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RATIONAL USE OF RANGELANDS AND DEVELOPMENT OF FODDER CROPS IN AFRICA

**REPORT on the UN-CCD/ILRI Workshop on a Network for
Promotion of Rational Use of Rangelands and Development of
Fodder Crops in the Context of the Regional Action Program to
Combat Desertification in Africa”**

Addis Ababa, Ethiopia

4-7 August 1998

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1- Introduction

The preparation of the Regional Action Programme (RAP) to Combat Desertification was formally launched at the Pan-African Conference on the Implementation of the CCD held in March 1997 in Burkina Faso. The conference adopted the guidelines for the elaboration of the RAP and passed a resolution requesting the CCD Secretariat to organize a series of seven thematic workshops.

Further to the resolution the CCD Secretariat is organizing jointly with the International Livestock Research Institute (ILRI) this regional workshop on a network for promotion of rational use of rangelands and development of fodder crops in the context of the RAP to combat desertification. The workshop was sponsored by IFAD, the Swiss government and the Government of Finland.

The workshop was convened at the International Livestock Research Institute (ILRI) campus in Addis Ababa, Ethiopia, from 4 to 7 August 1998.

About 68 persons participated in the workshop, including representatives of 4 African sub-regional organisations, 20 African specialised institutions, 13 countries, and ILRI and CCD Secretariat (Appendix 1).

Welcoming remarks were made by the Director General of ILRI, Dr. Hank Fitzhugh, who stressed the need for multi and interdisciplinary research networks that will support action programme to combat desertification; Dr **Seyfu Ketema**, the Director General of the Ethiopia Agricultural Research Organisation who said that because problems of natural resources management are experienced in all African countries, there is a need to promote research networks such as that of ILRI in order to solve such problems. Speaking on behalf of the CCD Secretariat, Mr. Claude Mottier pointed out that implementation of the CCD is through action programme at national, sub-regional and regional levels. Seven thematic workshops will be conducted at the regional level to identify the main issues and activities and networks of institutions to implement a regional action programme to combat desertification in Africa.

Dr. Tewolde, the Executive Director of the Environmental Protection Authority of Ethiopia, officially opened the workshop, on behalf of the Government of Ethiopia. He said that desertification is a real issue and affects the majority of the people in Africa, hence the CCD process provides opportunities for emancipation, especially of the poor. Emphasis on combating desertification should be on union or togetherness at local, national and regional level, rather than on financial resources. In Ethiopia the national action program to combat desertification includes rehabilitation of 'lost' environment for future generations.

2- Opening ceremony

Welcome address

Dr Hank Fitzhugh, Director General

International Livestock Research institute (ILRI)

Addis-Ababa, Ethiopia

Excellencies, Distinguished Colleagues,

It is my privilege to welcome you to the International Livestock Research institute, which along with the UN-CCD, is hosting this workshop for the development of the regional action programme to combat desertification in Africa.

Desertification is a problem which is both urgent and serious. Desertification is both a consequence and a cause of the changes in the global environment which have aroused public concerns around the world. Granted these concerns about global change and environmental impacts are real and important. However, the human consequences of desertification in Africa are of even greater importance.

Desertification can mean the irreversible loss of the natural resources required for agriculture and food security. For poor people in regions afflicted by drought and desertification, the consequences of lost agricultural productivity include the crushing effects of poverty and disease.

It is essential that we have a realistic action plan to combat desertification. This action plan will lead policy and development and set the priorities for relevant research.

ILRI is one of 16 centres supported by the Consultative Group for international Agriculture research, a consortium of more than 55 member nations, foundations and donor agencies supporting international

agriculture research to address poverty alleviation, food security and environmental protection. The CGIAR sponsors are the World Bank, FAO, UNDP and UNEP.

ILRI has a global mandate for international livestock research. Our principal activities continue to focus on sub-Saharan Africa. A major ILRI research is development oriented and conducted in collaboration with partners from national and international research organisations. A major research issues are those associated with livestock and environment. These are addressed by interdisciplinary research teams working in the Sahel and the drier areas of eastern Africa. ILRI research spans the spectrum from biological research on cattle, sheep and goats to assessing the social, economic and environmental impact of livestock production to economic analysis providing information for policy makers. During this workshop, my ILRI colleagues will provide more details on our research and related activities which are relevant to development of a regional action programme to combat desertification in Africa.

The challenge you face in the objectives for this workshop is exceedingly important. I am confident that by combining your experience and expertise, you will develop a realistic and effective plan of action to combat desertification.

Welcome and best wishes for success.

Statement from EARO

Dr. Seifu Kalema, Director General

Ethiopia Agricultural Research Organisation (EARO)

Addis-Ababa, Ethiopia

Ladies and gentlemen,
Workshop participants,

It indeed gives me a great pleasure and it is an honour to be with you here on this important workshop.

I am sure that this is an important issue for Africa and it is of particular importance to Ethiopia.

Ethiopia with the rest of Africa faces the problems of

- Population pressure
- Environmental degradation

Also Ethiopia has great interest because it has

- the largest cattle population in Africa
- the largest biodiversity in Africa

Thus, we have both the problem and also the natural resource required to overcome the problem.

My institution is a stage of developing a national research strategy including research in the environment and livestock.

We look forward to the outcome of this workshop, as it will contribute to our efforts to solve agricultural problems of the country.

We believe that we can achieve this by working together with international research institutes such as ILRI with which we had and still have a very positive relations.

In addition we believe that working at the regional level by using all resources available will be useful.

Statement from CCD Secretariat

Mr. Claude Mottier

*Executive secretariat of CCD representative
Geneva, Swinserland*

Excellence Monsieur le représentant du Ministre de l'Environnement,
Monsieur le Directeur général de l'Institut international de Recherche sur l'Elevage,
Mesdames, Messieurs les invités et les participants,

Veillez me permettre d'adresser tout d'abord au nom du Secrétariat de la Convention sur la lutte contre la désertification et tout spécialement du Secrétaire exécutif lui-même, Monsieur Hama Arba Diallo, quelques remerciements.

Nos remerciements, donc, vont tout d'abord au Gouvernement de l'Ethiopie pour son hospitalité et particulièrement à Monsieur le représentant du Ministre de l'Environnement qui a bien voulu honorer de sa présence l'ouverture de notre rencontre.

Notre reconnaissance va en deuxième lieu au Centre international de Recherche sur l'Elevage (ILRI), qui a accepté de participer à la mise sur pied de cet atelier et de l'héberger.

Je me fais également un devoir d'exprimer notre gratitude au Fonds international de Développement agricole ainsi qu'au Gouvernement de la Finlande pour leur précieux appui financier.

Enfin, que les personnes qui ont fait l'effort de se déplacer pour cette séance ainsi que tous les participants à l'atelier sachent que nous leur sommes reconnaissants de l'intérêt qu'ils marquent ainsi à l'endroit de la Convention sur la lutte contre la désertification au-delà du thème à l'ordre du jour de ces quelques journées.

Pour bien situer cet atelier sur les terres de parcours et les cultures fourragères, je rappellerai que la mise en oeuvre de la Convention passe par l'élaboration de programmes d'action à différents niveaux. C'est ainsi que sont préconisés, selon un principe de subsidiarité, des programmes tout d'abord au niveau des Etats touchés par la désertification ou la sécheresse - ce sont les Programmes d'action nationaux-, puis

des programmes, s'agissant de l'Afrique, au niveau des différentes sous-régions distinguées par la Convention -Afrique du Nord, Afrique de l'Ouest, Afrique de l'Est, Afrique australe et Afrique centrale-, et enfin au niveau régional, c'est-à-dire, selon le vocabulaire de la Convention, à celui du continent tout entier.

Revenant à notre atelier, il fait partie intégrante du processus devant conduire à l'élaboration d'un programme d'action au niveau régional.

Le document de référence principal sur lequel se fonde l'élaboration des programmes à tous les niveaux est évidemment la Convention elle-même. Adoptée en juin 1994 et entrée en vigueur en décembre 1996, elle stipule notamment, en son article 11, que *"les pays touchés Parties se consultent et coopèrent pour élaborer ... des programmes d'actions sous-régionaux ou régionaux en vue d'harmoniser, de compléter et de rendre plus efficaces les programmes nationaux"*.

La première consultation entre les pays africains relative à leur programme d'action régional a eu lieu lors de la Conférence panafricaine qui s'est tenue au Burkina Faso en mars 1997. La Résolution no 2 adoptée par les participants à cette conférence invite le Secrétariat intérimaire de la Convention à apporter son appui à l'élaboration d'un programme d'action régional. Quant à la démarche devant conduire à un tel programme, elle est indiquée dans un des documents de travail examinés et adoptés par la Conférence. Cette démarche repose sur la tenue de toute une série d'ateliers thématiques, sept en tout, dont le but est double:

- tout d'abord, faire le point de la situation en ce qui concerne les acquis et les insuffisances dans chacun des domaines retenus, et, à partir de là, repérer dans ces domaines les actions prioritaires devant être envisagées;
- en second lieu, identifier les institutions désireuses et capables d'apporter une contribution de qualité à la conception et à la mise en oeuvre des actions qui auront été décidées.

En d'autres termes, ces ateliers devraient servir à définir l'ossature du futur programme d'action de l'Afrique en matière de lutte contre la désertification et

d'atténuation des effets de la sécheresse et en même temps conduire à la mise en place de réseaux à même de mettre au point, d'appliquer puis d'évaluer et de réajuster en permanence le programme retenu.

