therefore, is to target the provision of labour-saving technologies to women, youths, individual farmers and farmer’s groups so as to bring more land under cultivation, both for major food and for cash crops. Conservation farming technologies will have a vital role in this respect.

Conservation Agriculture is not completely new in the African context. Before the onset of modern machinery, farmers used to plant crops, especially field peas, maize, cassava, bananas, in uncultivated land but followed by early weeding. Furthermore, conservation Agriculture is in line with the current push by African governments to promote sustainable development and public awareness of the need to manage land, air and water resources in a balanced and sustainable manner for present and future generations.

Mr. Chairman, before I conclude, I would like to point out real challenges in the promotion of animal traction and Conservation Agriculture that this workshop must address:

(a) Availability of animal traction and conservation equipment at affordable prices to end-users;
(b) Integration of indigenous and exotic cover crops into existing farming systems;
(c) The menace posed by weeds, especially in the light of declining soil fertility and water-holding capacity;
(d) Negative cultural norms and beliefs that constrain promotion of animal traction and Conservation Agriculture;
(e) The need for gender mainstreaming and empowering farmers through micro-finance and capacity development.

In conclusion, I must observe that many African countries will still continue to depend on the agricultural sector for sometime before industrialisation takes off. The entry point for the eradication of poverty must therefore be through the modernisation of agriculture. Meeting the above challenges will need a transformation of our agricultural systems. We are therefore looking forward to receiving concrete and practical recommendation from this workshop to modernise agriculture for poverty eradication.

I thank you for your attention.

I now have the honour and privilege to declare the workshop on Animal Traction and Conservation Agriculture open.

FOR GOD AND MY COUNTRY.
2. Abstracts of the keynote papers

2.1 CONSERVATION AGRICULTURE AND RURAL TRANSPORT IN THE CONTEXT OF MODERNISING AGRICULTURE IN UGANDA: POLICY AND STRATEGY

J.O.Y. Omoding
(MAAIF, Uganda) and
Wilfred R. Odogola
(NARO, Uganda)

Agriculture is the engine of Uganda’s economic growth, contributing 42 per cent of GDP, 85 per cent of export earnings, and providing employment to 80 per cent of the current population of about 22 million. The country has an estimated three million households, each with about 2.5 ha of land. These produce 94 per cent of agricultural output. There is inadequate and inefficient utilisation of farm power country-wide. This a major reason for the country cultivating only 27 per cent of its agricultural land.

Animal traction technology was introduced into Uganda in 1909. A year later a farmer training school in ox cultivation was opened in Kumi, and in 1920 the current Serere Agricultural and Animal Production Research Institute (SAARI) was established to be, among other things, a centre for research, testing, demonstration and training of farmers in ox-cultivation techniques. Through the extension efforts of the Ministry of Agriculture, as well as of other related institutions - including NGOs - the use of work animals rapidly spread throughout the Eastern and North-Eastern parts of the country, where ecological and cultural conditions favoured its development. In these areas the technology made a remarkable impact in increasing the acreage under cultivation. Currently, more than ten districts in the country intensively utilise Draught Animal Power (DAP) with another twelve districts using the technology somewhat less intensively. The remaining districts do not use work animals on the farm.

This paper outlines the processes of introducing and extending animal traction and Conservation Agriculture technologies into the country, as well as the research efforts to develop new equipment for animal traction and Conservation Agriculture. The paper also discusses the initiation of DAP equipment manufacture in 1967 by a privately-owned farm equipment manufacturing and repair workshop in Soroti. These efforts culminated in the establishment of the current Soroti Agricultural Implements and Machinery Manufacturing Company (SAIMMCO), a privately owned venture with capacity to meet farmer needs for improved animal drawn agricultural implements, post harvest implements, and other machinery and equipment with surplus capacity for export to neighbouring countries.

As positive developments that point towards sustainability, training in animal traction technology, which used to be undertaken by the Ministry of Agriculture at its colleges, district farmer training institutes, and by extension staff and the private sector in various districts, has now been strengthened through inclusion of draught animal power and Conservation Agriculture courses in curricula at primary, secondary, tertiary, and university levels.

The paper proposes a policy strategy aimed at addressing some of the major constraints that have hindered promotion of draught animal power in the country. These include cultural, political, economic, environmental, land tenure aspects, as well as training and care of work animals and maintenance and repair of draught animal implements. Strategies for sustainable introduction and promotion of the relatively new conservation tillage concepts into farming systems in Uganda are also discussed.
2.2 OVERVIEW OF ANIMAL TRACTION AND RURAL TRANSPORT IN DEVELOPMENT: THE CASE OF AFRICA

P H Starkey
(Animal Traction Development, UK) and
P G Kaumbutho
(KENDAT, Kenya)

Animal traction remains an important and sustainable source of farm power. An overview of animal traction (AT) in development and uses around the world was presented by Paul Starkey. Pascal Kaumbutho then highlighted the characteristics of the African region in the context of new applications of Conservation Agriculture (CA). The place for animal traction in a world of discriminative modernity and the associated urbanisation process, remains an issue. The presenters focused on how the problems remain the essentially the same, even as new approaches for enhancing animal traction, or newly found uses for it, in Conservation Agriculture, take root. They suggested that even as CA development progresses, technology transfer problems remain the same; these will remain a hindrance, unless addressed anew.

The African region is only now getting the message across to farmers, that ploughs can be adjusted and that animal power can be used to plant, ridge and weed. The entry of CA has to be carefully conducted to ensure that resource poor farmers do not get discouraged and confused. Issues of an economic, social, technical and environmental nature, whether in tillage, transport or other uses such as logging, need new consideration. The region has only recently started using animal drawn rippers and direct seeders. This is building on a decade of experimental work in Zimbabwe and Zambia. The Africa Conservation Tillage Network (ACT) has been formed, and national networks such as the Kenya Conservation Tillage Initiative (KCTI), with support form the Regional Land Management Unit (RELMA), are taking on the challenge.

Advances in CA need a system-wide view and interventions, where for example, links between CA and other components like rural transport and marketing, are realized. The general absence of - but the necessity of - an AT and CA policy, set in the context of other development needs or tendencies, remains a challenge.

The presentation captured the case of Africa and its development hiccups, caused by misplaced or underrated development priorities. Recommendations centred on ways of meeting the new challenges to rural development and the renewed comparative advantages of animal traction technologies. This is important as the region finds a new and conducive environment to focus on poverty reduction. Among the challenges are the eminent globalisation trends, which are likely to lead to a grossly disadvantaged consumer society in Africa.

The presenters recommended that the current shortcomings in realizing the potential for animal traction be met by combined national and regional efforts, whether they be promotional, industrial, institutional, financial, or policy-linked in orientation. More intensive and wider support from central level, whether for farmer organisation and training or credit provision for access to inputs, will remain essential. For sustained support regionally, organisations like Southern Africa Development Cooperation (SADC), Common Market for Eastern and Southern Africa (COMESA), East Africa Community and now the New Partnership for African Development (NEPAD) need to become part of the support network.

2.3 CONSERVATION AGRICULTURE IN DEVELOPMENT: THE CASE OF AFRICA

Martin Bwalya
(ACT, Zimbabwe) and
Theodor Friedrich
(FAO, Italy)

As the world population rises, pressure increases for agriculture to produce more food. This is especially so for the African continent, where it not only food supply, but also economic
development, poverty alleviation and improved living standards that are vital. But conventional agricultural production practices are among the factors contributing to the degradation of natural resources in Africa, whereas Conservation Agriculture (CA) offers proven agricultural production options that combine production with sustainability.

CA can be generally characterised by three main principles:
- Permanent maintenance of a soil cover of live or dead vegetal material on the surface. Burning of crop residues is banished.
- Permanent no-tillage and direct seeding or planting of crops through the soil cover using special equipment.
- Planning of crop rotations over several seasons to minimise the build-up of pests and diseases, to optimise plant nutrient use by synergy between different crop types, and to alternate crops with different rooting characteristics.

Following these three principles brings about the full benefits of CA while minimising the need for farm inputs, particularly agro-chemicals. Non-observance of only one of these principles, for example crop rotation, makes CA more difficult to manage, less sustainable, and increases the need for chemical inputs.

The case of Brazil is often quoted in the context of CA. That country, in particular, has a long history of farmers practising no-till farming. They have managed to create a mass movement; indeed they have developed a farming concept out of no-till practices that can be considered a true revolution in agriculture.

