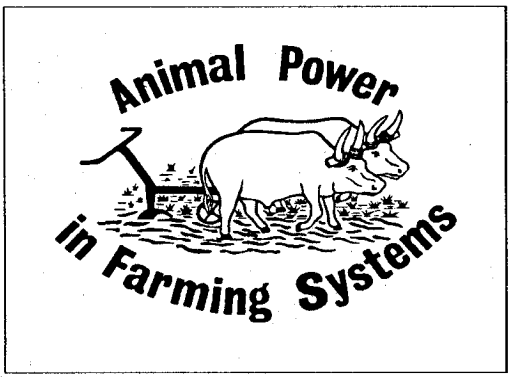
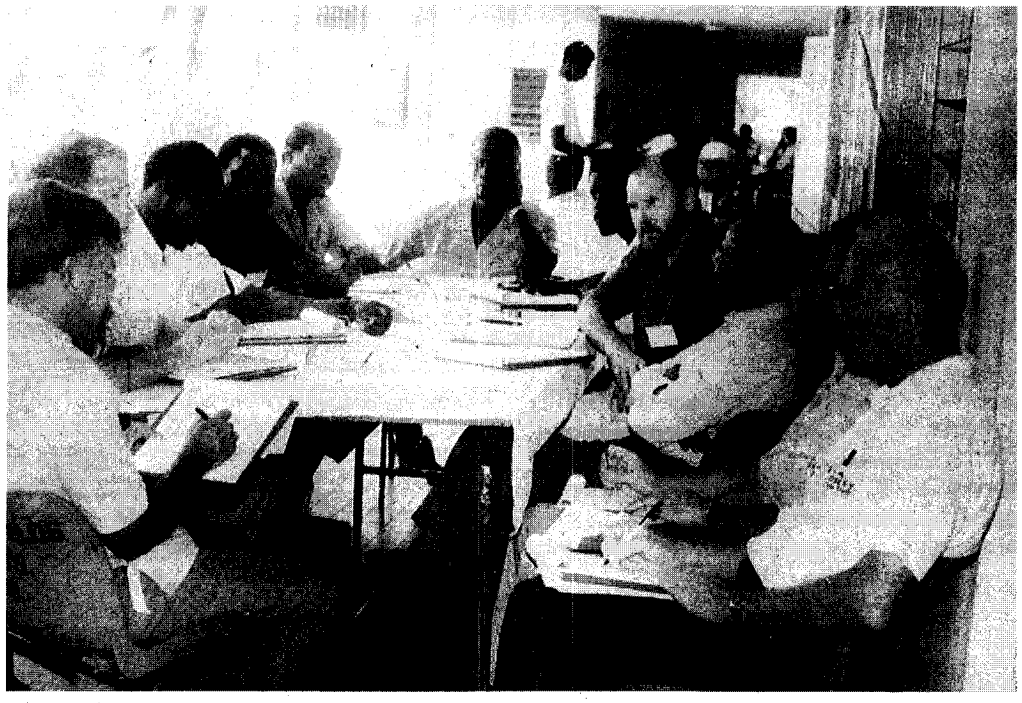


The Discussion Groups



Soil conservation and tillage: the role of animal traction in establishing permanent cropping systems

Group chairman: R. Mungroop
Rapporteur: M. Klaij
Group participants: A. Conteh, M. Forster, H. Freeman, R. Gifford, M. Jambawai, S. Jarju, N. Jezzard, A. Kamara, B. Mansaray.

General

The subject is wide and site-specific but generalizations can be made. Developing bush into permanent cultivation systems involves soil and water conservation considerations at all stages of the process. The golden rule of soil conservation is to keep maximum soil cover, both in terms of time and space. Erosion starts with the impact of individual raindrops. These disperse soil particles which then block the larger pores in the soil, so that infiltration rates are reduced considerably.

There will be times where crop cover is minimal or absent and the extent to which this happens depends on the cropping systems and the technology level used. It is then that land formation and proper tillage methods play a decisive role in conserving soils. Environmental conditions vary greatly and each site will need a specific set of cultural measures to be taken. Soil management, soil tillage and cropping systems are interrelated and all together serve one aim: economic production whilst maintaining the productive potential of the resource base. Animal traction and appropriate implements can be employed for several soil conservation measures.