Sur les sept ateliers thématiques que le Secrétariat de la Convention s'est promis de tenir dans ce cadre et à ces fins, deux ont déjà eu lieu. Le premier, qui portait sur le suivi écologique, la cartographie des ressources naturelles, la télédétection et les systèmes d'alerte précoce, s'est tenu à Nairobi il y a tout juste trois mois. Le deuxième, qui avait pour sujet l'agroforesterie et la conservation des sols et avait été organisé en collaboration avec l'ICRAF, s'est tenu au début du mois de juillet à Bamako.

L'atelier qui nous réunit et s'articule donc autour de la gestion des espaces pastoraux et des cultures fourragères, est le troisième en date.

Sur les quatre suivants, soit:

- un sur la gestion intégrée des ressources en eau,
- un sur la promotion de systèmes d'exploitation agricole durables,
- un sur l'utilisation de sources d'énergie renouvelables et de technologies respectueuses de l'environnement,
- et enfin un sur le renforcement des capacités et la promotion de ce qu'il est convenu d'appeler un cadre ou un environnement porteur,

deux sont encore programmés pour 1998, de telle sorte que la plus grande partie du programme d'action régional de l'Afrique sera en principe sous toit avant la fin de l'année, à charge pour les réseaux alors mis en place de l'élaborer davantage et d'en faire un instrument opérationnel.

La place du présent atelier dans le cadre du processus de mise en oeuvre de la Convention étant à présent clarifiée, qu'il me soit permis, Mesdames et Messieurs, de dire encore deux choses.

La première se rapporte à la nature des débats durant ces trois à quatre journées . Ce ne sont pas des échanges académiques sur la gestion des parcours et le développement des cultures fourragères qui sont souhaités ni à l'inverse la recherche immédiate de solutions aux problèmes rencontrés dans ces domaines.

Le but de l'atelier est bien plutôt, compte tenu du contexte dans lequel celui-ci s'insère et comme cela a déjà été dit, de tout d'abord identifier, à partir d'un rapide état des lieux, les principales actions devant constituer le volet «élevage » du futur Programme d'Action régional de lutte contre la désertification, et ensuite de jeter les bases d'un réseau d'institutions aptes à promouvoir et à développer ces actions. Mes collègues du Secrétariat de la Convention qui auront à présenter l'organisation des travaux ne manqueront certainement pas d'y revenir. Cependant, il ressort déjà de cette introduction que vous devrez être mus, tout au long de vos délibérations, par des considérations très pratiques.

La deuxième chose que je voulais dire est la suivante : cette rencontre se rapporte à l'application d'une convention à laquelle revient le mérite de vouloir remédier aux carences des actions passées. Elle est par conséquent une occasion de rappeler que les institutions de recherche ne devraient pas négliger les préoccupations, les intérêts, et les possibilités effectives des populations concernées. Ce souci, la Convention l'exprime à divers endroits en des termes très clairs. Ainsi l'article 16, lettre b) stipule que les Parties *"s'assurent que les activités de collecte, d'analyse et d'échange d'informations répondent aux besoins des collectivités locales ..., en vue de résoudre des problèmes spécifiques, et veillent à ce que les collectivités locales y participent"*.

Plus loin l'article 17, lettre f), énonce, à propos des programmes de recherche à entreprendre, qu'ils doivent être menés *" pour mettre au point, grâce à la participation effective des populations et des collectivités locales, des technologies meilleures, peu onéreuses et accessibles aux fins d'un développement durable"*.

Enfin, on se souviendra de la fameuse formule figurant à l'article 18 sur le transfert, l'acquisition, l'adaptation et la mise au point de nouvelles technologies selon laquelle

les dites technologies doivent être non seulement "*écologiquement rationnelles*", mais aussi "*économiquement viables et socialement acceptables*".

En conséquence j'espère, au nom du Secrétariat - et ce sera ma conclusion - que vos échanges ainsi que les décisions et les recommandations que vous êtes appelés à formuler s'inspireront de cette préoccupation éminemment sociale et pratique de la Convention sur la désertification.

Je vous remercie de votre attention

Opening address

Dr. Tewolde, Director Executif

Environmental Protection Authority of Ethiopia (EPAE)

Representative of the Government of Ethiopia

1. Honour and pleasure

Thanks

Workshop “ Development to the Regional Action Programme to combat desertification in Africa.

2. Welcome in the name of the Federal Democratic of Ethiopia

3. We need not have made this room without windows if it were always like today

4. But Desertification is with us

- most of the time
- some distance away
- yesterday’s sheet flow from the sky

5. That is why the CCD

- African initiative
- Bottom up
- Convention for poor, little specificity on finance, the first convention without financial mechanism
- But money is not really the issue
 - . commitment
 - . Bottom up
 - . cooperation - are

6. For this

- National NAP
- Regional NAP

7. What are we doing in Ethiopia

- CSE – done – policy out
- Other sectoral policies and strategies – done or being done
- NAP – now being done, combining there and seeing if there is more that could be added.

- Now all my colleagues out in the South-East, because of major prior arrangement

|

3- Workshop process

(i) Election of the Bureau and Adoption of the Agenda and Program of Work

The following were elected to the Bureau:

Chairperson: Professor Adebayo Abiola (Ecole Inter-Etats des Sciences et Medicine Veterinaries (EISMV) Dakar, Senegal)

Vice Chairperson and 1st Rapporteur: Professor Paul S Maro (SADC Environment and Land Management Sector, Lesotho)

2nd Rapporteur: Dr. Helen Leitch (ILRI-Nairobi)

Facilitator: Dr. Yalace Kaboret (EISMV – Dakar), consultant

The meeting then adopted the agenda and program of work, (Appendix 2).

(ii) General Introduction on the Organisation of the Workshop

In presenting the objectives and expected outputs of the workshop the CCD Secretariat representatives (Mr. Mansour Ndiaye and Dr. Moise Akle) took the meeting through a brief history of the CCD process, from the Earth Summit in Rio de Janeiro in 1992 through the several negotiating sessions of the Intergovernmental Negotiating Committee on Desertification (INCD) and adoption in June 1994 to the Convention entering into force in December 1996 and the first Conference of Parties (COP1) in November 1997. The CCD is a framework for sustainable development that must involve all concerned, hence the need for a bottom-up participatory approach and a search for partnerships and joint management of programs. The provisions of the CCD are the foundation for all action programs at all levels.

The Regional Action Program (RAP) has to co-ordinate continental efforts at implementing the CCD. In addition it is a framework for support to sub-regional and national programmes. African specialised institutions have a special role to play. Seven thematic workshops are planned to ensure that such institutions contribute to the design and implementation of the RAP, using their various networks.

This workshop on Rational Use of Rangelands and Development of Fodder Crops in the context of the RAP has to propose concrete priority activities; for although there is

a wealth of technologies, knowledge and experience in Africa on rangeland management, famine and livestock mortality continue to threaten food security and natural resource management in most African countries. Africa must find ways of managing research and practical applications to solve such problems. The following therefore are the **expected outcomes** of the workshop:

- Proposals on the actual contribution of specialised institutions in research and training to the national and sub-regional strategies for the rational use and management of rangelands and fodder crops in Africa;
- Identification of the pastoral and agro-pastoral components of the RAP for Africa and proposal for priority action and workplan for the RAP; and
- Identification of intergovernmental and non-governmental institutions and representatives of civil society (CBOs) that can contribute the core group of the suggested regional networking mechanism for the promotion of rangelands management and fodder crops development in Africa in the context of the CCD.

4- Workshop output

(i) Synopsis of Reports of African Specialised Institutions

The brief reports from the seventeen interventions by specialised institutions(**ICRISAT, AREN, ILRI, EISMV, OUA/IBAR, ISRA, NAPRI, PRASET, FNEN, OSSREA, UDEAC, SOAPA, KARI, CEA, SADC, DRC-Egypt, CARE-Ethiopia**) focused on the following issues:

- **Problems and main constraints identified** in the practice of rational use and management of rangelands in Africa. If properly managed, pastoralism is the best way to exploit fragile natural resources with positive impacts on the environment. It does not lead to desertification. Problems in pastoralism arise when there is prolonged drought leading to scarcity of fodder; invasion of pastoral areas by cultivators who disrupt grazing systems, destroy the vegetation and induce soil erosion. This coupled with overgrazing due to increased human and animal

populations often leads to conflicts between farmers and pastoralists which sometimes has transboundary implications.

Several of the specialised institutions that gave this diagnosis from their research (**e.g. AREN, ISRA, NAPRI, PRASET and KARI**) pointed out the lack of clear legal foundation and property rights for pastoralism as a major constraint to rational use of rangelands and development of fodder crops.

- **Suggested solutions to the identified problems and constraints** include:

Research to improve the nutritional value of animal feed and fodder productivity, using indigenous and exotic species (**AREN, OSSREA, OAU/IBAR, ICRISAT, ISRA, ILRI, DRC-Egypt**). In this respect there is advantage in using interaction in agro-industrial and agro-pastoral systems to increase productivity. Research into the cultural, socio-economic and political situation in which pastoral communities operate will suggest useful reforms, policies and strategies to make it possible to provide the necessary services such as water, human and animal health care, schools, market facilities, communications, and participation in the political life of the countries concerned.

Training is a vital activity in most specialized institutions but it should focus more on solving African problems. Sub-regional training in rangeland management has provided the Sahelian countries with capacity in forestry, pastoralism, and agricultural development (**EISMV**). The training should include training of technicians, extension staff and the resource users themselves, throughout the continent.

Partnership building and networking at various levels and among individuals, communities and institutions has proven to be a useful vehicle for solving problems of rangeland management and fodder production and should be encouraged (**AAPA, ISRA, CARE-Ethiopia, ICRISAT, ILRI, FNEN, UDEAC**). In order to involve pastoralists in all decision-making in the management of their natural resources there has to be decentralisation, the formation of animal/livestock/ water management associations or committees, and mechanisms for participation in program formulation and implementation (**Mali, Senegal, Burkina and Ethiopia**). Networking, particularly among specialised institutions as demonstrated by ILRI and ICRISAT,

not only facilitates the exchange and sharing of technologies, information and experiences, but also provides the mechanism for harmonising and co-ordinating policies, strategies and action programs for the rational use of rangelands and development of fodder crops at continental level.