Obviously Africa is not Brazil; agro-ecological conditions are usually different. The socio-cultural framework is also different. However, CA in Brazil has allowed the solution of many problems that are also very common in Africa. These include:
- Soil degradation,
- Drought and unreliable rainfall,
- Labour shortage,
- AIDS pandemic,
- Lack of farm power and appropriate implements

CA as a concept should be able to solve similar problems in Africa but the practical solutions, the actual field practices, have to be developed locally by farmers and researchers, as was the case in Brazil.

The terms Conservation Agriculture, or conservation tillage, are not entirely new to African agriculture. In Africa’s agricultural development, the 1960s and 1970s were the mechanisation era when many countries embarked on extensive agricultural mechanisation to increase agricultural output from an expanded area under cultivation. In the 1980s, as limitations to sustain these interventions become apparent, efforts moved to embrace other technologies, various of which relate to CA.

However, with the current rising demand for food in particular, and for agricultural productivity in general, coupled with less predictable rainfall, it is increasingly being realised that much more needs to be done.

While experience through a number of initiatives has shown that the principles of CA are feasible in the African environment, one must be aware that, apart from technical aspects, success in their application and adoption must conform to specific and local socio-economic and cultural factors.

One critical benchmark in the development and promotion of CA is that the concept and principles have to be internalised for the African situation. The paper discusses a number of such key factors:
- Awareness and appreciation of the problem;
- Awareness of possible options and technologies to address the problem;
- Compatibility or conflicts with existing cultural habits and traditions;
- Farmers’ access to necessary inputs;
• Public good and public sector commitment;
• Current state of the soils and weeds.

Although interpretations understandably vary, the term “Conservation Agriculture” is now used at household level across the continent. Additional to numerous localised initiatives on Conservation Agriculture, there are some national, regional and international programmes addressing issues of Conservation Agriculture in Africa.

Whereas adoption of no-till based conservation farming practices is significant among commercial farmers in most countries, the extent of sustained adoption among smallholder, communal farmers is minimum. Even with increasing focus on CA in smallholder agricultural development programmes, it is still quite common to find heavy support focusing on conventional farming practices.
3. Abstracts of the invited papers

3.1 SESSION 3: EQUIPMENT FOR CONSERVATION AGRICULTURE

3.1.1 EQUIPMENT FOR CONSERVATION AGRICULTURE: GENERAL STATUS AND TRENDS

Isaiah Nyagumbo  
(University of Zimbabwe)

This paper highlights current issues and trends in the development of Conservation Agriculture equipment in sub-Saharan Africa and analyses the factors that have been dominant in guiding their development. Prominent in agricultural development measures initially undertaken by most governments in the first three decades of independence to support mechanisation were tractor-powered systems. A large number of tractors and related equipment were imported into the region and supplied to farmers, often at highly subsidised prices, or used in government machinery hire-schemes. Interventions in favour of animal drawn systems began in the late 1970s.

Very little development/adaptation of imported farm machinery has been done in Africa. Tractor mechanisation in this period was based on conventional tillage systems using disc or mouldboard ploughs. Tillage equipment marketed during this period was therefore mainly for deep ploughing and mechanical weeding. Farm equipment for use in hand and animal power systems for smallholders has remained largely undeveloped and limited in both scope and variety - the hoe and the single-furrow mouldboard plough.

Increasing concerns about land degradation and the high cost of fuel from the 1980s has led to a shift in attention towards conservation agricultural practices, and particularly to reduced or no-tillage practices. This has created new demands for farm equipment adapted to this kind of farming system, i.e. equipment for planting and fertiliser placement through mulch, herbicide sprayers, sub-soiling and ripping, etc.

A large range of tractor drawn no-till/Conservation Agriculture equipment is now available. However, hand and animal drawn CA equipment is largely unavailable, or where it can be found, the range is very limited - essentially animal drawn minimum tillage rippers, which are slowly becoming popular in Central and Southern Africa. The paper describes available CA equipment in all farm power ranges, but mainly in hand and animal power systems. Interventions in research and equipment development and in on-farm adaptation processes and challenges are discussed. A description of the range of some equipment developed so far, and its main features, is provided. By highlighting the critical role that appropriate mechanisation and farm equipment would play in the widespread adoption of Conservation Agriculture, the paper concludes by suggesting possible strategies for the development and promotion of CA equipment and mechanisation systems, and for ensuring farmers have access to such equipment.

3.1.2 SMALLHOLDER EQUIPMENT FOR CONSERVATION AGRICULTURE

Fatima Ribeiro  
(DMC/CIRAD, France)

The development of animal-drawn no-till equipment started in South Brazil in 1985 when IAPAR (the Agricultural Research Institute of the State of Parana), designed prototypes of a no-till planter and knife-roller for cover crop management.

With the increasing adoption of no-till by small-scale farmers, the private sector took over the role of designing and providing a wide range of hand-operated and animal-drawn equipment. This
can be divided into three main groups by function for: soil improvement, cover crop management, and direct planting.

For soil improvement, an animal-drawn long box gravity applicator is used. Metering device is comprised of an axle with agitators, driven by a land wheel.

Cover crops can be managed mechanically, chemically, or by both means. Knife-rollers bend and crush the plants. They consist of a roller with knives, a support, a drawbar and a protection structure. For chemical weed control, chassis-mounted knapsack sprayers are available. Land wheels drive the pump, and the herbicide is applied through nozzles fitted to a height-adjustable horizontal boom.

A wide range of options have been developed for direct planting, including hand-jab planters (“matracas”) and animal-drawn planters for different soil and seed types. In addition, there are two-three row planters suitable for smaller tractors (15-25 Hp).

The performance and suitability of this equipment has been assessed under different socio-economic and agro-ecological conditions.

3.1.3 EQUIPMENT FOR LARGE-SCALE CONSERVATION AGRICULTURE: STATUS AND TRENDS
Peter Hickman
(SRP Marketing, Zimbabwe)

Conservation tillage, in its various forms, has been practised commercially in Zimbabwe for the past two decades. The agricultural machinery manufacturers, a well established industry within Zimbabwe, have developed machinery to suit the various concepts and to provide farmers with a choice of machinery that suits their particular systems and management style. The paper covers a broad spectrum of both local and imported equipment and systems, ranging from zero-till through to controlled traffic and conservation farming.

The agricultural trade’s parameters have generally been to avoid making recommendations to farmers on specific systems, but rather to provide the farming industry with a choice of equipment to suit farmers' needs and choices. Considerable experience has been gained in the development and introduction of new land preparation systems. Issues such as wet and dry land preparation, fertility levels, PH values, etc., are discussed. In addition, subjects such as soil erosion, soil compaction, use of herbicides, disease control, crop rotation, economics and comparative costs are also covered.

Machinery specifically designed to maximise moisture conservation, water retention and distribution, reduction of erosion, and monitoring equipment are also described.

The paper will provide participants with a comprehensive background of the development, adaptation and use of a broad spectrum of conservation tillage equipment, with particular emphasis on work with it in systems of sub-Saharan Africa, where there are unique rainfall patterns and soil structures.

3.1.4 MANUFACTURING FARM EQUIPMENT, MARKETING, AND PROVISION OF BACKUP SERVICES
Tony Rowland, Vimal Naik and Greg Garnie
(Zimplow, Zimbabwe)

Zimplow Limited was established as a manufacturer of animal-drawn farm implements at Bulawayo in 1939. It is the largest producer of animal-drawn implements on the continent, with extensive regional markets. Zimplow is the home of the Mealie Brand® range of farm implements. It is an ISO 9002 certified company and takes pride in the knowledge that its operating systems are of world class standard.

Beside its normal operational activities, Zimplow also has a research and development office to continually seek product improvement and to develop new models. One result of this research is a single-furrow plough of which the original mass of 39 kg has been reduced to 35 kg. An even
lighter plough of 29 kg has also been developed specifically for use with donkeys. In addition to these developments, we also have a range of cultivators and planters suitable for use with oxen and donkeys.

One of the challenges facing Zimplow Limited is the question of standardisation; the paper describes how this is being faced.

Conservation Agriculture is a new challenge to established manufacturers. We are aware of the potential benefits, and we have re-defined our research and development work to include this aspect. We are working in collaboration with various agricultural research institutes in this regard, and we are now in a position to produce the Pelabana/ILI ripper-planter attachment that fits directly behind the standard single-furrow plough beam.