Land clearing

The slash and burning method of clearing small areas is relatively safe compared to the mechanized clearing. In the latter system, the heavy equipment used can compact the soil over large areas. Infiltration capacity is then reduced and root growth is affected, which can lead to irreparable damage due to soil erosion. Brushing, felling, burning, destumping and raking have to be done. There is some potential for using animal power in conjunction with ropes and pulleys to assist with the felling and logging of trees during land clearance. There is greater potential for using animals for raking up of residues, an operation performed during the establishment of the farm of the ICRISAT Sahelian Centre in Niger.

Land formation

Terracing, levelling, bunding, and contour tillage were discussed. The diversity of ecological zones, slope, slope length, and the envisaged cropping technology determine which land formation type to apply. Very clearly there is great potential for use of animal traction and equipment to reduce the drudgery of hand labour in moving soil. Animal-drawn scoops, levellers, bundformers and an vast range of tillage equipment are currently being used in many parts of the world, and this is an area where animals can be used most effectively.

Cropping system

Maximum crop cover, in terms of time and space, can often be best achieved by mixed cropping. Intercropping and alley cropping have potential in farming systems using draft animal power. Cover crops can also be established using animal traction.

Conservation tillage

Conservation tillage is based on the central theme of keeping the soil in place so that it is not moved by wind or water. Crop cover and use of crop residues are important in achieving this. Animal traction has great potential not only because it substitutes hand labour but

also because many operations can be accomplished more quickly and therefore with greater timeliness. The ways and means to achieve this are again site-specific, and depend on cropping systems. Techniques for using animal traction and equipment need to be adapted to the cropping system, and *vice versa.* The cropping practices discussed included sowing, weeding and crop protection. Weeding deserves particular attention. Expansion of the sown area (associated with animal traction) leads to severe labour bottlenecks at weeding, particularly for the women, on whom this workload generally falls. Consequently weeding is often insufficient and untimely, and this results in considerable reductions in crop yields, compared with the potential yields. Proper combinations of tillage methods, row spacings and weeding equipment need to be selected. Weed control requires year-round effort to ensure that noxious weeds are not allowed to shed seed, as this leads to a build-up in weed populations over the years.

The option to use chemicals for crop protection is mainly important for (so-called) cash crops, such as cotton, groundnuts, cowpeas and some plantation crops. The use of animal traction for applying such chemicals appears limited.

Research needs and recommendations

- Much information is available on animal traction techniques and equipment, but most of this is found in various publications produced by international institutions and donor agencies. Several of these publications need updating and all need a wider circulation by the international community.
- Adaptive research, which is site-specific, needs to be done at a national level. Such research must involve the target group, in other word those farmers who are the end-users of the system.
- Local training programmes exist, but they may need to be expanded and intensified.
- Workshops, such as this networkshop or ICRISAT roving workshops, provide an excellent way of exchanging information on a personal basis, and this can often lead to further collaboration and joint action.

Discussion points

Many questions and comments expressed the concern and belief that tillage invariably leads to soil erosion and degradation, particularly tillage in dry soils. It was felt that tillage using animal traction *may* lead to soil degradation, but that with the careful selection of conservation tillage methods, soil productivity *can* be maintained at high production levels. The actual methods to use depend on each site and points to consider include the rainfall amount and intensity, the soil type, slope and the cropping system.

The subject of tied ridging was raised. Research trials had shown that in the semi-arid areas tied ridging can raise yields. Tied ridging is labour-intensive, but animals can be used effectively. Research on equipment and techniques for animal-powered ridging tying was being undertaken by ICRISAT and IITA/SAFGRAD, but it was too early to say whether the farmers would feel the enhanced yields would justify the extra work required to achieve them.

There were questions about terracing. While some participants thought it to be too labour-intensive for many applications, others thought that this problem could be overcome using animal power and appropriate implements.

It was noted that soil conservation techniques such as terracing and bunding often require considerable farmer cooperation. Examples of communal cooperation for terrace construction in Latin America were cited, as were the watershed committees formed in The Gambia.

The significant social implications of such co-operation were noted.

The need for integrating agriculture with animal husbandry was discussed in relation to the common observation that animals are often weakest at the time they have to perform most work. It was thought that, by planting forage plants or trees on slopes or areas likely to erode, farmers can both conserve their land and improve the condition of their animals.