(ii) ILRI Report on Networking and Research for Development of Pastoralism in Africa

The presentation from ILRI emphasised the purpose of the institution: to improve human welfare through the increase of productivity of livestock systems while protecting the natural resource base. ILRI has substantial experience working in partnership with national agricultural research systems (NARS), advanced research institutes (ARIs) and other international research and development organisations. ILRI uses a systems, multidisciplinary and participatory approach to implement its work. Examples of work in pastoral areas mentioned: land rights, monitoring of vegetation in the Sahel, socio-economic studies of pastoralists and agro-pastoralists, natural resource management, forage crop development and improving its utilisation. ILRI has commenced impact assessment of research technology. An example was given of the fodder bank technology adopted by 28,000 farmers in 15 countries of West Africa, who have planted over 19,000 ha of forage legumes (mainly stylosanthes). The internal rate of return from adoption of this technology was estimated at 38%.

Regarding efficient use of rangelands, pastoralism is viewed as an efficient system of livestock production because the vast semi-arid or arid areas where crop production is risky can be utilised by livestock to convert otherwise wasted resources, into valuable, high-quality products. It is a system of production suits the environmental condition. The contribution of pastoralism has been underestimated because many products are home consumed, locally traded or used in other production processes. Development intervention should be based on sound knowledge of pastoral systems and its productivity. Policies and programs, which can reduce the risk of output losses, are needed. Improving information gathering is also necessary to generate better data to calculate the contribution of pastoralism.

ILRI implements 3 multidisciplinary livestock networks on behalf of the membership of national agricultural research institutes. ILRI and its partners have consolidated several networks over recent years as part of a process to maximise opportunities for research and minimise time and resources spent on managing the network process. All network research has subregional/regional relevance and is based on constraint analyses; the research is designed to produce new technologies and interventions for farmers. The NARS-ILRI networks have been successful in implementing research, building capacity for livestock research and development, and encouraging national research institutes to utilise existing, but often unused, resources more effectively for livestock research. The Association for **Strengthening** Agriculture Research in East and Central Africa (ASARECA) network is already researching new ways to provide quantitative indicators of impending crises so as to permit the better management of the manmade and natural crises affecting pastoral communities. This network project is only one of several independent activities addressing different aspects of the development of pastoral communities. The results from these projects need cross-referencing and co-ordination to ensure that decision-makers and those responsible for the development of pastoral communities receive the best and most coherent recommendations

(iii) Summary of the Consultant Report on Rational Management of Rangelands and Development of Fodder Crops.

Africa is characterised by eco-climatic diversity which determines several different types of soil, vegetation and farming systems. Of all the regions of Africa, the Sahel is where the management of rangeland and the development of fodder crops are particularly difficult, because the climatic conditions are the most severe (low rainfall), plant resources and soil are poor the number of livestock is increasing, population pressure is growing, and important rainwater resources are to be found in the valleys permanent lakes and the big rivers.

The management of rangeland in any eco-climatic zone is characterised by a basically traditional system (movement of herds and no organised use of pastureland) in an environment where available rangeland is continually decreasing because of the expansion of croplands and urbanisation. In addition to that, land rights are poorly adapted or ambiguous and the cause of many conflicts between pastoralists and

farmers. Attempts have been made to find solutions aimed at the rational management of rangelands, with the establishment in some countries of a system of land ownership security (the cases of Senegal and Mali), **rangeland management and monitoring system** (Senegal), an early warning system, and even integrated development programmes (Guinea, Burkina Faso). However, there are persistent problems with the rational management of pastoral areas, mainly linked to land tenure, the annual variability of plant resources, the lack of communication or any participatory approach, and the difficulty of investing in areas of pastoral development.

Solving the problem of livestock feed has required the introduction of the technique of fodder crop production. Attempts have been made to produce fodder (either under irrigation or during the rainy season) and fodder crop seed in several countries using either imported or locally produced legume and grass species. Unfortunately, several factors (climatic, socio-economic, economic and technical) are hindering their expansion in the field.

An analysis of livestock systems (nomadism, the transhumance, sedentary livestock production, large-scale livestock production), of available feed (pastures, agro-industrial by-products), of the pastoralists socio-economic conditions (production units, pastoral society, poverty, land security, multiple activities of the pastoralists), of pastoralists socio-professional organisations, and the macroeconomic and economic aspects of African countries, made it possible to conduct a diagnosis of the situation as concerns the rational management of rangeland and the development of fodder crops in Africa. the following constraints were identified:

- Climatic irregularities and the brevity of the rainy season
- “agricultural” farming systems with no place for fodder production
- the limited availability of **other feed resources** for animal feed
- increased human and animal pressure on natural resources
- training needs not yet satisfied
- lack of inadequate pastoral codes and land ownership systems
- inadequacy of funding for livestock production

A strategic approach towards the rational management of rangelands and the development of fodder corps was proposed, with actions at national and sub-regional level.

In the context of the RAP to combat desertification in Africa the following proposals for action were made:

- define programmes of work
- identify the resource persons and institutions to constitute the network
- establish a committee to monitor decision taken
- draw up project sheets taking account of the programmes of work decided upon with detailed time schedules.

(iv) General Discussion

The open discussion identified a number of issues that needed be addressed in the consultant's report in order that it reflects the African situation.

- Continent-wide coverage of issues, and constraints is required. It was recognised that the time allocated to prepare the initial report was inadequate.
- Relation to Subregional Action Programs and National Action Programs needs to be expounded.
- Areas amenable to RAP, such as networking and information exchange, training and research, must receive focus.
- Property rights, taking into consideration mobility of pastoralists, is an important area which needs more emphasis.
- The RAP must be framed in the context of the African environment characterised by decentralisation, liberalisation and globalisation.

(v) Terms of reference for Working Groups

Two working groups were formed and charged with the task of proposing follow-up actions under the agreed terms of reference.

TERMS OF REFERENCE FOR WORKING GROUP ONE

1. Based on the information contained in the document prepared by the consultant, the information notes by African specialized institutions and relevant deliberations by the workshop, identify the main constraints in the practice of rational use of rangelands in Africa.

2. In order to enhance the rational use of rangelands in Africa in the context of the Regional Action Programme to Combat Desertification, propose the strategies that need to be put in place.

3. On the basis of the proposed strategies, suggest concrete measures, priority activities and timeframe to be developed in the context of the formulation of the Regional Action Programme to Combat Desertification.

4. The Working Group is requested to review the attached document entitled “Suggestions on Networking among Relevant Institutions, Organizations, Agencies and Bodies in context of the RAP”, and to discuss and agree on:

- the institutional arrangements to be put in place;
- the criteria for selecting a focal point;
- the mandate and role of the focal point in facilitating and coordinating the thematic area under consideration.

The objective of this institutional arrangement would be to promote closer cooperation and coordination of activities among the specialized institutions dealing with rational use of rangelands in Africa, in context of the RAP.

TERMS OF REFERENCE FOR WORKING GROUP TWO

1. Based on the information contained in the document prepared by the consultant, the information notes by African specialized institutions and relevant deliberations by the workshop, identify the main constraints in the Development of Fodder Crops in Africa.

2. In order to enhance the Development of Fodder Crops in Africa in the context of the Regional Action Programme to Combat Desertification, propose the strategies that need to be put in place.

3. On the basis of the proposed strategies, suggest concrete measures, priority activities and timeframe to be developed in the context of the formulation of the Regional Action Programme to Combat Desertification.

4. The Working Group is requested to review the attached document entitled “Suggestions on Networking among Relevant Institutions, Organizations, Agencies and Bodies in context of the RAP”, and to discuss and agree on:

- the institutional arrangements to be put in place;
- the criteria for selecting a focal point;
- the mandate and role of the focal point in facilitating and coordinating the thematic area under consideration.

The objective of this institutional arrangement would be to promote closer cooperation and coordination of activities among the specialized institutions dealing with Development of Fodder Crops in Africa, in context of the RAP.

5. Closure ceremony of the Workshop

(i) Vote of Thanks

Réunis à Addis-Abéba, Ethiopie du 4 au 7 Aout 1998 dans le cadre de l'Atelier régional sur la gestion rationnelle des espacespastoraux et le développement des cultures fourragères en Afrique, les Institutions régionales et sous-régionales de meme que les institutions africaines spécialisées expriment leur profonde gratitude pour l'accueil chaleureux et les excellentes conditions de travail, au peuple et au Gouvernement de la république Fédérale de l'Ethiopie et à l'Institut International de la Recherche sur l'Elevage. Les participants à cette consultation saisissent cette opportunité pour renouveler au Secrétariat de l'UN-CCD, toute sa reconnaissance pour le soutien apporté à l'Afrique dans le cadre de la mise en oeuvre de la dite Convention. L'Atelier réitère sa disposition à assurer le suivi des résultats auxquels il est parvenu.

Fait à Addis-Abéba, le 7 Aout 1998.

L'Atelier

Closing Remarks, Hugo Li-Pun, ILRI

Ladies and gentlemen,

We have reached the final session of this important workshop. I have been highly impressed by the level of participation, the intensity of discussions, and the dedication shown by participants. It indicates the expertise on the subject, and the commitment to advance forward in achieving the goals of the convention to combat desertification in Africa.

Two words that have been mentioned over and over should be kept in mind: participation and partnerships.