3.2 SESSION 5: ANIMAL TRACTION IN THE CONTEXT OF CONSERVATION AGRICULTURE

3.2.1 ANIMALS AS A SOURCE OF POWER (HUSBANDRY ISSUES)
Tammi Krecek
(University of Pretoria, South Africa) and
Anne Pearson
(CTVM, UK)

A healthy, well-fed, well-managed draught animal is essential for providing animal power for agriculture. Previous reviews at ATNESA meetings have identified the challenges faced, and issues and opportunities available to improve management of working animals (Pearson et al., 1999, 2002). In this paper, the ways extension messages can be prepared and delivered to help people maintain healthy well-fed, and well-managed animals are identified.

Factors which need to be considered in developing disease control and prevention programmes for working oxen and equids are discussed, with emphasis on vector-borne diseases, helminth disease, and vaccination programmes. Experiences in improving the management of working animals, including their nutrition, footcare, working practices, harness-related injuries, and worm control in rural and peri-urban environments are outlined.

Most draught animals are owned and used by smallholder farmers and transport operators, who very often lack the financial means to pay for - or even access the information needed about - nutritional supplements, vaccinations and drug treatments. Smallholdings are often remote from veterinary services, placing the emphasis on preventative measures and on local remedies when working animals do fall sick. In many areas, NGO’s are increasingly operating to assist farmers and transport operators care for their animals, acting as a back-up to government extension services, which are sometimes constrained in their areas of operation by a lack of resources. Equine charities operate in peri-urban areas in some parts of Africa. They have traditionally provided static and mobile treatment teams for equines and training courses for farriers and harness-makers. The effectiveness and sustainability of these services, and ways in which health care and husbandry messages could be delivered to improve impact, are discussed.

3.2.2 INTEGRATION OF LIVESTOCK IN CONSERVATION AGRICULTURE
Cyprian Ebong
(NARO, Uganda) and
David G Smith
(CTVMV, UK)

The population of Uganda of estimated at 22 million people and it is projected to be increasing at an annual rate of 2.5 per cent. The increasing population requires an increasing acreage under crops to meet the additional demands for food, fibre, and wood. Analysis of available data indicates that acreage under cultivation has been increasing by approximately 94 000 ha per annum. Over 70 per cent of the land cultivated to annual crops is in the north and eastern parts of Uganda, where animal traction technologies are vital to food security and household cash income. A survey
was conducted in 14 districts of Uganda. Estimates of the draught power supply potential from the national herd were estimated. Land area cultivated to annual crops was used to estimate the demand for animal draught power. The gap between supply and demand was computed over the next 30 years. Results indicated Uganda would not be able to meet demand for animal draught power before 2030. It is concluded that, much as animal draught power was the most appropriate technology for increasing production and labour productivity in Uganda, there is a need to increase the efficiency of sustainable tractive effort derived from oxen. Available options, including minimum tillage technologies, were proposed.

3.2.3 ANIMAL POWER USE IN RURAL AND PERI-URBAN TRANSPORT

T E Simalenga
(University of Venda, South Africa) and
P G Kaumbutho
(KENDAT, Kenya)

Transport is a major aspect of rural life and of urban communities. Efficient transport, apart from ferrying agricultural inputs and produce, can also facilitate other income-generating activities and lessen the women’s burden of carrying firewood and water. The modes of transport in Eastern and Southern Africa range from head-loading, usually by women on farm and village paths, to pick-up trucks on metalled roads. The other common modes are intermediate means of transport (IMT) such as wheelbarrows, handcarts, bicycles, animal panniers and animal drawn carts.

The paper discusses the recent developments in the rural transport sector and the role of animal powered transport in meeting on-farm needs, improving people’s mobility, marketing, and employment opportunities.

Key issues such as entrepreneurship in animal power transport, gender issues, and alleviation of burden to women farmers have been highlighted and possible interventions proposed. The paper concludes that industrial as well as equipment support services are required to enable the transport sector to thrive in rural and peri-urban areas.

3.3 SESSION 6: POLICY ISSUES ON ANIMAL TRACTION AND CONSERVATION AGRICULTURE

3.3.1 SUSTAINABLE INPUT SUPPLY SERVICES FOR ANIMAL TRACTION AND CONSERVATION AGRICULTURE - POLICY ISSUES

John E. Ashburner
(FAO, Ghana)

A review of the agricultural machinery and equipment industry in Sub-Saharan Africa (SSA) reveals significant differences between countries. In the cotton production areas, a number of medium and large-scale workshops have been established for the production of animal drawn equipment, many of the units having eventually diversified production into agro-processing equipment and supplies for rural and urban needs (fencing, furniture and other lines) in an attempt to achieve improved profitability. Other medium and even large-scale manufacturers are located in the more humid tropical areas and in the highlands, producing hand tools in particular.

International research organisations, NGO’s, technology training and development centres, some agricultural mechanisation centres, and many universities have been active in many countries producing prototype equipment, but bottlenecks have occurred in many cases in bringing this equipment into local production. Some of the many emergency situations in the region, together with a number of heavily financed investment projects, have seen massive importations of both hand tools and some animal traction equipment, on occasion to the detriment of the local manufacturing industry and distribution networks.
The industry and support infrastructure will be of paramount importance as efforts continue to broaden the adoption of Conservation Agriculture practices throughout Africa. This paper describes the present situation and attempts to draw some pertinent observations and conclusions.

3.3.2 THE BENEFITS OF A LIBERALISED AND DECENTRALISED DEVELOPMENT MODEL: EXPERIENCES FROM UGANDA
F X K Wagaba
(MOLG, Uganda)

Over the last fifteen years, Uganda has implemented a number of reforms that were intended to strengthen and improve the performance of the economy, improve public sector management and delivery of services, and promote good governance. The institutional reforms focused on reducing Government control and regulation of development activities in the country, promoting private-sector initiatives and involvement in development activities, and creating an enabling environment to attract both local and foreign capital investments. The expected outputs were: achievement of rapid economic development through improved macro-economic performance; improved delivery of services; improved public sector management; and good governance and public accountability.

3.3.3 APPROACHES FOR BUILDING FARMERS’ MANAGEMENT SKILLS IN ANIMAL TRACTION AND CONSERVATION AGRICULTURE USE
Joseph Oryokot
(NAADS, Uganda) and
Michael Foster
(SG2000, Uganda)

The Government of Uganda has adopted, among others, two important policies: the Poverty Eradication Action Plan (PEAP) and the Plan for the Modernisation of Agriculture (PMA). In these, promoting the use of animal traction and the adoption of Conservation Agriculture are both accommodated. The role of the National Agricultural Advisory Services (NAADS) will be vital. The vision for NAADS is to be a decentralised, farmer-owned and private-sector serviced extension delivery system. Its mission is to increase farmer access to information, knowledge and technology for profitable agricultural production. The paper outlines the guiding principles of NAADS and the strategy for developing farmer capacity for animal traction and Conservation Agriculture.

The institutional framework for agricultural service delivery is based on farmer groups, Sub-County farmer’s forums, District farmer’s forums, and a national farmer’s forum. Service providers depend on the expertise and support of the private sector, NGO’s, universities and training institutions, research organisations such as NARO, UCDA and CDO, together with other governmental organisations. Linkages between these stakeholders are described in the paper, as also are the achievements to date.

3.4 SESSION 8: ENTREPRENEURSHIP DEVELOPMENT IN MANUFACTURING, MARKETING AND SERVICE PROVISION

3.4.1 ENTREPRENEURSHIP AND MICRO-ENTERPRISE DEVELOPMENT FOR ANIMAL TRACTION AND CONSERVATION AGRICULTURE
Isaac Sakala
(Africare, Zambia) and
Piet Stevens
(IMAG, Zambia)

Micro and small businesses are crucial for developing countries, generating up to 40 per cent of rural and half or more of urban employment. Between 500 million and one billion of the world’s
Economically active poor people run such businesses, ranging from trading and service activities to small-scale production.

Micro-enterprises assist meeting basic human needs; provide skill and entrepreneurial training, and act as a vital link with formal sector businesses. More important, they are very close to their clients, flexible in their services, and main players for sustainable poverty alleviation. Yet, fewer than two percent of micro and small businesses have access to credit - other than moneylenders in the informal sector.

Since 1996, IMAG and Africare, through the Smallholder Agriculture Mechanization Promotions Project (SAMeP), in Zambia have been working to assist small enterprises that are involved in the supply, distribution and maintenance of animal drawn conservation tillage implements. The entrepreneurs involved include private retailers and metal workshops in rural and peri-urban areas. Since the government of Zambia liberalised the agricultural sector, scope for the development of such businesses has increased greatly. However, bottlenecks are the seasonal nature of the businesses, a widely scattered demand, low purchase power of farmers, high lending interest rates, and high costs of inputs.