The problem of destumping was raised, and it was wondered whether chemicals could be effectively used to speed up the decomposition of roots.

It was concluded that emphasis in research and extension should be on means of avoiding erosion, as prevention was both cheaper and easier than the measures needed to cure eroded landscapes.

The selection and development of animal-drawn equipment

Group chairman: G. Le Thiec
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Group participants: L. Afantonou, W. Boie, E. Busquets, A. Diallo, S. Harouna, S. Hooke, R. Imboden, E. Koroma.

Context

Animal-drawn implements cannot be considered in isolation from crop production systems. For any particular region, crop or soil type it is essential to take into account operational requirements for agronomic and soil management practices.

Use of available designs

When selecting implements for testing, the potential of implements currently used by farmers should be evaluated. Only if locally available equipment fails to meet the needs, should new designs be introduced.

Evaluation of simple equipment

It is desirable to study the potential in West Africa for the simple wooden implements widely used in Ethiopia and southern Asia. They are made largely from wood, and could be made and maintained at low cost by local artisans with little upgrading of existing skills and facilities.

Use of wooden implements

While some group members favoured the development of wooden implements in West Africa, others felt that this would put further deforestation pressure on the precarious ecological balance of the Sahel.

A checklist of equipment selection criteria

- Available animals (species/breed, size/weight, pulling capacity).
- Soil type.
- Existing farming practices and cropping systems.
- Typical farm size.
- Equipment ownership patterns (individual/collective).
- Range of operations required and potential use of equipment during the season/year.
- Technical level of intended users and possible needs for training.
- Existing equipment.
- Existing manufacturing techniques used by local artisans or workshops.
- Possibilities for further developments (e.g. other parts/attachments) to achieve greater working capacity and additional applications.
- Financial conditions of farmers (yields, cash flows, profitability, credit worthiness, financial management abilities).
- Possibilities for renting out equipment to generate additional farmer income.
- Cost and availability of raw materials for fabrication.

Methodological stages for testing, evaluating and promoting equipment

1. Identification of needs: study of the farming system in which equipment will be used, and context of work for which it will be selected or developed.
2. Operational requirements: definition of exactly what the equipment is required to do.

3. Specifications: clear listing of weight, draft, size, working width (requirements, limits), affordable costs, technical level of users, maintenance requirements, working life.
4. Study of options: review of available equipment (locally or from other countries) that meets specified requirements. If none available development of new prototype or adaptation.
5. On-station testing and evaluation of selected design.
6. On-farm testing and evaluation with farmers.
7. Standardization of appropriate design, with formal drawings.
8. Small batch production and distribution to farmers.
9. Further on-farm evaluation with farmers to establish durability and suitability.
10. Economic studies and assessment.
11. Large scale production and extension.

In recognition of the diversity of conditions this checklist was made general to allow widespread applicability in different regions and countries. The pattern can be made more specific as details become known, and networking activities are implemented.

Networking initiatives

Synthesis and exchange of technical information. There is a need for greater information exchange. One practical way of achieving this would be to synthesize existing knowledge on different forms of equipment used in various countries and make it available to researchers and manufacturers in cooperating countries. This work might be carried out by consultants who could visit different countries to gather information on technical specifications, test results, conditions of use (soils, agronomic conditions), potential for further improvements and the costs of equipment available within West Africa.

Once this information is available and has been circulated to national research and development programmes and manufacturers in each country, these organizations will be in a position to assess their own requirements and specific requests for network cooperation are likely to emerge.

A regional meeting of experts involved in farm equipment development and representatives of manufacturers would promote linkages, and its organization should be considered as a specific networking activity.

Discussion points

Experience of the Asian Regional Network on Agricultural Machinery (RNAM) was cited indicating that initially there had been great interest in prototype exchanges between the countries. However it became apparent that most prototypes were simply the result of on-station development that had little relevance to the farmers. Thus it became network policy only to exchange equipment designs that had been proven by farmer use, that were being commercially manufactured and which farmers were buying. It was also noted that it was often more instructive to arrange professional visits to a country with a potentially useful design, rather than send out an implement which might be received without knowledge of its background and context.

The fact that most West African countries have their own factories was noted and the importance of developing complementarity and cooperation was considered a vital and necessary network initiative. This could start with a regional meeting of manufacturers and agricultural professionals.