PARTICIPATION of stakeholders is critical. It is up to the African nations to solve their problems. There is the willingness, the expertise and the aspirations. International agencies, donors, and many other stakeholders may be interested in joining efforts, but by themselves they cannot be successful. They will have to join African efforts thorough appropriate PARTNERSHIPS. As we have discussed during this meeting, causes leading to desertification are quite complex on a global, continental or local level. It is not possible to think that a single organization could undertake this challenge. Clearly a concerted effort is required. We have agreed on the principles and modes of collaboration to take advantage of the available expertise in the topic of range management and fodder cultivation, the available infrastructure, the strengthening efforts required and the ways of linking partners in an open and collegial manner.

I am very impressed with the outputs of these meeting. But one additional one, which often is not mentioned in the achievements of meetings, is the acquiring and strengthening of Friendships. It would be through them that an open and collaborative effort could be developed to undertake the tremendous challenges ahead of us. The outputs of this meeting are just the beginning. At ILRI we are looking forward to the follow-up actions and the implementation of agreements. ILRI

within its global mandate continues to give a very high priority to our efforts in this continent, and will support the efforts to combat desertification in its areas of expertise.

I would like to acknowledge:

- **the co-organisers of this meeting, our colleagues from the UN-CCD Secretariat for the role that they played before and within the meeting**
- **the Bureau for the capable way in which they handle the plenary sessions and made possible to arrive to concrete agreements based on consensus**
- **the Chairpersons and rapporteurs for the substantial effort of facilitating the working groups and preparing their reports**
- **the Consultants from the Ecole Interetats des Science et Medecine Veterinaire for the background documents which provided the bases for our discussions**
- **the interpreters for their patient and diligent work of simultaneously translating sometimes difficult discussions**
- **the ILRI technical and administrative support for the effective way in which this meeting was conducted. Special thanks to Dr Simeon Ehui, Ms Letty Padolina and their collaborators.**

Finally, we hope to see you again and wish to find ways of collaborating in the near future.

Bon Voyage et Merci Beaucoup!

Statement by the representative of CCD Secretariat

Mr. M. Mansour Ndiaye

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Monsieur le Directeur Résident de l'ILRI,

Distingués délégués,

Chers collègues,

Mesdames et Messieurs

Il me revient donc l'honneur de m'adresser à vous au nom du Secrétariat Exécutif de la CCD, au moment où s'achèvent les travaux de notre atelier consacré à la promotion de la gestion rationnelle des espaces pastoraux et de Développement des cultures fourragères dans le contexte du PAR de lutte contre la désertification.

Monsieur le président,

Permettez moi avant tout de remercier le Gouvernement de l'Ethiopie qui a bien voulu parrainer cette rencontre.- Que le Directeur général de l'ILRI ainsi que tous ses collaborateurs trouvent ici également l'expression de notre profonde gratitude pour l'hospitalité offerte sur ce magnifique site de l'ILRI et la disponibilité à toutes épreuves de chacun des membres de cette Institution.

Mes remerciements vont également vers le FIDA et le Gouvernement de la Finlande qui ont bien voulu apporter leurs soutiens financiers à l'organisation de cette rencontre très importante.

Monsieur le Président,

Les défis que l'Afrique tente de relever à travers la formulation en cours de son programme d'Action Régional de Lutte contre la Désertification ont ceci de singulier, qu'ils recouvrent finalement les principales questions posées sur son chemin vers le développement durable.

En cela, la convention de lutte contre la Désertification est plus que jamais un instrument qui vient appuyer la mise en place, par les autorités africaines, de stratégies de développement censées aller vers l'attente des populations, tout particulièrement celles dont les conditions de vie dépendent des assénités tirées des ressources naturelles renouvelables.

Les questions relatives au pastoralisme et le développement des cultures fourragères sont assurément parmi ces facteurs qui peuvent contribuer à cette quête pour un développement maîtrisé dont l'expression première est de redonner à la terre sa vocation fondamentale, celle de nourrir les Hommes.

Voici pourquoi, cet atelier avait à nos yeux le devoir de proposer aux principaux décideurs africains placés à l'échelle régionale, un programme de travail réaliste car adapté aux conditions du continent, mais aussi, suffisamment ambitieux pour que son application correcte redonne au pastoralisme une place de choix dans les cadres d'orientation à mettre en exergue.

Il y a tout bien de se réjouir des résultats auxquels nous sommes parvenus aujourd'hui, même s'il est vrai que le processus ne fait que démarrer et que peut être le plus difficile est encore devant nous. La première réussite me semble-t-il a été de réunir tout d'abord les experts des meilleures institutions basées en Afrique.

Ensuite la qualité des documents soumis à l'examen de l'Atelier ainsi que l'atmosphère qui a prévalu tout au long de cette semaine méritent certainement d'être soulignées. Aussi, voudrions nous féliciter les consultants qui ont préparé les documents de référence, ainsi que toutes les institutions qui ont bien voulu présenter des notes d'information qui fournissent au lecteur une bonne indication de l'impressionnante expertise disponible sur le continent africain dans les domaines du pastoralisme et le développement des cultures fourragères.

Mais, je le disais tantot, nous n'en sommes qu'au début du processus, les conclusions auxquelles nous sommes parvenues appellent de tous un suivi immédiat tant il est vrai qu'en Afrique la résolution des problèmes auxquels sont confrontés les acteurs, se posent en terme d'urgence.

C'est donc sans discontinuer que le secrétariat de la CCD apportera à l'Afrique dans la mesure de ses moyens, le soutien requis pour que l'élan pris ici à Addis-Ababa soit maintenue jusqu'à l'adoption par les africains du PAR dont les composantes relevant du pastoralisme et des cultures fourragères seront des piliers.

Il ne faut pas se le cacher cependant, le processus tel qu'envisagé dans la CCD est long , souvent compliqué à mettre en place tant peuvent apparaitre difficile le défi de faire travailler ensemble des catégories d'acteurs qui ont évolué par le passé selon des

approches différentes. C'est dire qu'il nous faut veiller à ce que les liens tissés ici se développent et contribuent à la détermination de la politique pastorale la plus indiquée pour le continent.

Le mécanisme mondial mis en place par la Conférence des Parties à la CCD ainsi que le comité la Science et de la Technologie qui est également un organe subsidiaire de cette même Conférence des Parties seront informés des résultats de nos travaux pour que leurs soutiens aux efforts des institutions spécialisées africaines apportent à ces dernières l'impulsion nécessaire à la réussite des activités envisagées.

Monsieur le Président,

Je ne saurais terminer sans adresser un salut fraternel à chacun ici en reconnaissance à l'intérêt manifesté par tous les participants à la réussite de cette rencontre.

Je me permets et en cela je pense pouvoir parler également au nom de l'atelier d'adresser toute notre félicitation à l'équipe du service d'interprétariat pour leur patience et leur compétence.

Ils sont également nombreux ceux qui, dans les coulisses se sont occupés de la logistique et ont contribué ainsi à l'excellence des conditions de travail dont nous avons bénéficié tout au long de cette semaine. Je pense que nous leur devons gratitude et considération.

Je vous remercie.

Closing remarks by the Chairperson of plenary session

Pr. F.A.Abiola

Directeur EISMV

BP 5077, Dakar, SENEGAL

Monsieur de Directeur Résident de l'ILRI,
Messieurs les Représentants du Secrétariat de la CCD
Mesdames et Messieurs les participants

Nous sommes venus de différents horizons de notre continent et nous avons travaillé pendant 4 jours pour identifier des contraintes, élaborer des stratégies et proposer des activités dans ce combat permanent que nous avons tous engagé contre la désertification.

Monsieur le Directeur Résident,

Je peux vous assurer que les organisateurs de cette rencontre ont réussi à réunir ici à Addis- Ababa, à l'ILRI, des personnalités scientifiques et techniques ayant des grandes compétences dans la gestion des espaces pastoraux et le développement des cultures fourragères.

J'ai été moi-même impressionné par leur simplicité, leur ponctualité, leur détermination, leur sérieux au travail et leur courtoisie dans les débats intenses que nous avons eus pendant ces 4 jours. L'Afrique, par leur haute compétence s'est regardée dans le miroir et, de façon pragmatique, des actions dont je viens de parler ont été retenues.

C'est au vu de tout ceci que je peux me permettre de les remercier d'être venus apporter leur contribution combien efficace à cet atelier.

Permettez-moi aussi de remercier comme le Directeur résident de l'ILRI, le consultant qui en peu de temps a pu nous soumettre un document qui a permis les réflexions aussi enrichissantes.

Quant aux représentants du Secrétariat de la CCD, nous les prions de recevoir pour eux-mêmes et de bien vouloir transmettre au Secrétaire Exécutif, Mr Harba Diallo, les assurances de notre profonde gratitude.

La lutte continue et nous souhaitons que les nombreux obstacles inhérents à toute œuvre humaine, ne nous découragent avant la victoire, notre commune Victoire sur la désertification. Ensemble, nous gagnerons.

Un de mes amis dis souvent : si tu avances, tu meurs, si tu t'arrêtes tu meurs. Je sais que vous aller choisir de toujours avancer.

Les mots vont certainement me manquer pour remercier l'ILRI qui pendant 4 jours a fermé les yeux sur certaines de nos caprices et nous a permis d'obtenir des résultats aussi utiles pour le continent.

Monsieur le Directeur résident,

Nous vous prions de dire merci à tous ceux qui nous ont soutenu d'une façon ou d'une autre durant notre séjour parmi vous. Je pense surtout à ces agents qui sont souvent dans l'anonymat : les plantons, les chauffeurs, les gardiens et, retenons une mention spéciale pour les personnels du restaurant, ceux-là qui nous ont permis d'avoir l'équilibre biologique nécessaire pour tenir le rythme impressionnant des journées de nos travaux.