This paper discusses IMAG and Africare’s experience in supporting the development of a private-sector manufacturing and distribution network for conservation tillage implements and spares. It highlights the strategies used by IMAG and Africare, as well as the successes obtained and lessons learned.

3.4.2 EMPOWERING RURAL AND PERI-URBAN ARTISANS: UGANDA CASE STUDY
J K Byaruhanga
(Gatsby Trust, Uganda)

Uganda has recently launched the Plan for the Modernisation of Agriculture (PMA) as a key element for poverty eradication. Among the major strategies for PMA is the development and adoption of technologies for irrigation, increased farm power, and agro-processing.

Considering that most farmers are smallholders, there is a role for appropriate manually-operated or semi-automatic technologies that will enhance mechanisation of production and agro-processing on or near the farm. Since these are usually small machines, one can see a role for rural and peri-urban artisans who could be assisted to manufacture and maintain these technologies.

UGT works with entrepreneurs in the small-scale sector, of which artisans are a part. Artisans, especially those in the rural area, usually lack tools, technical skills, design skills, work sheds, and access to credit and to electricity.

These are the problems addressed by entrepreneurs who become Gatsby Club members and are therefore able to access services from the Trust.

3.4.3 ELEMENTS FOR A CONDUCIVE ENVIRONMENT FOR INTERNATIONALLY OPERATING IMPLEMENT MANUFACTURERS AND SUPPLIERS
Andre Verardi
(SEMEATO, Brazil)

The paper describes the organisation of the company SEMEATO S/A in Brazil and in particular, its involvement in the supply of agricultural equipment for Conservation Agriculture. The adoption of direct planting techniques in Brazil was mainly brought about by a mixture of public pressure and financial incentives. The farmers organising themselves into associations and encouraged the movement. There has been growing interest in this process from FAO, World Bank, GTZ and CIRAD.

The commercial attractions of producing the equipment locally include the ability to reduce costs. There are close links with the research organisations, and the distributors have gained sufficient technical knowledge and entrepreneurial skills to assist and train farmers.
There have, however, been difficulties among manufacturers due to the limited government support. There is much bureaucracy, and goods destined for export are subject to considerable taxation. Logistics are also complicated.

The paper notes various aspects of importance for leading export companies such as SEMEATO. High quality products are essential, with continuous updating of designs. Adoption of trademarks is necessary to protect the brands, and export business must form part of the strategic plans of the company. Export now constitutes the core business of SEMEATO.

3.5 SESSION 9: ORGANISATION OF MACHINERY USE AND SERVICES

3.5.1 MULTI-FARM USE OPTIONS FOR ENHANCED FARMER ACCESS TO MACHINERY AND SERVICES
H. Loos
(GTZ, Ghana)

The development of the agricultural sector is a key element in the Poverty Reduction Strategy of Ghana. Agriculture there contributes 60 per cent to domestic product, 65 per cent to employment and 50 per cent to exports. Increases in agricultural production and productivity and the subsequent introduction of agro-based industries are seen as the motor for economic growth, of income generation, and creation of job opportunities.

However, the majority of Ghanaian farmers still work at a very low level of mechanisation, tilling the land with hand tools and transporting their produce by head load. These labour intensive production methods limit the area under cultivation and are responsible for severe yield losses resulting from untimely field operations. Furthermore, the tedious fieldwork and low returns on labour make agriculture increasingly unattractive for youth, resulting in migration from the rural areas.

Different organisational models to assure efficient services are discussed. The establishment of Private Mechanisation Service Centres (Modelled after the German Maschinenring), which receive some support through Government, is favoured as an option; for it involves the private and the public sector, but maintains private entrepreneurship and assures organised service delivery.

3.5.2 MULTI-FARM USE: THE CASE OF TRACTOR AND MACHINERY HIRE-SERVICE IN THE VHEMBE DISTRICT OF THE LIMPOPO PROVINCE - SOUTH AFRICA
Khathu Nedavhe-Muthala
(BASED, South Africa),
Martin Bwalya
(ACT, Zimbabwe) and
Edward Chuma
(University of Zimbabwe, Harare)

The Broadening Agricultural Services for Extension and Development (BASED) programme, jointly with the African Conservation Tillage Network, is working on community-based development and promotion of sustainable soil and water management practices among smallholder farmers in the Limpopo Province (formally Northern Province) of South Africa.

In pursuing the objectives of the programme, private tractor owners operating farm machinery hire schemes have been engaged to provide the needed power and machinery input for the operations. The paper discusses detailed experiences of about thirty private tractor owners in Limpopo province, their operators, and the farmers using the service.

The paper highlights technical, socio-economic and cultural issues that influence successful management of a private farm machinery-hiring scheme, basing on the BASED project case. The paper discusses the role of multi-farm use and privately owned tractor/machinery hire schemes
in increasing smallholders’ access to farm machinery in general and to conservation farming equipment in particular.

3.5.3 MANUFACTURING OF FARM EQUIPMENT, MARKETING, AND BACK-UP SERVICES
Asubo Makarios
(SAIMMCO, Uganda)

The role of agriculture in the economic development of Africa is fundamental. Agriculture must be transformed to produce adequate food for the rapidly growing population. We must also increase production of export crops in an increasingly competitive world. In order to maximise yields, appropriate implements have to be used and the various field operations have to be well timed according to crop needs and environmental requirements.

For any technology to be useful in a community, it should be oriented to the needs of the majority. It should also be readily available and reliable, and utilise available resources of capital and labour as much as possible in order to ensure its sustainability.

Manufacturers aim to design implements that can carry out field operations to the satisfaction of farmers. With information gleaned from implement demonstrations, an assessment of their performance and effectiveness is used to develop them further and eliminate any shortcomings. Our Sales Agents, supplemented by our own Depots, facilitate the provision of the necessary hardware. They also deal with disseminating information to different target groups, such as farmers, artisans and extension staff. Small traders are being supported in areas where on-farm promotion of AT has been conducted to involve them in marketing our implements and spares. SAIMMCO, like other manufactures and importers of agricultural implements, is struggling with distribution problems.

3.6 SESSION 10: MICRO-FINANCE IN ANIMAL TRACTION AND CONSERVATION AGRICULTURE DEVELOPMENT

3.6.1 EXPERIENCES WITH MICRO-FINANCE IN PROMOTING ANIMAL TRACTION AND CONSERVATION AGRICULTURE: OPPORTUNITIES AND BOTTLENECKS
Basil Wanzira
(PACODEV, Uganda),
Wilfred R. Odogola
(FARMESA, Uganda),
W. Nalyongo
(PACODEV, Uganda)

In sub-Saharan Africa, typical goals of rural development include food production and poverty alleviation. Despite varying views on the best ways of achieving these goals, production intensification, exploitation of marginal lands, and expansion of trade are among the options often cited. At smallholder level, accelerated adaptation and adoption of improved agricultural technologies and practices is one of the driving forces for sustainable rural development. Intensification of farming must be part and parcel of the strategy for ensuring livelihood security for most countries in sub-Saharan Africa, where agricultural land per capita is continuously decreasing.

This paper focuses on a number of issues related to financial service delivery for food production and poverty alleviation for rural development. The introduction outlines the needs for micro-finance in AT and CA, defines micro-finance, and characterises both formal and informal institutions for micro-finance that address the needs of different levels of recipients.

Step-by-step procedures for preparing a borrower, or group of borrowers, for timely loan repayment is given. The process includes a rapid appraisal survey to identify and catalogue borrower
characteristics and their requirements in respect of AT and CA. Sensitisation of individuals, groups or associations are organised to respond to issues such as: What is credit? Why the credit? How does credit work? Who accesses it and how?

Other activities include rigorous training in business analysis and planning, registration of individuals, groups or associations, preparation and submission of business plans, lodging of loan requests, and eventually, loan approval and disbursement.

In conclusion, the paper outlines the case of the micro-financing that has very successfully operated under the Farmesa Project in Uganda.
4. Reports on workshop activities

4.1 FIELD VISITS

4.1.1 Visit for group #1: Selected research institute
27 participants enlisted for the field trip to two NARO research institutes: Kawanda Agricultural Research Institute (KARI) and the Agricultural Engineering and Applied Technology Research Institute (AEATRI) and later to Makerere University Agricultural Research Institute, Kabanyolo (MUARIK).

KARI
At KARI, the Director of the Institute, Dr Magunda, met the team and provided an overview of the institute. The team then visited three of the four research programs at the institute:
- Postharvest
- Horticulture
- Soils & soil management
- Banana

At the Banana Research Program, the team visited demonstration plots depicting various management practices on banana which emphasise aspects related to CA. Methods of banana multiplication through tissue culture vs. suckers were also demonstrated.