There was no consensus reached on the relative advantages and disadvantages of wood implements. While wood was not always readily available or cheap in the Sahel, the ability of wooden implements to be made and maintained by village artisans in Ethiopia and Asia

indicated potential durability and sustainability.

There was seen to be a need to strike a balance between the "engineer"-orientated approach that good designs can be produced and perfected on-station and the approach of "the farmer knows best". The former can lead to the production of technically good but economically or socially inappropriate designs, while the latter neglects the historically proven importance of persuasion and even salesmanship in the promotion of innovations. The value of private sector initiatives in designing and promoting equipment was stressed. However it was recognized that for reasons of social and political balance, rural development initiatives such as animal traction equipment development could not be left entirely to the private sector. The exact relationship between extension workers, government research stations and the private sector in terms of equipment promotion and subsidies could be a matter of sensitivity and controversy.

Animal management and health

Group chairman: K. Apetofia
Rapporteur: S. Ravindran
Group participants: W. McKinlay, S. Adeoye, A. Mansaray, M. Sesay, A. Kamara.

Introduction

It was the general feeling of the group that although the animal is, by definition, the key component of animal traction research and extension programmes, it is usually given very little importance. In general there is more emphasis on equipment, agronomic practices or socio-economic factors than on the animals themselves. This is probably due to the small number of veterinarians or animal scientists associated with such programmes.

The methodology adopted by the work group was to first identify some of the problems relating to animal management and health. Then some possible solutions, both at village and national level, were discussed. Finally some research priorities and needs for improved documentation and communication were identified.

Identification of animal health and management problems

The group noted that some of the major diseases of draft animals known to occur in West Africa were rinderpest, contagious bovine pleuropneumonia, black quarter, trypanosomiasis, external and internal parasites, footrot and deficiency diseases caused by nutritional shortages of key minerals. Although most of these diseases are common to other ruminants in West Africa it was considered that draft animals might be particularly at risk. This was because it was assumed that work stress may interfere with the immune system of draft animals, so that disease prevention and control for work animals are vital.

In most countries, animal traction projects emphasize the spread of work oxen technology to farmers without due consideration of the disease situation or the availability and quality of feeds and fodder in the prevailing farming systems. The manpower of the animal traction projects, especially at the senior technical level, is also grossly inadequate to monitor and service the needs of farmers relating to animal health and management.

The group highlighted the weak linkages between animal traction projects, veterinary departments and those concerned with extension in the field of animal husbandry. This in the past has resulted in the poor management of draft animals at village level, resulting in low work output and even deaths. It was noted that vaccinations against contagious and communicable diseases were often not practised on a regular basis due to shortages of supplies, and this could have catastrophic results.

Possible solutions at village level

The group felt that most of the problems in animal health originate from the poor sanitary conditions under which most cattle are maintained overnight. Therefore there is a need to improve the sanitary practices, especially the removal of animal dung or bedding on a daily basis, in order to reduce the populations of flies. The dung so removed can be utilized for making compost, and this is an area requiring extension advice and farmer training.

Local remedies at present used by farmers for controlling fly attack include the application of vegetable and mineral oils on the skin. These appear to give varying results. The use of a mixture of salt and wood ash in water as a remedy for ticks has been in existence in villages now for a long time. In the absence of veterinary services offering alternative solutions which are affordable by the farmers, the use of such local remedies may be encouraged.

The mineral deficiencies noticed among the work oxen in the region might be reduced if leguminous plants were to be intercropped in areas where animals graze. Provision of crop residues like groundnut hay and other leguminous hays can provide specific minerals as well as improve the overall nutritional status of the work animals. However the provision of mineral licks may be a superior solution, especially in areas of high deficiency.

Some solutions at national level

Before the utilization of animal traction technology is intensified it would seem advisable to conduct disease surveys to identify potential constraints. In those West African countries where this has not been carried out, special emphasis should be placed on defining the importance of trypanosomiasis and its vector the tsetse fly. In tsetse-infested areas, it is recommended that only trypanotolerant cattle should be promoted by animal traction programmes.