Mesdames et Messieurs les Participants,

Comment aurions-nous pu nous comprendre sans les interprètes ?

C'est pourquoi, en votre nom, je vais les remercier pour leur patience. Ils ont tous supporté dans leur casque, certaines impressions parfois désagréables de notre voix, surtout lorsqu'il nous arrive de l'élever.

Bientôt, nous allons commencer par retourner chez nous. Comme on le dit, ce n'est qu'un au revoir.

Messieurs les Représentants du Secrétariat de la CCD,

Le plus dur commence, traduire dans les réalités ce que nous avons retenu ici de faire.

C'est sur cet espoir que je vais arrêter ici mon propos.

Bon voyage

Bon retour dans no pays et à très bientôt

APPENDIX 1

**UN-CCD/ILRI Workshop for the Development of the
Regional Action Programme to Combat Desertification in Africa
Addis Ababa, ETHIOPIA
04 – 07 August 1998**

Agenda

Tuesday, 04 August 1998

8h30 – 9h15	Registration of Participants
9h15 – 10h15	Opening Ceremony
	<ul style="list-style-type: none">• Welcome remarks by Director General of ILRI• Statement by the Executive Secretary of the CCD Secretariat• Statement by the Representative of the Government of Ethiopia
10h15– 10h30	Coffee Break & Group photograph
10h30 – 11h30	Election of the Bureau and adoption of the Agenda and programme
	of work
11h30 – 12h00	Introduction on the organization of the workshop (CCD)
12h00 – 12h30	Brief reports by representatives of African specialized institutions
	on their possible roles in the elaboration of the RAP
12h30 – 13h00	Information Notes: (ECOWAS, EGYPT)
13h00 – 14h00	Lunch Break
14h00 – 14h30	Information Notes: (ICRAF, SARDC)
	in these areas in the Africa region
14h30 – 16h00	Report by ILRI on research for the development of pastoralism in
	Africa: challenge and opportunities in context of the CCD
16h00 – 16h15	Coffee Break
16h15 – 16h45	Consultants report on the status of rangelands and fodder crops development in Africa
16h45 – 18h00	General discussion
19h00	Reception

Wednesday, 5 August 1998

08h30 – 09h00	Continuation of ‘Report by ILRI on research for the development of pastoralism in Africa: challenge and opportunities in context of the CCD’
09h30 – 10h00	Presentation of the specific issues in the terms of reference and Organization of two working groups (consultants)
10h00 – 10h30	Coffee Break
10h30 – 13h00	Working group sessions
13h00 – 14h00	Lunch Break
14h00 – 16h00	Continuation of working group sessions
16h00 – 16h15	Coffee Break
16h15 – 18h00	Continuation of working group sessions

Thursday, 6 August 1998

08h30 – 10h00	Continuation of working group sessions: consideration of reports in the working groups
10h00 – 10h30	Coffee Break
10h30 – 13h00	Continuation of working group sessions: discussion of reports in the working groups
13h00 – 14h00	Lunch Break
14h00 – 18h00	<ul style="list-style-type: none"> • Finalization of working group reports (by reporters) • Preparation of workshop report (by the Bureau with assistance of the CCD Secretariat) • Preparation of recommendations

Friday, 7 August 1998: Plenary Session

08h30 – 09h15	Reviews of the reports of the working groups
09h15 – 10h00	Presentation of the workshop report and recommendations
10h00 – 10h30	Coffee Break

10h30 – 11h30	Adoption of the final report of the workshop
11h30 – 12h30	Concluding statements and closure of the workshop
12h30 – 14h00	Lunch Break
PM	OPEN

Saturday, 8 August 1998

Trip to Abernossa (Optional)

APPENDIX 2

**(UN-CCD/ILRI) Workshop on a Network for Promotion of
Rational Use of Rangelands and Development of Fodder Crops
in Context of the Regional Action Programme**

Addis Ababa, Ethiopia, 4-7 August 1998

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APPENDIX 3

**UN-CCD/ILRI Workshop for the Development of the
Regional Action Programme to Combat Desertification in Africa
Addis Ababa, ETHIOPIA
04 – 07 August 1998**

REPORT OF WORKING GROUPS

REPORT OF WORKING GROUP ONE:
Rational Use of Rangelands in the context of CCD

The working group constituted of 25 members: Aliou KA, Dr Boubacar Assane, Moges Belayneh, Mamadou Coulibaly, Mrs Martha Dibissa, Yonis Bekele, Yazew Teferi, Dr Ibrahim B. Abou-Deya, Dr Maïga Mouslim, Amani Hamidou, Zoungrana Philippe, Victor Tihalerwa, Bosse Boazou Henri, Mrs Catherine Okai, Lars Grindsted, Randah Pierre, Dr Nancy McCarthy, Alemayehu Azeze, Clever Mafuta, Barry Harouna, J.T. Musiime, Dr Henry Chereruiyot, Dr Moïse Aklé, Dr Mamadou Diop, Dr M.E. Smalley.

After the presentation of the Terms of Reference (TOR), the group elected its bureau as shown hereunder.

- | | | | |
|----|---------------------|---|------------------------------|
| 1. | Dr. J.T. Musiime | - | OAU/IBAR, Chairperson |
| 2. | Mr. Harouna Bary | - | PRASET , Rapporteur |
| 3. | Mr. Alemayehu Azeze | - | OSSREA, Rapporteur |
| 4. | Dr. Moïse Akle | - | CCD Secretariat, Facilitator |

The group discussed the items of TOR. The following were the results of the discussion.

With regard to item one of the TOR, the group agreed to first consider the constraints identified by the consultant and found them acceptable, with some amendments. The group went on to identify additional, constraints.

Then the group identified, strategies, one each against the constraints. Finally measures /actions to implement the proposed strategies were identified.

The constraints, strategies and measures identified are presented in a tabular form to demonstrate their relationship (Tabular I)

While discussing the constraints, the group identified four major challenges :

1. To restore and maintain peace :
In order to reduce the risk of political destabilisation.
2. To promote the economic and social development of livestock production :
 - ◆ In order to improve the income and living conditions of pastoralists ;
 - ◆ In order to build up the contribution of livestock production to national economies.

3. To guarantee the sustainable management of natural resources ;
4. To facilitate the adaptation of pastoral societies to on-going socio-economic changes.

Concerning item 4 of the TOR which deals with the Networking, a proposal contained in the document entitled "suggestions on Networking among relevant institutions, organisations, Agencies and bodies in the context of RAP" was discussed. The group found the proposal acceptable.

Finally the Working Group made the following recommendations :

RECOMMENDATIONS

1. Conduct studies of pastoral resources with a view to have them better managed.
2. Undertake a general study on the standardisation of pastoral legislation and call on states to ensure the judicious application of those legislations
3. Sensitise policy makers to the need to increase public investment in the livestock sector
4. Involve pastoral organisations in the development of livestock policies

NETWORK

5. With regard to its membership ensure the participation of associations, particularly pastoralists associations
6. Call on the Network to encourage the various structures for conflict prevention and management to take account of conflicts linked to the exploitation of pastoral resources.

REPORT OF WORKING GROUP TWO:
Development of fodder crops to combat desertification in the context of CCD

The working group constituted of 18 members: H.M. El Shaer (chairman), M. Amadou, I. Bayoumi Abou-Dea, E.H. Clinton, M. Diop, B. Dodo, Y. Drissa, S.K. Ehui, M.S. Kallah, J.W. Kiio, H. Li-Pun, Mrs. B. Maass, Mrs. E. Mace, N. Ndiangu'i, M.M. N'Diaye, Y. Sanon, Mrs. C. Zoungana, and N. van Duivenbooden (rapporteur).

Introduction

To facilitate and focus the work according to the terms of reference provided by the workshop organisers, it was felt necessary firstly to define fodder crops as the conventional definition seems too restricted given the current practices of farmers and pastoralists, and the objectives of the Regional Action Program (RAP) to combat desertification. The following definition is retained:

Fodder crops are plants cultivated by farmers to produce animal feed, have additional purposes if any, and contribute to food security.

This implies that in addition to fodder crops (see list in consultant's report), crops like millet, maize, etc. are also considered.

The term of reference of this working group relates to the main objective to develop fodder crops in Africa to combat drought and desertification and to improve the living conditions and welfare of the resource-poor farmers and pastoralists.

TERMS OF REFERENCE FOR WORKING GROUP TWO

i). Based on the information contained in the document prepared by the consultant, the information notes by African specialized institutions and relevant deliberations by the workshop, identify the main constraints in the Development of Fodder Crops in Africa.

ii). In order to enhance the Development of Fodder Crops in Africa in the context of the Regional Action Programme to Combat Desertification, propose the strategies that need to be put in place.

iii) On the basis of the proposed strategies, suggest concrete measures, priority activities and timeframe to be developed in the context of the formulation of the Regional Action Programme to Combat Desertification.

iv) The Working Group is requested to review the attached document entitled “Suggestions on Networking among Relevant Institutions, Organizations, Agencies and Bodies in context of the RAP”, and to discuss and agree on:

- the institutional arrangements to be put in place;
- the criteria for selecting a focal point;
- the mandate and role of the focal point in facilitating and coordinating the thematic area under consideration.

The objective of this institutional arrangement would be to promote closer cooperation and coordination of activities among the specialized institutions dealing with Development of Fodder Crops in Africa, in context of the RAP.

2. Main constraints for fodder production

The constraints identified by the working group are subdivided into three groups; i.e. related to policy, technical, and socio-economic issues.

2.1 Constraints related to policy issues

There is in general a lack of integrated crop and livestock policies at the national level to develop fodder crop production. In addition, conducive domestic and regional trade policies are missing. The issues that are additionally lacking include:

- exchange of fodder crop germplasm among countries;
- exchange of information on fodder crops among countries;
- availability of funds (credit schemes) to develop fodder crops;
- co-ordination and valorisation of agricultural research on and development of fodder crop production.