At the Soils Management Department, the group saw cover crop management with generation of much discussion. At the Horticulture Program, the team visited the tree nursery where they were briefed through the different stages of preparing seedlings, including grafting and tissue culture techniques and the materials required. They toured the different shades, housing various plantlets including coffee, bananas, citrus and mangoes.

AEATRI
At the Agricultural Engineering and Applied Technology Research Institute (AEATRI) the group was given an overview of the institute: its establishment, mandate, objectives, programmes, activities and technologies developed. These included light model plough, planters, CT equipment, weeders, grass choppers, roots and tuber slicers, and maize shellers. In the water area the group was demonstrated a treadle pump, windmill, bio-gas digesters and other appliances.

Areas of concern included linkage to private sector manufacturers to multiply the technologies more so when they are interested in only those with a sure market. Widening source base for promising technologies (another model of the motorised maize Sheller available in Eritrea and willing to pass on blue prints). There was definite interest in the relevance of the equipment to smallholder agricultural sector and enterprise. Some participants, particularly those from Ethiopia and Eritrea wanted to purchase some of the equipment like manual maize shellers but they were afraid of encountering export complications on departure to their home countries. They went on to enquire about having blue-prints for the same equipment but these were not readily available.

Kabanyolo University Farm
The team visited the Agricultural Engineering Department at this farm of the Makerere University Research Institute, holding discussions with various memebers of the staff.

4.1.2 Visit for groups # 2 & 3 : Farmer training in Iganga & Tororo districts
Two different groups, each of 25-30 participants were organised for this field visit, both groups visiting field sites in Iganga and Tororo districts.
Tillage demonstration, Mukulu
The sub-group that started at the Tororo end, started with a demonstration of ploughing by Sasakawa Global 2000 farmers at Mukuju Village, 8-10 km along the Tororo-Mbale road. The demonstration consisted of a two-to-three pass ploughing operation followed by a harrowing operation using a cultivator attachment to a Rumpstad multipurpose toolbar. The farmers including a 13-year old boy, demonstrated how to open a furrow for a plough-planting operation which needed two men while two women followed behind placing seed. The next demonstration was on weeding with an ox-drawn cultivator. The farmers were very good at what they did though were completely unaware of conservation tillage concepts. Farmers described the equipment in use as heavy and they needed lighter ploughs for smaller people and particularly for women.

Discussion with Tororo farmers
Africa 2000 farmers in Tororo were the next to be visited. These gave a tour of their gardens with cover-crop use in an agro-forestry and soil conserving system demonstrated. Cover crops in use were such as Crotararia and Gliricidia. Tree crops like Lucerne were also observed to be in use. Use of pits to harvest rain-water around banana trees was a practice receiving intensive use among farmers. It was not clear why water collection pits were necessary in an area with relatively high rainfall rates. Risk of flooding was considered to be eminent.

4.1.3 Visit to the SG 2000 One-Stop-Centre
The One-Stop-Centre is a Sasakawa Global 2000 (SG 2000) outfit where farmers obtain all aspects of farming and community development all at one stop site. It is a centre established with participation of enterprise women groups currently involved with the following activities:

- Processing cassava to Gari and other by-products,
- Making donuts and other snacks for sale to all,
- Stocking an assortment of agricultural inputs including farm equipment, seed, fertiliser and pesticides for sale to members and to all interested farmers within and outside the area.
- The group also conducts training on various aspect of agriculture including micro-finance.

The One Stop Centre is run by one of several SG 2000 projects as a means of providing a long term and sustained input and service support for women while building on their entrepreneurial capacity. SG 2000 role is to encourage women and empower them through training in business operation. This involving assistance and team and capacity building centre has the expected signs of growing to self-sustenance. After this is achieved, SG 2000 will cautiously pull out. The group initiative was a clear example of how rural people and particularly women can take control of their own development. Stockist supply systems are already being considered as some of the important ways of advancing conservation agriculture.

Ikulwe district farmer training Institute, Iganga district
At this centre participants were demonstrated on-station as well as on-farm research work by NARO and its collaborators. This covered soil fertility enhancement aspects. The work also included integration of several cover crops into the farming system in this district. Farmers visited were very enthusiastic to receive the visiting team and could ably explain the trials in their fields.

4.1.4 Visit for Group #4 : Fabricators in Eastern Uganda
Visits were made by some 40 participants to manufacturers at different levels in Soroti and Jinja Districts, as indicated below.
SAIMMCO The Soroti Agricultural Machinery and Implements Manufacturing Company (SAIMMCO) started as an engineering plant established by Asian entrepreneurs in 1967. It was established to manufacture farm implements and replacement parts for ginneries and other general engineering items. Nationalised in 1972 after the expulsion of the Asian community, it was then rehabilitated and re-capitalised under a UNIDO/UNCDF/UNDP supported project, which started in 1987. It was then that the name SAIMMCO was established.
The company was privatised in 1999 and acquired by the current owners - the Alam Group of Companies. SAIMMCO is the sole large-scale manufacturer of farm implements, mainly animal drawn, in the country. The product range includes ox-ploughs, ox-carts, potato slicers, potato graders, groundnut lifters and shellers, dam-scoops, harrows, brick moulds, hammer mills, and oil-press and bicycle parts.

The workshop is well equipped with versatile production machines that allow low production runs to be accommodated within its capacity.

At present, the company does not produce any specific CA-related equipment. However, management expressed willingness to learn about this equipment and possibly include it in their product range.

**Uganda Veterans Association Group - Kanapa Parish, Ongiino Sub-county, Kumi District**

The team visited the Uganda Veterans Association Group at their base at Kanapa Parish in Ongiino Sub-county, Kumi District. These farmers use animal power and single mouldboard plough for land preparation. The Group held lengthy discussions and some also tried out the plough with the draft animals made available for the demonstration.

**A local blacksmith in Ongiino Sub-county, Kumi District**

The area is also known to have a number of local blacksmiths involved in the fabrication of an assortment of household and farm tools and replacement parts, including bicycle parts. The team visited Mr. Dividison Olelger who is one of the long standing and experienced blacksmiths in the area.

At now 75 years old, Mr. Olelger is still a full-time blacksmith, a practice he started at the age of 26 in 1953 learning on-the-job from his father. He indicated that he has managed to “feed” and educate his children all these years from his earnings in blacksmith. He indicated that his major problem was sourcing of raw materials (scrap metal) for which sometimes he has to go long distances (to urban centres).

His range of regularly made tools and parts include:

- s/mouldboard plough shares
- s/mouldboard plough landsides
- s/mouldboard plough mouldboards
- kitchen knives
- axes and hoes
- bicycle saddle frame.

**Jinja Steel Rolling Mills**

The company, located in Jinja, is a large-scale foundry manufacturing an assortment of steel profiles, mainly from scrap steel. It manufactures a wide range of steel profiles - sizes and shapes. This includes deformed bars, flat and angle-iron profiles other made to specific user requirements. It supplies most of Uganda’s steel requirements and exports mainly to Kenya, Rwanda and Congo DR.

The Company is also part of the Alam Group of Companies. The company also makes the I-steel profiles, which are cut and bent to plough beam specifications and supplied to SAIMMCO.
4.2 EQUIPMENT EXHIBITION AND POSTER PRESENTATIONS

4.2.1 Equipment exhibition (with a contribution from Fredrick Ochieng)
There were numerous items of agricultural equipment and accessories on display designed for both farm and transport tasks. A total of 14 companies and organisations were represented, with five from Brazil, two from Uganda and Kenya, and others from Ghana, Malawi, Zambia, South Africa and Zimbabwe. The equipment displayed is briefly described below.

Fitarelli (contact zenith@st.com.br)
This Brazilian company specialises in hand operated and animal drawn CA equipment. The display included:
- Hand operated jab planter for seed only
- Hand operated jab planter for seed and fertiliser
- Long beam AT direct planter
- Long beam AT minimum tillage planter
- Ride-on AT direct planter (illustrated right)

Ladel (contact iadel@cadl.com.br)
This is another Brazilian Company manufacturing hand operated and animal drawn CA equipment.
- Long beam AT direct planter
- AT ripper/weeder
- AT sprayer with accessories
- AT Knife roller

Knapik (contact : knpk@net-uniao.com.br)
This Brazilian Company specialises in manufacturing sprayers for small farmers:
- Hand operated wheel-barrow boom sprayer with accessories
- AT sprayer with accessories

Triton (contact : triton@tritonmaquinas.com.br)
Also from Brazil, manufacturing planting and spraying equipment for small farmers. It displayed:
- Long beam AT direct planter
- AT direct planter with press wheels
- Long beam AT minimum tillage planter
- Hand pulled boom sprayer
- AT ride-on boom sprayer

SEMEATO (contact semeato1@pro.via-rs.com.br)
This is a Brazilian company established in 1965 and has since expanded to incorporate research and development, as well as a training school for people who work in the industry. The high technology machine they displayed was a multi-crop planter:
- Tractor mounted direct drill/planter.