The veterinary laboratory facilities existing in most of West Africa are inadequate. It is therefore advisable to set up small veterinary diagnostic facilities in association with animal traction programmes, in order to diagnose and treat the diseases that are of special importance to draft animals. Where there is not already a major contribution from animal scientists, animal traction projects may need more technical supervision and guidance from specialists in animal health and management. Animal traction projects should be upgraded into permanent divisions or departments within the relevant agriculture ministry, to ensure long-term commitment to animal traction.

Tethering systems of animal grazing can be practised in villages to prevent crop destruction, but these are only really satisfactory if they involve improved pastures. Therefore improvements in the status and management of communal (or private) pasture land should be given priority within national animal traction programmes.

The use of cows for draft work in villages should be encouraged as it may become an important solution to the problem of obtaining and replacing animals for traction. However this should only be recommended for areas where good husbandry and management systems already exist.

Farmer instruction relating to animal traction should not simply deal with animal training and the use of equipment. The husbandry and management of work animals should be more strongly emphasized.

Research needs

- The nutritional requirement of work animals, both males and females, for varying levels of work output and in both tsetse-infested and tsetse-free zones is a subject of top research priority.
- Research on the utilization of cows as draft animals should be intensified.
- Quantitative and qualitative research on carcase and meat characteristics of draft animals may be necessary, since an increasing proportion of the beef consumed in West Africa is likely to originate from draft animals.
- Investigations into the usage of local remedies and indigenous herbal medicines for working animals should be continued.

Documentation and communication

An animal traction network should assist national programmes by identifying all current research programmes in the region that are involved with work relating to draft animals. A directory and bibliography relating to current and past draft animal research in West Africa should be produced and circulated by the Network committee.

To facilitate the exchange of information and ensure requests for information reach appropriate people, points of contact should be defined or established in every country (or

even within provinces, districts or projects if their size and activities warrant this).

Subject matter specialists working on animal traction should participate in exchange visits with their colleagues in the region, to facilitate the exchange of ideas, information and experiences.

There is a need for a quarterly or biannual newsletter to be published covering all aspects of animal traction in the Network area.

Discussion points

It was noted that there was very little information available on the use of donkeys or mules. Donkeys could be particularly important for assisting women in their work. This was an area requiring research and information exchange.

The disease problems of moving animals from one area to another were stressed. Examples were cited from Sierra Leone, Burkina Faso and Senegal of disease problems that followed the purchase of animals from other areas.

The need for *simple* methods of improving the nutrition and health status of animals was stressed. Crop residues seemed particularly appropriate. The importance of small quantities of nitrogen was noted, and this could come from legumes or even from urea, which is relatively cheap and available. Work by ILCA Nigeria on alley cropping and the development of forage banks was cited.

Some details were given of ILCA's work on the nutrition of draft animals in Ethiopia. In various trials it was noted that the smaller, local cattle needed less water, had a greater ability to digest local pasture and had fewer health problems than the larger crossbred animals. In general working animals could not eat enough poor quality diet (such as that of local pastures) to replace their energy requirements and so lost weight. Wherever practical, work animals should be brought into condition before the time they are required to work, to allow such weight loss from a position of strength. However, in one trial working animals continued to work well for several months, despite losing weight, indicating that cattle can be very resilient in the face of poor nutrition.

Research and evaluation methodologies for animal traction programmes

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General

Both research and evaluation studies relating to animal traction need a comprehensive approach to the whole farming system. Farming systems involve many interacting components and therefore require some form of global view and overall analysis.

There is a need to study and measure the impact of animal traction technology. One clear, overall measure seems to be the rate of adoption of a technology.

While economics are clearly important, there is a danger when too much emphasis is placed on economic issues at the expense of social effects. There should be some means of assessing social values such as prestige and status, which have a large influence on determining what technology is purchased. Oversimplified input-output statements should be avoided; for example, it is inappropriate to make generalizations concerning the ratio of oxen to land area, unless the crops and the intensity of cropping are clearly specified.

There is a need for some standardization of methodology; for example certain defined categories of measurements or data collection should be adopted by different research programmes to facilitate cooperation between programmes. Such common data sets could arise from group reviews of the results of various existing methodologies.

Recommendations

1. Guidelines for the comprehensive analysis of animal traction information based on farming system strategies need to be developed. Within this context the use of common data sets should be encouraged.

2. Experimental treatments should be arranged to ascertain the relative performance of animal traction practices with other agronomic interventions, and particular importance should be placed on defining and measuring the *interactions* between the various components.