In addition, it was noted that in the past, focus of policies in the domain of livestock production was too much on veterinary issues.

2.2 Constraints related to technical issues

These constraints are related to the following issues, which can roughly be categorised into two groups:

A. Constraints related to fodder crop production and management:

- A1. Lack of fodder crop species adapted to the various ecological niches;
- A2. Lack of fodder crop seeds (e.g. caused by lack of multiplication centres);
- A3. Low production levels of fodder;
- A4. Produce is only available during a short period of the year;
- A5. Level of inputs required, especially for conventional fodder crops: irrigation water, labour, and financial resources, and seeds

- A6. Low level of technical knowledge of farmers and institutions, especially in the field of fodder crop seed production, due to lack of constraints C5-7;
- A7. Bio-physical environment, including soils (soil fertility, salinity), climate (temperature, rainfall, wind), and diseases and pests

B. Constraints related to crop-livestock interactions:

- B1. Variable quality of fodder crop produce (e.g. high fibrous material, anti-nutritional factors);
- B2. No focus on target livestock production system (related to time, place and number of animals during the year);
- B3. No demand of farmers for this type of feed;
- B4. Low level of technical knowledge of farmers, pastoralists, and institutions in the field of fodder crop utilisation, due to constraints C5-7;
- B5. Lack of conservation technologies for the various fodder crops.

2.3 Constraints related to socio-economic issues

These constraints are related to the following issues:

- C1. Low profitability;
- C2. Poor land tenure system that prevents farmers from investments;
- C3. Poor marketing aspects, related to poor infrastructure and/or organisational aspects;
- C4. Low awareness of fodder crops as alternative feed source due to constraints C5-7;
- C5. Poor or no extension services, training, and education of farmers and pastoralists;
- C6. Poor information supply (e.g. from research institutes) and low sensitisation;
- C7. Lack of using participatory approaches;
- C8. Socio-cultural issues (e.g. willingness to cultivate fodder crops);
- C9. Inappropriate land use practices (e.g. bush-fires);
- C10. Low availability of inputs due to poor distribution systems, or high prices (e.g. of seeds);
- C11. Poverty of farmers and pastoralists;
- C12. Lack of gender analysis (labour division; who is taking the lead in cultivating and using fodder crops?);
- C13. Lack of taking into account indigenous fodder crop practices by research and development institutions.

3. Strategies to develop fodder crops

In developing the strategies to develop fodder crops, the working group has taken a holistic approach to relate the policy, technical and socio-economic issues. For practical purposes, policy issues are kept separate from the latter two.

3.1 Strategies related to policy issues

To strengthen sub-regional and national activities, in the framework of CCD by harmonising policy directions, the working group proposed that the following strategies need to be developed in consultation with stakeholder implementing institutions:

- A1. To develop appropriate sub-regional and national sectoral, and macro-economic policies that integrate crop and livestock sectors (including fodder crop production) and stimulate the collaboration between agricultural research and development institutions;
- A2. To establish appropriate policy and legal structures to ensure land tenure security especially in areas within countries subject to desertification;
- A3. To establish a legal framework for the free exchange of germplasm of species that help in combating desertification within the current policies being developed by OAU;
- A4. To establish a regional facilitation fund to implement the proposed strategies to combat desertification;
- A5. To promote inclusion and intensification of fodder crops within regional and national development programs.

3.2 Strategies related to technical and socio-economic issues to promote fodder crop production

To develop a regional framework which advocates an integrated approach, consistent with the CCD approaches, the following strategies will be executed by stakeholder institutes through a bottom-up approach, so as to address the technical and socio-economic constraints as identified in Section 2:

- B1. To identify a co-ordinating agency that is responsible for (i) the supply of information and seeds of fodder crops to stakeholder institutes, and (ii) the training of trainers of these institutes (e.g. participatory approaches, seed production, forage utilisation);
- B2. To develop a state-of-the-art handbook on the development of fodder crops (including technologies available) and guidelines for extension services of transferable fodder crop production technologies that describe aspects for both production (e.g. inputs, risks, expected yield) and utilisation (e.g. conservation techniques, quality, target livestock production system);

- B3. To identify in each sub-region one or more fodder crop seed multiplication centres for the species most adopted by farmers at present;
- B4. To develop scenario's for future sustainable integrated crop and livestock production systems while taking into account the use of indigenous knowledge to combat desertification, improve welfare of farmers and pastoralists, and identify research and development needs (outputs comprise e.g. maps of target areas for fodder crops);
- B5. To put in place a support program that promote environmental education on combating desertification focusing on the development of fodder crops, exchange of information, and training;
- B6. To increase awareness on combating desertification, and the role of fodder crops in this process through participatory approaches and gender analysis;
- B7. Specialised institutions support in a participatory way countries' efforts towards the development of efficient farmer's organisations to ensure availability and accessibility of inputs (seeds, fertilisers) as well as the marketing of fodder crop produce;
- B8. To develop and promote participatory approaches, in particular taking into account indigenous knowledge, in the development of fodder crops;
- B9. To put in place the appropriate mechanism towards fund raising to carry out the proposed activities to develop fodder crops by the various stakeholder institutions.

4. Activities

The group felt that in the process of promoting the network for rangeland management and development of fodder crops it is necessary to list a number of activities that should be undertaken in the short-term, as well as in the long-term. The following tentative list of activities has been developed (in order of priority, as far as possible as some must be carried out simultaneously):

1. Request the CCD-secretariat to facilitate the development of an inventory of institutions, organisations and networks related to fodder crop development;
2. Prepare a complete and comprehensive state-of-art report (including prospects and constraints) on the development of fodder crops and technologies, including indigenous knowledge;
3. Increase awareness and knowledge of farmers, pastoralists, and institutions towards desertification impact and the potential role of fodder crops to combat desertification;
4. Identify gaps and potentials of fodder crop development through desk studies and participatory research (e.g. understanding constraints of farmers, why no adoption of fodder crop technologies, need for training);

5. Diffuse fodder crop technologies to end-users; the application of research findings related to fodder crop production for relevant animal production systems;
6. Enhance technical co-operation and exchange of information through the proposed Network;
7. Provide training on fodder crop management (e.g. seed production), utilisation and participatory approaches for fodder crop development;
8. Assist in investment priorities to develop fodder crops;
9. Operational linkage with other Rio-Conventions (e.g. Biodiversity and CCD), so as to enhance the free exchange of germplasm among relevant institutions;
10. Develop mechanisms, based on the participatory development of research and development project proposals, to fund the proposed activities;
11. Assessment of policy options to improve the livelihood of pastoralists and protect the environment through intensification of livestock production and the introduction of fodder crops.

In the long-term an intensification of livestock production systems is envisaged that will increase the demand for fodder crops, leading to further intensification of fodder crop production systems. Furthermore, it is proposed that specialised institutions liaise with government authorities in view to facilitate the development of fodder crops within the framework of an appropriate land tenure regulation.

5. Institutional aspects

The working group discussed and agreed upon four major issues related to institutional aspects: rational of working through a network, institutional arrangements, the criteria for the selection of the focal point, and the selection process of focal point.

5.1 Rationale

A network is a demand-driven mechanism to exchange information, harmonise methodologies, avoid duplication of efforts, and stimulate effective use of available resources. In addition, the networking aims at optimising efficiency and effectiveness at the regional level through achieving economies of scale, understanding natural phenomena, and data compatibility and sharing.

The networking could achieve the following added value to individual activities: more coherence, more harmonisation, expanded co-operation and partnership, avoidance of duplication of effort, and formulation of clear operational framework.

The network will also manage all issues related to data acquisition, develop mechanisms for dissemination, consolidate all activities and knowledge base in the

relevant areas of specialisation, establish linkages among existing institutions and structures, and contribute to capacity building.

5.2 Institutional arrangements

The networking will be open ended, but membership will be categorised into various levels, and they should have experience and the capacity to work and collaborate on the relevant thematic area of the network.

The network will have a clear mandate from its members, which could include formulation of the operational framework, consolidation of activities and knowledge base in the relevant areas of jurisdiction and establishment of effective linkages among the various institutions and organisations.

A focal point will be entrusted to follow the CCD process at the regional level. The focal point to be designated will perform the following functions:

- It will have the priority role of facilitating and co-ordinating activities in the relevant thematic area at the regional level, and to boost regional co-operation for field application of the positive research results;
- It should have the mandate for a fixed term to act on behalf of the co-operating institutions and relevant NGOs;
- It should report on the progress of activities and projects agreed upon by the network members to the network and the Regional Co-ordination Unit;
- It will be the main channel of network information from members and the state of the art in the relevant thematic area.

Details of implementation to be carried out by the focal point will be finalised in consultation with the designated institute.

5.3 Criteria for the selection of the focal point

The criteria for the selection of the focal point include the following:

- Willingness and commitment to co-operate and contribute to the formulation of the RAP;
- Proven capacity (geographic representation, human resources skills, sufficient infrastructure);
- Activities must have direct bearing to combating desertification;
- Ability and readiness to co-operate and conduct joint and complimentary missions or activities with other institutions at regional and international levels;
- Ability to mobilise financial resources (and harmonise its activities with that of the network.

5.4 Selection process

As regards the designation of the focal point, the group recommends that the CCD-secretariat invite all specialised institutions to indicate their interest of being a focal point, and submit their offer to the CCD-secretariat on the basis of the criteria and role of focal point as agreed upon. It recommends that the secretariat has these applications at least three month before the Forum on African Regional Action Program to combat Desertification, to allow them to compile information on the applicants and submit the list to the Ministerial segment of the said event, who will select the focal point.