Micron Sprayers (contact micron@micron.co.uk)
Two of their sprayers were on display:
- The Handy (hand-held herbicide sprayer) This can apply either formulations or traditional water based products.
• The Ulva. This is a hand-held sprayer for insecticide and fungicide application, designed for low and ultra low volumes. It can apply both oil and water-based sprays.

**SAIMMCO LTD (contact alamgroup@hotmail.com )**
SAIMMCO is a private company run by ALAM Group of Companies in Soroti and manufactures farm implements. Some of the equipment they displayed included plough, ridger, dam scoop (see photo), ox-cart with metallic wheels and Diamond spike tooth harrow.

**Triple W Engineering (contact muckleb@africaonline.co.ke )**
This is a private manufacturing company based in Kenya and producing a range of equipment. On display included donkey and ox-drawn equipment: donkey plough with weeder attachment, ox-drawn weeder, ridger attachment, single-row planter with harnessing as well as puncture-free tyres and manual weeder.

**KENDAT (contact kendat@africaonline.co.ke)**
Kenya Network for Draught Animal Technology (KENDAT) is a local non-governmental organisation that empowers resource-poor communities by advancing animal traction technologies. Current programmes focus on improving donkey welfare and utilization, promoting conservation agriculture for increased production and environmental preservation, and enhancing provisions for rural and peri-urban transport services in Kenya. A variety of harnesses and equipment were on display.

They included:
• Collar harness and saddle for carting
• Saddles (locally modified and by Donkey Sanctuary)
• Pannier
• Mulch planter
• Ridgers (Victory brand)

**Malawian Handcart Project (contact Mercurywendroff@mindspring.com)**
Malawian cart is quite versatile. It can carry grain to the maize mill, bricks carrying grass, water in polythene drums as well as being used as an ambulance. The cart is made using bicycle wheels, and can easily be fabricated by a carpenter in about four days. The chassis consists of two frames, each of two planks, having a bicycle wheel sandwiched between them. These frames are held together by the wheel axles in their middle and spaced by wooden blocks.
Hastt, Zimbabwe (contact hastto@africaonline.co.zw)
Hastt Zimbabwe manufactures various tractor- and animal-drawn equipment and implements. The animal-drawn implements are manufactured under the brand name “Haka”, and the following were on display:
  • Haka plough
  • Spike harrow
  • Cultivator

The Jab Planter Project in Ghana (contact ebobobee@yahoo.com)
The project focuses on the production of Jab planter, which was on display, using locally available materials (wood, sheet steels and mild steel) and techniques. The production involves planning, steel rolling and drilling.

The project is part of conservation tillage research in Ghana and seeks to incorporate the introduction of Jab planter not just as a planting tool but also as an economic venture for local artisans.

Youth with a mission (YWAM) (contact work@ywam.or.ug)
This is an organisation based in Katakwi region of Uganda.

Their goal is to attack poverty in this region and hold out hope to neighbours in Karamoja. The organisation has a design centre in Katakwi which trains farmers and artisans on manufacture of low-cost equipment. These include weeders, seeders, harrows, ridging ploughs, carts and donkey harnesses. The organisation displayed a weeder and a cart with double-rimmed bicycle wheels (see photo).

4.2.2 Poster presentations
There were fifteen poster presentations, as described below:
2. Conservation tillage for soil and water management under smallholder farming condition in Eastern Cape in S. Africa by Universities of Venda and Fort - Hare (T.E. Simalenga, M. Mabi and O.J. Mandiringara)
3. Traction and Conservation Agriculture in Eritrea
4. AGROMISA (Knowledge Centre for Small-scale and Sustainable Agriculture in the Tropics)
5. Worms/African Horse-sickness/ Community Tick Control/Lumpy skin disease/Lung sickness (Contagious bovine pleuropneumonia) by Department of Tropical Veterinary Medicine, University of Pretoria
6. Namibia: Land of the brave
7. ACT services in conservation farming by GTZ/ ACT
8. Helping communities with their own development by Masai Pastoralist Development Organisation (L. Sakita and D. Conroy)
9. Animal traction in action in Tororo District by Farm Hands
10. The potential for conservation tillage practices to improve smallholder maize production in Zimbabwe
11. The development of reduced-tillage systems suited to the requirements of resource poor farmers in Kwa-Zulu, Natal, South Africa by ARC LNR (R.M. Fowler, P. Hlatshwayo and J. Arathoon)
12. Helping communities with their own development by Maasai Pastoralist Development Organisation (L. Sakita and D. Conroy)
13. Animal traction in action in Tororo District by Farm Hands
14. The potential for conservation tillage practices to improve smallholder maize production in Zimbabwe.
15. The development of reduced tillage systems suited to the requirements of resource poor farmers in Kwa-Zulu Natal, South Africa by ARC LNR (R.M. Fowler, P. Hlatshwayo and J. Arathoon)

4.3 REPORT ON FIELD DEMONSTRATIONS
During the afternoon of Day 1, workshop participants, together with a number of farmers invited from the neighbouring districts of Jinja and Iganga, converged at the Agricultural Show Ground in Jinja for a demonstration of a range of CA equipment received from various Brazilian manufacturers. This was as follows:

- FITARELLI: several models of hand and animal drawn direct planters,
- IADEL: animal drawn ripper/weeder, direct planter, boom sprayer, knife roller
- TRITON: direct animal drawn planters, boom sprayers manual and animal drawn,
- KNAPIK: direct planter, wheel-barrow-boom and shielded sprayer.

Prior to demonstrating each item of equipment, its purpose and operational features were explained to the onlookers. Manually operated direct jab-planters and the wheel-barrow-boom and shielded sprayer were demonstrated in turn. Both male and female demonstrators took part in the actual operation of the equipment. For the animal drawn equipment, a pair of well-trained animals was used. The participants watched closely as one item of equipment after the other was demonstrated. Questions were asked and clarifications provided. The Brazilian manufacturers took direct charge of these field demonstrations.

4.4 CONCLUSIONS OF THE GROUP DISCUSSIONS
Two days of discussions took place with six different Working Groups covering the following topics:

1. AT for transport in the context of marketing shortcomings and access to markets;
2. Can farm services - such as those for animal health, extension, and machine hire - be privatised effectively?
3. Effectiveness and sustainability of farmers’ organisations;
4. Farming as a business - the role of AT and CA;
5. Where is the compromise? Crop residues to feed soils or animals?

After the topics were decided upon in the plenary, the participants split into smaller groups to discuss the above items in detail. The discussions were started off with a problem analysis and, where appropriate, put into the international context. The results and resolutions of deliberations are as follows:

**Group 1**

**AT for Transport in the context of shortcomings and access to markets**
The members of the group identified two major problems regarding this issue, which applies to all sub-Saharan countries. The lack of access to credit in particular presents one of the obstacles, which hamper small and subsistence farmers in financing and acquiring AT technology. This goes hand in hand with the need to generate - and promote - a critical mass, to make the investment worthwhile.

The working group resolved that in promoting animal traction, stakeholders should address the two major problems and recommended specific steps to remedy the current situation.
Regarding access to credit, the working group identified opportunities to create additional income generating activities for subsistence and small farmers, i.e. involvement in road construction, introduction to commercial agriculture. However, the group took note that when discussing access to credit, farmers should also be informed and sensitised about the need for savings, either to finance AT or to build up collateral. In addition, the group recommended that specific credit terms should be developed for the agricultural sector, incorporating more appropriate conditions, such as extended loan periods, lower interest rates, and different forms of collateral. Lastly, the issue of sanctions for loan defaulters was discussed, and the working group advised that transparent steps need to be in place to address this problem.

On the second issue of a critical mass, the participants recommended a series of concrete steps to support creating the required ‘turnover’. In particular, it was suggested that ATNESA establish a member-based action group, which in turn would sensitisate stakeholders and carry out a participatory survey. This would then provide the basis for three activity areas: (i) the design of a suitable credit product; (ii) advertising and promotion of the product and AT; and (iii) supply of carts by local manufacturers. The first steps in this direction should take place by December 2002, and initial reporting on the progress so far available by the same time.