3. At all level of experimentation, and *in every year* of an animal traction research programme, representative sub-sets of experimental treatments should be performed:
   - on-station at an operation level
   - on-station at a disciplinary level
   - on-farm, researcher managed
   - on-farm, farmer managed

   Thus on-station research should be replicated on typical farmers' fields at an early stage.

4. When planning or evaluating research, it is important to take into consideration the long learning periods associated with farmer adoption of animal traction technologies. Slow initial uptake does not necessarily mean that a technology is inappropriate.

5. Methodologies and research activities should be discussed and reviewed by colleagues in several disciplines. Such group reviews should be regarded as an important component of animal traction workshops, and should enhance the quality of research activities within the countries of the animal traction network. Such cooperation should lead to the development of a more professional approach to animal traction research.

Discussion points

Animal traction research must be orientated towards the farmers, and be appropriate to the farming systems. Farmers' ideas should be sought out, but this should not be taken to imply that all innovative ideas have to originate from the farmers themselves.

It is particularly important that research be carried out at the same time on-farm and on-station. Many animal traction research programmes have presented technology to the farmers only after several years of on-station development, and have been disappointed because technology proved inappropriate to the different conditions and practices of the farmers' fields. Similarly on-station replications may help in the interpretation of on-farm trial results.

More work is needed on methodologies for socio-economic studies. It might be useful if the Network could assist in the preparation of guidelines for such studies.

While standardized data sets may be desirable, there is a danger in attempting to standardize, since local conditions are so variable that comparisons may become meaningless. Even within countries, an economic index such as the opportunity cost of a person's time varies enormously between locations and seasons, and between different gender and age groups. While there is much to be gained from information exchange between countries, it may be dangerous to try to make direct comparisons of the data from different locations.

Research and evaluation studies should take more note of the needs of development planners. This may mean the scope of the work, or simply its reporting, may have to be broadened to allow it to be more effectively used in determining national policies. While farmers are the ultimate end-users of research results, it is development planners that determine the policies that greatly influence whether or not a technology succeeds.

Social and economic aspects of animal traction use

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Group participants: F. Ndiamé, S. Poats, M. Sangaré, Y. Schwartz.

Low profitability

In general animal traction is insufficiently profitable to justify commercially orientated loans from banks and projects. The relationship between the costs of the inputs (equipment and animals) and those of the outputs (crop produce for sale) is usually unfavourable from the point of view of the farmer. Possible remedies for this problem include:

- Lower the price of inputs required to start animal traction.
- Increase the prices paid for farm produce.
- Modify the conditions governing loans, perhaps with credit subsidies.
- Improve farmer training to ensure farmers master the technology quickly and so gain full benefits from animal traction from the first year.

Cash-crop orientation

Since the input costs of animal traction are high, relative to the outputs, animal traction generally has to be promoted in connection with the more profitable "cash crops". This can lead to an *economically* acceptable balance of inputs and outputs, but one usually based on relatively *high-cost* inputs and outputs. An equilibrium based on a lower level of inputs would often be preferable. In order to achieve this, programmes might:

- Analyse the relative importance of the technical qualities of implements and the need for low costs.
- Clearly define the maximum cost of equipment that would be appropriate to the target groups. If high cost equipment does not appear to be economically feasible, then *affordable* implements should be promoted, even if they have a lower technical specification than more expensive alternatives.
- Define development strategies based on the low cost implements suitable for low-input, low-output farming systems, in order that the technology is not restricted to richer farmers.

Credit systems

Credit systems are seldom adapted to the needs of animal traction farmers. The adoption of animal traction is a long-term investment; which is often only profitable if the costs are spread over many years. This implies:

- Credit conditions relating to animal traction must be appropriate to the technology. This may imply longer periods before the first repayment is due, and longer overall loan periods than other loans. To allow this, interest rates may need to be subsidized.
- Alternative systems to allow farmers to obtain credit may be necessary. For example instead of concentrating on individual loans, credit might be provided to associations of farmers.

Extensification

The adoption of animal traction tends to lead to *extensification*, i.e. the cultivation of larger areas of land, rather than leading to the more *intensive* use of existing land. Insufficient attention has been given to techniques that can lead to more intensive production systems. This implies:

- Options for *intensifying* production with animal traction should be studied to determine the most profitable systems. This may require linear programming techniques.
- There should be promotion of operations and techniques (such as weeding) that encourage intensification of cropping, and not

simply operations (such as plowing) that may only lead to the extensification of the farms.