APPENDIX 4 / PAPERS PRESENTED

Atelier Régional sur la promotion de la gestion rationnelle des espaces pastoraux et le développement des cultures fourragères en Afrique.

Introduction générale à l'organisation de l'atelier

Mohamadou-MANSOUR N'DIAYE
Secrétariat de la CCD

Merci Monsieur le Président,

Cette introduction générale à l'organisation de nos travaux vise avant tout à rappeler les raisons pour lesquelles, les institutions spécialisées africaines ainsi que leurs principaux partenaires se retrouvent ici, à Addis-Ababa afin de discuter des principales questions liées à la gestion des espaces pastoraux et le développement des cultures fourragères dans le contexte de la formulation du Programme d'Action Régional de lutte contre la désertification.

Il n'est certainement pas de questions plus importantes pour l'Afrique tant elle recouvre des dimensions écologiques certes, mais également sociales, économiques, culturelles et souvent même politiques.

Certainement une façon de présenter cette problématique serait de procéder en trois temps :

- D'abord, nous dirons la justification ou si vous préférez les facteurs légitimant qu'aujourd'hui même on soit réuni ici, à Addis-Ababa.
- Deuxièmement, le contexte et là, il faudra rappeler avant même que l'on rentre dans le vif du sujet, ce que représente le Programme d'Action Régional de lutte contre la désertification, sa portée, sa capacité à renouveler la gestion de sujets cruciaux pour le développement de l'Afrique, et au premier rang les sujets du pastoralisme et des cultures fourragères.
- Enfin, troisièmement, cette présentation devra mettre l'accent sur l'apport des institutions spécialisées africaines à la formulation du P.A.R .

Monsieur le Président,

Au nombre des facteurs légitimant cette rencontre, il y a d'abord le texte de la Convention sur la lutte contre la désertification que nous avons tous sous les yeux. Ce traité beaucoup d'entre nous en connaissent les tenants et aboutissants ; mais y'aurait-il une seule institution, je dirais même une seule personne ici, pas tout à fait informée des dispositions de cette convention, notre devoir, au risque de nous répéter, est de rappeler ces fondamentaux de la C.C.D., ceci afin de nous assurer que nous parlons tous le même langage et disposons finalement du même niveau d'information.

Aussi, très rapidement, nous voudrions brosser le tableau qui relate le cheminement de la C.C.D. :

- D'abord, invoquer la Conférence sur l'Environnement et le Développement à Rio de Janeiro en 1992. C'est dans ce lieu précis que la Communauté Internationale avait accepté le principe d'élaborer un instrument qui fixe les conditions de lutte contre la désertification et l'atténuation des effets de la sécheresse.

- Depuis, cinq sessions de négociations ont eu lieu et la Convention a été finalement adoptée le 17 juin 1994. Il convient de rappeler qu'en même temps que l'adoption de la Convention, une résolution portant sur les mesures à prendre d'urgence en Afrique reconnaissait à cette région un caractère prioritaire dans la mise en oeuvre de la Convention, du à la manifestation grave de la désertification dans plusieurs pays. Toujours dans le chapitre du rappel historique, on peut retenir qu'en décembre 1996, la C.C.D. en tant que traité international avait recueilli les 50 premières ratifications nécessaires à son entrée en vigueur. Depuis, ce chiffre a été plus que doublé puisqu'au moment où on parle 128 pays ont ratifiés la Convention.

- Aux mois d'octobre-novembre 1997 s'est tenue la première conférence des Parties à la Convention (Rome- Italie) et la communauté internationale avait notamment bouclé le processus de mise en place des différents organes et institutions censés appuyer la mise en oeuvre de la Convention.

Cette année, précisément du 30 novembre au 11 décembre 1998, se tiendra en terre africaine (Sénégal), la deuxième conférence des Parties et l'accent sera mis tout particulièrement sur l'aspect programmatique, en d'autres termes, les pays Parties à la Convention examineront le niveau d'avancement dans la mise en oeuvre de la convention y compris le Programme d'Action Régional (Afrique) dont le processus de formulation sera un peu plus étoffé au sortir de cet atelier d'Addis-Ababa.

Monsieur le Président,

Voilà pour ce qui est du calendrier global. Il y a certainement des spécificités à relever notamment pour le P.A.R. où il s'agit de se conformer à une décision ministérielle prise à l'occasion de la Conférence Panafricaine sur la C.C.D. tenue à Ouagadougou en mars 1997. Une résolution spécifique indiquait en effet que la préparation du P.A.R. devait passer par une série de 7 ateliers thématiques qui ont été identifiés par des experts africains, approuvés par leurs autorités politiques.

L'atelier d'Addis-Ababa dont les institutions africaines spécialisées sont les principales animatrices est le troisième maillon de cette chaîne de 7 ateliers.

C'est ici que nous proposons d'aborder le deuxième aspect de cette Communication, celui que nous avons tantôt appelé le Contexte. Le contexte à l'évidence, c'est la formulation du P.A.R., mais il faut rappeler ces principes de base qui fondent la C.C.D. à savoir tout d'abord :

- Que la Convention sur la lutte sur la désertification est un cadre d'orientation qui est proposé aux pays touchés par ce phénomène. Ce cadre d'orientation va beaucoup plus loin que la simple réhabilitation des terres et le renouvellement des ressources naturelles. La C.C.D. tout en ayant ses limites peut être vue comme une autre façon d'approcher, de concevoir la problématique du développement, tout particulièrement en Afrique. C'est pourquoi, elle se veut avant tout la propriété de tous les acteurs concernés d'où cette formule consacrée qu'est l'approche dite de bas en haut, donc englobant tous les segments de la société.

- Autre principe de base, le processus participatif en d'autres termes s'assurer que les décisions prises sont l'expression des préoccupations du plus grand nombre.

- La Convention c'est aussi la recherche d'une forme de coopération renouvelée basée non plus sur l'assistanat voir l'aide conditionnée mais beaucoup plus sur le partenariat donc la gestion en commun d'un phénomène qui ne connaît pas de frontière et dont les incidences négatives sont perceptibles dans toutes les régions du monde.

Précisément, le Programme d'Action Régional que l'Afrique est en train de mettre en place est aussi en train de prendre forme en Amérique Latine et aux Caraïbes, en Asie et en Méditerranée Septentrionale.

De quoi s'agit-il ?

L'article 13 de l'Annexe Régionale pour l'Afrique donne une bonne orientation du contenu du P.A.R.. Il convient surtout de noter dès à présent et c'est très important pour la suite de nos délibérations, que le P.A.R. est essentiellement un cadre d'appui aux Programmes d'Action Nationaux et aux Programmes d'Action Sous-Régionaux. Pour ainsi dire, le P.A.R. n'a pas une portée opérationnelle, il est perçu dans la Convention comme un niveau continental de coordination des activités entreprises aux niveaux national et sous-régional.

Cela veut dire que toute la discussion et les résultats auxquels nous aboutirons au sortir de cet atelier devront mener à des activités qui ne sauraient entrer en conflit avec les autres niveaux cités.

D'où le besoin pour les institutions africaines spécialisées en gestion des parcours et le développement des cultures fourragères de se concerter et de s'entendre sur ce que peuvent être les composantes du P.A.R. dans ces domaines précis.

Bien évidemment, la question de cette concertation en vue d'une meilleure articulation des efforts déployés par ces institutions mène vers l'idée de la promotion de cette coopération inter-institutionnelle, encore convient-il d'alarmer tout le monde en insistant sur le fait que cette coopération sous forme d'un réseau à promouvoir il est important d'en déterminer les contours tant il est vrai que son interprétation peut porter à confusion.

Les principaux documents de référence qui seront présents ici évoqueront le sujet. Il s'agira alors de déterminer le rôle du réseau, fixer les modalités de son fonctionnement et surtout de démontrer sa valeur ajoutée dans la perspective d'une meilleure efficacité des actions entreprises par les uns et par les autres.

Sur ce sujet comme sur d'autres pour lesquelles les institutions ici présentes sont invitées à se concerter et à parvenir à une décision acceptable de toutes, Il y a certainement beaucoup à dire à commencer par l'expérience de chacune de ces institutions. C'est la raison pour laquelle, il a été proposé que des notes d'information soient préparées par toutes les institutions pertinentes, afin que celles-ci puissent nous dire non pas seulement ce qu'elles font, mais je dirais surtout comment elles font connaître ce qu'elles font tout particulièrement dans le contexte du P.A.R. de lutte contre la désertification.

Comment les uns et les autres agissent en vue de lever les contraintes qui pèsent sur le développement du pastoralisme et des cultures fourragères ?

En quoi peuvent-elles apporter leur contribution au processus de formulation du P.A.R. ?

Monsieur le Président,

C'est ici que nous touchons au point 3, le dernier de cet exposé relatif au rôle potentiel que chaque institution spécialisée peut tenir à l'échelle régionale.

Nous voudrions ici prendre le risque d'être un peu provocateur en espérant toutefois que cela sera perçu plutôt comme une marque d'intérêt au travail impressionnant abattu par les structures africaines agissant dans le domaine du pastoralisme et le développement des cultures fourragères.

L'institution qui nous fait l'honneur d'abriter nos travaux en est un exemple type tant sa réputation est internationale pour la qualité de son expertise et celle des femmes et des hommes qui y travaillent. Il en existe plusieurs autres aux 4 coins du continent. Et la provocation serait de dire : « Mais qu'avez-vous donc fait de toutes ces sommes de connaissances accumulées au fil des ans ? » Ne voyez-vous donc pas qu'au moment même où l'on est réuni ici à Addis-Ababa pour parler de gestion rationnelle des espaces pastoraux et le développement des cultures fourragères, les dernières dépêches des agences d'informations nous apprennent qu'il y a des risques de famine et d'hécatombe du cheptel dans certains pays africains.