Group 2

Can farm services such as those for animal health, extension, and machine hire be privatised effectively?

This working group dealt intensively with the question of privatisation and concluded that privatisation does have a number of merits, provided some conditions are met. First of all, it was noted that the provision of private services is more costly than state-sponsored activities. This means that awareness has to be created among prospective clients about the advantages of private-sector services. Secondly, private services need to focus on tangible outputs, such as animal health remedies or machinery hire.

The general idea of privatisation was welcomed by the members, and three aspects were specifically highlighted: (i) the provision of better services by private operators; (ii) the increase of availability of services; and (iii), increased competition between providers, which impacts on affordability and service structures.

As a way forward, the members mapped out three steps to be taken in the direction of privatisation.
1) The start of a ‘wise’ privatisation process in which - in Uganda - NAADS could play an important role.
2) The formation of multidisciplinary co-operatives to render a variety of services.
3) The provision of government supported incentives, e.g. tax relief and soft loans (to investors and end users) in order to stimulate private-sector involvement.

Group 3

Sustainability and effectiveness of farmers’ organisations.

The third working group looked into the success and failure of farmers’ organisations. The participants first collected and analysed international experiences, with particular attention to the reasons for the failure of organisations, i.e. the collapse, or low output and effectiveness of farmers’ groups. The members noted that a number of preconditions need to be in place for the success of these organisations:

First among these preconditions are the common interest and the shared goals of the members of organisation. This common understanding is essential for the operation and long-term vision of farmer’s groups and all members are called upon to establish or revise this aspect of their organisations.
One of the major obstacles for farmers’ organisations can be the lack of a clear organisational structure, which has been set up in a participatory manner, and the corresponding transparency, both in respect of finance and decision-making processes.

Despite the best intentions of members who form an organisation, one of the biggest problems for new leadership is often the lack of facilitation skills. Groups and organisations need to be lead well, with the leadership able to both encourage participation and give direction.

Lastly, one of the favourable ingredients for starting a successful farmers’ organisation is to build on already existing structures. Experience shows that in doing so, the effectiveness and sustainability of member- based organisations is greatly increased.

As a way forward, the group recommended a critical examination of the performances of similar groups to learn from their successes, but also from their failures.

The working group resolved to recommend the following items for inclusion in capacity-building efforts for farmer’s organisations:

1. Building of appropriate capacity related to organisational and management skills in already existing groups;
2. Rendering direct support to institutions to develop facilitating skills profiles;
3. Promoting the affiliation of small and subsistence farmers to local farmer’s organisations;

Learning from successes and failures.

**Group 4**

**Farming as a business - the role of CA and AT**

The fourth group dealt with the new mind-set needed to make farming viable and sustainable. An underlying premise is that farming is more than just agriculture: it is a business enterprise. This perception, as the working group members agreed, has to be developed amongst farmers themselves, but also in the agricultural sector as such.

In this context, the participants stressed that the rules of markets and entrepreneurship also apply to the agricultural sector. The group focussed on a few major issues that need to be considered when dealing with this topic.

In supporting farmers to develop their operations as a business enterprise, a careful pre-selection from among them has to take place. An honest assessment of the farmers’ abilities and business skills has to be carried out, as well as analysis of the productivity of the future business. Together with the farmer, a should then be made and future considered.

This is quite similar to other business development approaches. In the case of farming, particular emphasis has to be placed on and farmers also need to have as was amply pointed out by Group 1. All stakeholders are requested to work towards the necessary attitude change, which should be supported by by appropriate incentives from governments and the private sector. The working group called upon all stakeholders and policymakers to provide training for farmers, in order to start the process of turning farmers into entrepreneurs.

During the discussions, the working group identified a number of problem areas that hamper business development in the agricultural sector. Three major areas were considered in detail:

1. The availability of markets for farm products and agro-processed products. Especially in traditional and rural areas, the markets and the financial capacity of those markets are not well enough developed to be the basis for operating viable businesses.
2. Agricultural products are also subject to the negative, as well as positive effects, of the ongoing globalisation. This has a direct impact on the agricultural sector, especially in countries where farming methods are not on a par with international technologies, and where farm produce does not measure up to international demands.
3. The third item, the working group observed was the lack of appropriate infrastructure in a number of countries.
The lack of infrastructure directly and negatively affects the commercialisation of farming.
In a second round, the group discussed basic strategies to bring about the new mind-set mentioned above. It was strongly emphasized that farmers must be an integral part of this process if they are to accept the new, and sometimes unfamiliar, concept and operate within it.

When considering the promoting of farming enterprises, the group recommended taking into account the following factors:

1. A farmer has to select his/her type of production enterprise.
2. Farmers need to understand the advantages of marketing groups, for these can greatly increase the leverage farmers can exert in selling their produce at profitable prices.
3. Relevant information on markets and products needs to be disseminated effectively. This also includes information and assistance to farmers on post-harvest business opportunities.

On a different level, the working group recommended addressing issues concerning infrastructure, land tenure law, and incentives for farmers embarked on changing their production strategies. A major feature of the discussions was the emphasis the participants placed on the need for the political level to devise policies that enable the growth of an entrepreneurial-oriented agricultural sector.

In summary, the working group presented five considerations and intervention areas for stakeholders:

1. To develop the sector, multidisciplinary and holistic approaches are required.
2. The implication of the above is that farmers have to have a good understanding of the complementarity of agro-based enterprises.
3. Stakeholders and policy makers have to promote the use of new technologies and provide training in these new methods.
4. Agro-based business knowledge needs to be integrated into the educational system.
5. Long-term planning efforts have to be made to initiate and implement the necessary changes.

Group 5

*Where is the compromise? Crop Residues feeding soils or animals*

This group discussed the contradictions that occur for CA between the crop-based and livestock-based - often pastoral - farming systems that are widespread in Africa. The group noted that livestock-based systems compete for crop residues as fodder, while crop-based systems require them as ground cover in CA.

Another conflict area is the organisation of access to land: in many countries the land tenure systems are not appropriately regulated. Different users requirements, especially in cases of cultural differences, can lead to potential conflicts. On a more technical note, the group highlighted that the custom of all-year-grazing leads to the rapid deterioration of the soil quality.

The working group recommended a variety of solutions to the stated problems. In summary, the best way forward lies in the implementation of integrated farming systems. This entails the reduction of cropping in order to increase productivity, and the streamlined, integrated operation of cropping and grazing areas.

Group 6

*Equipment for CA - How to introduce new technologies.*

This group consisted of manufacturers of farming equipment and a range of other stakeholders in the agricultural sector. The manufacturers stated that they basically react to farmer demand in order to have economically viable enterprises. However, members of the working group emphasised that there is a responsibility for manufacturers to participate also in formulating new ideas regarding Conservation Agriculture. New products need to be developed and introduced, as well as the farmers’ access to equipment assured.
In using agricultural equipment, farmers encounter a number of problems, which the working group recommends be addressed in future:

1. The maintenance and repair of equipment remains a problem between farmers and manufacturers. Very often, supplies and spares are not readily available or are very costly.
2. Awareness creation should start on both sides: farmers need to be sensitised and informed about the possibilities that agricultural equipment offers them; on the other hand, manufacturers need to take a farmer’s perspective when developing and marketing products.
3. Especially in very traditional areas, farmers need to be assisted concerning the most appropriate equipment for their needs and their production methods.
4. The working group acknowledged that a critical mass is needed as an incentive to manufacturers to install the necessary infrastructure and capacity to develop, produce, market and sell equipment.
5. Lastly, it was pointed out that there is still an urgent need to define and select the truly acceptable technologies.

As a way forward, the working group resolved that a more intensive exchange of information between stakeholders is necessary, including the need to know more about the performance of equipment. Manufacturers need to provide tangible information for the end user in order to make an informed choice on appropriate equipment.

The working group recommended that manufacturers should more often be involved in the demonstration and promotion of equipment, as they had been for this Workshop. Furthermore, stakeholders should jointly assess the needs of farming systems before the introduction of new technologies.

Manufacturers also need to take into account that they should only produce equipment that matches the financial capacity of the customers. In this context, accessible maintenance and repair services must be planned for and provided.