Multipurpose implements

Multipurpose implements that are expensive have often been promoted, but the utilization of the multipurpose functions has been disappointing. Most have only been used for primary cultivation, and single purpose implements for this are cheaper and simpler. Farmers have thus often had to repay large loans for multipurpose equipment even though the relatively high price of these has not been justified by the operations actually performed. This suggests:

- More emphasis should be placed on equipment that is cheap and simple, even if this implies single purpose implements.
- Where multipurpose implements have been promoted, more emphasis should be placed on farmer training to stimulate the multipurpose use of the implements.

Animal traction as an element in the farming system

Frequently, insufficient attention is given to the fact that animal traction is only one element among many within complex farming systems. The different elements are mutually dependent on each other, and the interactions need to be fully appreciated. The implications of this are:

- Animal traction activities should be coordinated with other development initiatives in an integrated, multidisciplinary way.
- In-depth, multidisciplinary surveys with a socio-economic component should be carried out prior to, and during, animal traction development initiatives. Such base-line surveys are essential to ensure the development programme is appropriate and orientated to the farming system, and, by continuing such surveys, feedback can be obtained as to the impact of the programme on all aspects of the farming system.

Non-economic factors influencing animal traction

The acceptance and adoption of animal traction do not only depend on economic factors. Social considerations such as enhanced (or diminished) status, traditional gender roles, or changes in the drudgery connected with work can all determine whether or not animal traction is desirable. The implications of this include:

- Socio-economic studies should accompany animal traction programmes from the outset. These should include information on decision-making processes, and any effects animal traction has on the role of different social groups (women, children, hired labour), wealth distribution and attitudes. Reasons for the acceptance or rejection of various parts of the programme should be used for determining the future direction of the animal traction initiatives.

Definition of target groups for animal traction programmes

Animal traction programmes do not always have a clear idea as to the type of farm or farming family for whom the technology is intended. Within any area there are large differences between the sizes of farms, the numbers of people in farming households and the type of people who make key decisions. It is not realistic to expect all types of farm to adopt animal traction at the same time. The implications of this are:

- Animal traction programmes should study the various farm types in an area, clearly define their target groups and choose an approach that is appropriate for this group. This implies that the services of a sociologist are required at an early stage in any programme.

Specific recommendations

Social scientists should be more actively involved in animal traction programmes in order to identify the target groups, the financial implications of the technology and its social effects.

Social scientists should work more closely with colleagues in the more technical disciplines, such as agricultural engineering and animal science. This is particularly important in order to ensure that promoted technology is fully adapted to the social, economic and cultural realities of the target groups and their farming systems.

Credit programmes for animal traction need to be more flexible and more tailored to the particular and long-term nature of such investments. Alternative systems for providing credit should be more fully investigated.

Social scientists should have a more active role at both national and project level in suggesting or determining appropriate policies relating to animal traction, such as those relating to prices, credit and subsidies.

More effective exchange of information between the different countries in the region is essential to accelerate progress in developing and spreading appropriate and acceptable animal traction technologies.

Discussion points

Some of the components that lead to profitable use of animal traction were discussed. The difficulty in defining profitability was highlighted, particularly since animal traction may persist and spread even in areas where it appears to be intrinsically unprofitable. This may be associated with social benefits, such as reduction in drudgery, or hidden economic benefits, such as more profitable use of a farmer's time. Similarly there are hidden economic and social costs relating to animal traction, including the element of risk.

The potential profit that comes from resale of animals was highlighted, as was the associated need to provide some form of insurance for expensive draft animals, particularly those bought on credit. Underutilization of animals was a problem since the costs of maintaining animals had to be spread over a small number of operations. To solve this might require greater understanding of the links between the different components of the farming systems: for example improved marketing of produce through the use of animal transport.

The problems of emphasizing cash crops at the expense of staple food crops were discussed, but it was recognized that the families of farmers in areas where cash crops (such as cotton) were promoted often had standards of living above those of areas producing less marketable crops.