4.5 CLOSING CEREMONY

CLOSING SPEECH BY THE GUEST OF HONOUR
Dr Olaho Mukani
Director of Animal Resources, MAAIF
Representing the Permanent Secretary of Agriculture

Distinguished delegates
Workshop conveners
Dear Participants
Ladies and Gentlemen,

I am greatly honoured to officiate at the closing of this very important International Workshop on Animal Traction and Conservation Agriculture, with emphasis on their contribution to the Modernisation of Agriculture. As I am made to understand, this is the first workshop combining the initiatives of the Animal Traction Network for Eastern and Southern Africa (ATNESA) with those of the Africa Conservation Tillage network (ACT).

I am happy to note that the participants to this workshop have been drawn from no less than 16 countries of the world covering the five continents. The participants do not only come from different countries but also from many different institutions and disciplines, with strong participation from the private sector. This multi-disciplinary participation is most welcome because it has provided a wider base for sharing experience and knowledge that will contribute to government efforts to modernize agriculture.

To our visitors from outside Uganda, it is my sincere hope that the field tour you had on Wednesday exposed you to Uganda’s countryside and our efforts to promote animal traction and
Conservation Agriculture. The contacts you have established should now lay the foundation for future collaboration and networking.

The quality papers presented, and discussions that followed, have given participants a deeper understanding of the new concepts of Conservation Agriculture and broadened our knowledge on the diversified uses of animal traction technologies. In this context, I wish to thank the Brazilians, South Africans, Zimbabweans, Ghanaians, Kenyans, Ugandans, NGOs and SAIMMCO who brought equipment for display and demonstration. Special thanks go to FAO, GTZ, UNIDO, ATNESA and ACT for facilitating the workshop and enabling the equipment to be brought to Uganda. I am particularly happy to note that some equipment will remain in Uganda and will provide “engineering germplasm” for Conservation Agriculture here.

Finally, I am happy that the Uganda Network for Animal Traction and Conservation Agriculture (UNATCA) has been formed, and I am going to launch it shortly. The establishment of UNATCA is the product of the long collaboration with ATNESA. I am convinced that the existence of UNATCA will now promote networking with similar associations within Africa and beyond for mutual benefit.

In conclusion I must thank FAO, GTZ, ACT, NGOs, ATNESA, all participants and the National Organising Committee for the job well done.

I now have great pleasure in declaring UNATCA LAUNCHED and the International Workshop CLOSED. I wish all the participants and invited guests a safe journey back to their countries and institutions.
5. Appendices

5.1 WORKSHOP PROGRAMME

<table>
<thead>
<tr>
<th>TIME</th>
<th>ACTIVITY/PRESENTATION</th>
<th>CHAIR PERSONS</th>
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<tbody>
<tr>
<td></td>
<td>Setting up posters and exhibits (continues all day)</td>
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<tr>
<td>12:00</td>
<td>Registration desk opens and continues till 18:30</td>
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DAY 1: Monday 20th May, 2002

SESSION 1 WORKSHOP INTRODUCTION MACBETH JAMES

08:30 Registration of participants continues
09:00 Outline of workshop objectives and introduction of participants, by W. Odogola, Workshop Co-ordinator.
09:30 Tea break

SESSION 2 KEY NOTE PAPERS/ OFFICIAL OPENING J J OTIM

10:00 Guest of Honour, Hon. Minister of State for Agriculture Animal Industry and Fisheries arrives F Byaruhanga
10:05 Guest of Honour tours exhibits/Poster viewing
10:45 Welcome remarks by Chairman of the Organizing Committee.
11:00 Key note paper: Overview of Animal Traction & Rural Transport in Development: The Case of Africa by P. Starkey and P. Kaumbutho
11:30 Key note paper: Overview of Conservation Agriculture in Development: The Case of Africa, M. Bwalya and T.Friedrich
12:00 Official remarks by the Director General, NARO
12:10 Official remarks by the FAOR
12:20 Official Opening of the Workshop by Guest of Honour, Minister of State for Agriculture Animal Industry and Fisheries F. BYARUHANGA
13:00 Lunch Break

SESSION 3 EQUIPMENT FOR CONSERVATION AGRICULTURE RICHARD SHETTO

14:00 Equipment for conservation agriculture: General status and trends, by Isaiah Nyagumbo
14:20 Small-holder equipment for conservation agriculture, by Fatima Ribeiro
14:40 Equipment for large scale conservation agriculture: status and trends, by Peter Hickman.
15:00 Manufacturing of farm equipment, marketing and provision of back-up services by V. Naik and T. Rowland.
15:10 DISCUSSION

SESSION 4 MACHINERY EXHIBITION T. FRIEDRICH

15:30 Introduction to Exhibition and field demonstration/Refreshment at the Show ground.
Visits Exhibition/demonstration/
DAY 2: Tuesday 21st May 2002
SESSION 5   ANIMAL TRACTION IN THE CONTEXT OF CONSERVATION AGRICULTURE  ALUMA JOHN 08:30  Animal a source of power (Husbandry issues), by A. Pearson and T Krecek. 08:50  Integration of livestock in conservation agriculture by C Ebong and D Smith 09:10  Animal power use in rural and peri urban transport, by T Simalenga and P Kaumbutho 09:30  DISCUSSION 10:30  Tea Break 11:00  Sustainable input supply services for animal traction and conservation

SESSION 6   POLICY ISSUES ON ANIMAL TRACTION AND CONSERVATION AGRICULTURE  J.O.Y. OMODING 13:30  11:00 Sustainable input supply services for animal traction and conservation agriculture - policy issues by J. Ashburner 11:20  The benefits of a liberalized and decentralized development model: Experiences from Uganda by Wagaba 11:40  Approaches for building farmers’ management skills in animal traction and conservation agriculture use J. Oryokot and A Foster 12:00  DISCUSSION 13:00  Lunch Break

SESSION 7   EMERGING ISSUES  MODERATOR 14:00  PLENARY DISCUSSION AND INTRODUCTION TO GROUP WORK 14:30  GROUP DISCUSSION ON EMERGING ISSUES 16:15  Tea break 16:45  GROUP PRESENTATIONS 17:45  Field day guidelines

Evening  Informal presentations (videos, etc....)
DAY 3: Wednesday 22nd May 2002
8:00  Field Visits  Evening Workshop Dinner

DAY 4: Thursday 23rd May 2002
SESSION 8   ENTREPRENEURSHIP DEVELOPMENT IN MANUFACTURING, MARKETING AND SERVICE PROVISION  T. SIMALENGA 08:30  Entrepreneurship and micro-enterprise development for animal traction and conservation agriculture by I Sakala and P Stevens 08:50  Empowering rural and peri-urban artisans, Ugandan case study by J. K. Byaruhanga. 09:10  Elements for conducive environment for internationally operating implement manufacturers and suppliers by Andre Verardi 09:30  Discussion 09:50  Posters and exhibition 10:10  Tea break

SESSION 9   ORGANISATION OF MACHINERY USE AND SERVICES AND MICRO-FINANCE  T SIMALENGA 11:00  Multi-farm use options for enhanced farmer accessibility to machinery and services by H Loos
11:20 Multi-farm use South African experience Kathu
11:40 Manufacture of farm equipment, marketing and provision of backup services, by Asubo Makarios
12:00 Experiences with micro-finance in promoting AT and CA: opportunities and bottlenecks B Wanzira
12:20 DISCUSSION
13:00 Lunch Break
14:00 Group Discussion
15:30 Break
16:00 Presentation of group work
17:00 Synthesis of issues from Tuesday to Thursday

Evening Informal presentations (videos, etc....)

DAY 5: Friday 24th May 2002

SESSION 10 WORKSHOP SYNTHESIS AND ACTION PLANS JAMES MACBETH
08:30 Propose elements that contribute to modernising agriculture in the region using AT and CA MODERATOR
10:30 Tea break
11:00 Apply the proposed elements to the specific case of Uganda
13:00 Workshop Synthesis
13:30 Workshop evaluation;
Launching of UNATCA and official closing of Workshop
14:00 Lunch
Departure of participants
Editorial Committee commences Report and Proceedings
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5.3 WORKSHOP EVALUATION

An evaluation of the Workshop was undertaken on the last day; participants were requested to mark their evaluation on flip-chart sheets. The results concerning how well the Workshop met its objectives are laid out below.

The relevance of the nine different issues discussed during the Workshop was judged as indicated below. It will be noted that the central themes of the workshop “Equipment” and “The Role of AT in CA” were deemed highly relevant.

Overall organisation of the Workshop was also evaluated, with very satisfactory results. The transport arrangements, in particular, were much appreciated.
There followed an in-depth questionnaire, including thirty questions regarding the individual papers, the group discussions, field trips and again an overall view of the workshop and its organisation. The following chart illustrates the replies, all aspects being judged either useful or very useful.