It was stressed that more attention needed to be paid to the clients of animal traction technology, rather than simply to the technology itself. A client-orientated approach would imply more emphasis on the social and economic realities of the farming systems and this should lead to more appropriate implements, credit packages and extension advice being offered.

Farmer needs for extension and training

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Group participants: A. Bangura, B. Kouadio, P. Lekezime, S. Ouedraogo, A. Schumacher, D. Zerbo.

Introduction

The group underlined the critical importance of a comprehensive understanding of the rural milieu in which prospective animal traction farmers live and work. It was also recognized that individual farmers have different training needs. The group decided to identify those training topics which new, inexperienced adopters of animal traction might need. These were classified in five main groups: animals, equipment, land, use of animals on farms, and management. Some suggestions were also given for training strategies, extension services and research and development.

Farmer training topics

Animals

- Selection of suitable animals.
- Nutrition.
- Daily care.
- Animal health: problem of disease and preventive requirements.
- Animal housing and stables.
- Hygiene: stable, food, animals.
- Animal husbandry.

Equipment

- Farmers need to be presented with an overview of what is possible in the area concerned.
- Criteria which determine the appropriateness of each piece of equipment in relation to the local environment.
- Composition of the recommended package.
- Assembling equipment and taking it apart.
- Spare parts, anticipated wear on wearing parts.
- Maintenance, repairs, useable life.
- Accessories and their manufacture, including different sizes of yokes or harnessing systems.

Land

- Presentation of recommended standards for field sizes and total areas suitable for use with draft animals.
- How to define and lay out fields.
- Methods of destumping and land clearing.
- Anti-erosion techniques.

Animal traction techniques

- Training of oxen by the farmers themselves on their farms.
- *Progressive* training programme in undertaking different farming operations using draft animals.
- Agricultural techniques (clearing fields, plowing, cultivation, transport, fertilizer application, forage storage, etc.)

Management

- Planning for the agricultural season, work calendar.
- Standards of management.
- Principles of credit and reimbursement.
- Retiring and replacing animals.
- Financial management of the farm and the importance of savings.

Developing training strategies: points to consider

- Importance of adequate training for trainers.
- Location of farmer training: training centres good for demonstrations, but on-farm training more effective.
- Timing of farmer training: e.g. dry season when farmers not pressed.

- Training in literacy should accompany practical training.
- Technical follow-up, monitoring and evaluation: in this context farmers' associations may be encouraged.

Training recommendations

- Extension agents should have a comprehensive knowledge of the rural environment and the type of farmers found there.
- Training must be highly practical and structured so that topics are covered progressively.
- Permanent systems of technical follow-up and evaluation should be established and should regularly reassess farmers' needs for further training.

Extension services

- A primary role should be to act as a two-way channel to provide feedback.
- Extension services should evaluate and respond to the expressed needs of farmers in order to assure the evolution of the technology, farm profitability and the living standard in farming communities.
- Assist farmers to have access to credit.
- Develop reliable supply systems for farm inputs. This may involve working with local blacksmiths.
- Promote the spirit of on-going training to farmers. This may include the production of documents in the local language and use of audiovisual materials.
- Ensure farmers know how to obtain further information: this may involve developing or strengthening simple communication channels.

Research and development

- Research is an indispensable tool in a development structure.
- An inventory of past research must be made in each area before further research is planned.
- The technologies already available in the rural sector should be used as a basis for further development.

Discussion points

The training of trainers is particularly important. Extension workers should be closely associated with research programmes. Training should be a continuing process, with regular in-service training courses. To ensure good trainers remain in the service, there should be good career structures within extension departments. There should be prospects for professional recognition at all levels, with rewards or incentives (financial or through status) for effective field work.

Farmers can themselves be particularly effective trainers or advocates of a technology. Arranging visits by groups of farmers considering adopting animal traction to nearby farmers already using the technology may be especially useful. Farmers' associations can allow useful contact between farmers themselves and between the associations (or their leaders) and extension services and research workers.

More use should be made of mass media services, notably the radio. Farmers often listen to the radio and farming programmes can have an important impact. The media can also assist in the promotion of technologies among decision-makers. Since decision-makers and those with political power have often been educated in an environment where animal traction was regarded as a backward technology, the importance of convincing the authorities the advantages of animal traction should not be neglected. Indeed it may be vital in order to ensure that national policies are favourable to the development of animal power.