Que d'expériences acquises pour déterminer ici les capacités de charge, définir là, la notion de surpâturage, mettre en exergue le problème du foncier pastoral expérimenter des modes de gestion avec une complexité scientifique redoutable et des résultats de base très intéressants. Des thèses entières ont été écrites sur les vertus du nomadisme comme remède inégalable contre le processus d'érosion des sols et la gestion durable de la couverture herbacée.

Où sont donc passées toutes ces méthodes mises au point dans les laboratoires et centres de recherches auxquelles ont été donnés le label de procédés adaptés aux écosystèmes fragiles et par conséquent bons pour la lutte contre la désertification.

On est en droit, Monsieur le Président, d'être d'autant plus provocateur, même impertinent qu'il est presque certain que sans l'écoute et l'application des mesures préconisées par nos institutions spécialisées on ne ferait qu'assister à la pérennité des politiques au coup par coup qui sont sans lendemain on le sait.

Cet atelier a donc le devoir à tout le moins de proposer les conditions de mise en place de projets d'envergure et de s'atteler à la formulation et à la mise en oeuvre de ceux-ci. Ce lieu, Addis Ababa devrait rester dans le processus du P.A.R. comme le moment de tirer des leçons de la situation actuelle. L'Afrique et ses partenaires sont

certainement intéressés d'entendre la voix des institutions spécialisées et l'ultime question Mesdames et Messieurs serait : que proposez vous comme marche à suivre pour qu'en sortant d'ici vendredi prochain on ait un tableau de bord précis indiquant ce que la gestion des espaces pastoraux et le développement des cultures fourragères peuvent apporter de plus et de mieux aux populations concernées à travers le Programme d'Action Régional de lutte contre la désertification.

Merci Monsieur le Président.

**INTERODUCTORY NOTE FOR THE REGIONAL WORKSHOP ON THE
RATIONAL USE OF RANGELANDS AND FOODER CROPS
DEVELOPMENT IN AFRICA IN THE CONTEXT OF THE ELABORATION
OF THE REGIONAL ACTION PROGRAMME FOR AFRICA (RAP/CCD) .**

ADDIS-ABABA (ETHIOPIA) , 4 – 7 AUGUST , 1998

**BACKGROUND PAPER ON THE OBJECTIVES, METHODS OF
APPROACH AND EXPECTED OUTCOMES OF THE WORKSHOP.**

BY

Dr MOISE AKLE, CONSULTANT

This paper has been prepared by Dr Moise AKLE , Consultant , with the financial support of the CCD Secretariat. The views expressed and suggestions made in the document are the ones of the Consultant and do it necessary represent those of the interim Secretariat.

Geneva, July 1998

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LIST OF ACRONYMS

ACSAD : Arab Center for Semi-Arid Drylands

ACDI/CIDA : Agency Canadienne pour le Developpement
International/Canadian
International Development Agency

ALESCO : Arab League for Education and Science

ASARECA : Association for Strengthening Agricultural Research in Eastern
and
Central Africa

CCD: Convention to Combat Desertification

CEBV : Communaute Economique du Betail et de la Viande

CEDARE : Centre for Environment and Development in Arab and European
Region

CEDEAO/ECOWAS : Communaute Economique des Etts de l' Afrique
de
l'Ouest/Economic Community of West African States

CGIAR : Consultative Group for International Agricultural Research

CILSS : Comite Permanent Inter-Etats de Lutte contre la Secheresse dans le
Sahle

CIRAD : Center International de Recherche Agronomique Pour le
Developpement en
Cooperation

CIRDES : Center International de Recherche - Developpement sur l'elevage en
zone
Sub-Humide

CNUED : Conference des Natioons Unies sur
l'Environnement et le Developpement

CORAF : Conference des Responsables de Recherche Agronomique
Africains

CRDI : Center de recherche pour le Developpement International

CTA : Center Technique Agricole (Wagenengen , Pays-Bas)

DMP : Deseert Margins Programme (ICRISA Sahelian Center)

DFID (ex-ODI) : Overseas Development Institute

EISMV : Ecole Inter-Etats des Sciences et Medecine Veterinaire de Dakar

EMASAR : Ecological Management of Africa Semi-Arid Rangelands (FAO /
UNEP ,
Project)

FAO : Food and Agricultural Organization , (United Nations)

FIDA/IFAD : Fonds International de Developpement Agricole

FST : Fertilité des terres de Savanes (Programme CIRAD)

GEF/FEM ; Global Environmental Facility/Food Mondial pour l'Environnement

GTZ : Agence Allemande de Cooperation

IBAR/OAU : Inter-African Bureau for Animal Resources (Organization of
African
Unity)

ICARDA : International Center for Agricultural Research in Drylands
Areas

ICRAF : International Center for Research in Agroforestry
 ICIPE : International Center for Insect physiology and Ecology
 ICRISAT : International Crop Research Institute Semi-Arid Tropics
 IEMVT : Institute d'Elevage et de Medecine Veterinaire des Pays
 Tropicaux
 IFPRI : International Food Policy Research Institute
 IGAD : Intergovernmental Authority for Development
 IIED : International Institute for Environment and Development
 IITA : International Institute for Tropical Agriculture
 ILRI : International Livestock Research

Institute

INSAH/CILSS :Institute du Sahel (CILSS)
 IPGRI : International Plant Genetic Resources Institute
 IRA : Institute des zones Arides (Tunisie)
 MAB : Man and Biosphere (Programme Unesco)
 ONG/NGO : Organization Non-Gouvernementale
 ORSTOM : Office de la Recherche Scientifique et Technique pour le
 Developpement
 En Cooperation
 OSS : Obsrvatoire du Sahel et du Sahara
 OSSREA : Organization for Social Science Research in Eastern Africa
 PAN/NAP : Programme d'Action National
 PAR/RAP : Programme d'Action Regionale
 PASR/SRAP : Programm d'Action Sous-Regionale
 PINEP : Pastoral Information Network Programme
 PRASET : Project Regional d'Appui au secteur de l'elevage Transhumant
 PVO/NGO/NRMS : Privater Voluntary Organizations and Non- Governmental
 Organizations in Natural Resources Management (a USAID funded Project)
 SACCAR : Southern Africa Development Community
 SADC : Southern Africa Development Community
 SAFGRAD/OAU : Semi-Arid Food Grain Research in Arid dry lands
 (Organization of
 African Unity ;
 SIDA : Swedish International Development Agency
 SALWA : Semi-Arid Low Lands of West Africa (ICRAF Programme)
 TOR : Term of reference
 UE/EU : Union Europeenne/European Union
 UEMOA : Union Economique et Monetaire Ouest Africaine
 UDEAC/CEMAC : Union Douaniere et Economique de l'Africa Centerale
 UMA : Union du Maghreb Arabe
 UNECA/CEA : Commission Economique des Nations Unies pour l'Afrique
 UNDP/PNUD : Programme des Nations Unies pour le Developpement
 UNSO/BNUS : Bureau du PNUD pour la lutte contre la Developpement
 USAID : United States Agency for Development
 WB (IBRD) : World Bank

INTRODUCTION

One of the major concerns regarding the livestock- Environment interactions to which African negotiations deserved some attention during the United Nations Convention to Combat Desertification process is certainly the question of the interactions between pastoralism and desertification.

Quite often, and notably in the Sahel region, cause-effect relations are established between the recurrent droughts, desertification and pastoralism crises. Assuming that desertification then was considered to be the continuous rangeland degradation and worsening pastoralism crisis, the current changes occurring in the production and natural resources management systems commonly in use in these ecosystems, which range from the maghrebian Steppes largely dominated by the alfa- grass to the South African veld throughout the Sahelian steppes characterized mainly by annual gramineae and thorny shrubs or the woody Savannah and the Highland grasslands of eastern and southern Africa (Ethiopia, Kenya, Tanzania, Drakensberg mountain in South Africa were not adequately addressed.

There is no doubt, that, besides their environmental impacts on the potential of rangelands natural resources, traditional pastoral crises have disrupted the economies of several African Countries. Consequently and in conformity with its main objectives, the United Nations Convention to Combat Desertification adopted in June 1994 in Paris, France has offered a good opportunity for a concentrated action to reverse this trend.

On the basis of efficient supporting measures at all levels, based on Partnership and International Cooperation arrangements, in the framework of an integrated approach compatible with Agenda 21, with a view to promoting sustainable development in affected areas, the CCD offers an opportunity to reverse this trend.

The purpose of this working paper is to provide information needed on the objectives, method of approach and expected outcome of the regional workshop for the rational use and management of rangelands and fodder crops development in Africa in the context CCD Regional Program for Africa.

I/ - THE WORKSHOP IN THE CONTEXT OF THE ELABORATION OF THE CDD REGIONAL ACTION PROGRAM FOR AFRICA.

A – Legal basis for convening the workshop and its specific objectives

1- Provisions of the resolution No.2 of the Ouagadougou Panafrican Conference on the RAP process for Africa.

The present workshop has been convened in accordance with resolution No.2 of the Panafrican Conference held in Ouagadougou, Burkina Faso in March 1997, within the framework of Africa's preparation to the CCD first Conference of Parties held in (Rome, Italy, October 1997) and the follow up in Africa of the UNCED outcomes (New York, June 1997).

The effective holding of the Workshop is a concrete response to provisions No.2 and 3 of the operative part of the aforesaid resolution, which invites in substance the CCD Secretariat:

- A) To facilitate the RAP process for Africa by networking all competent sub-regional and regional African institutions in various areas relevant to combat desertification and / or mitigate the effects of drought.
- B) To concentrate supportive efforts in areas of priority as identified by the Convention in its regional annex for Africa (Cf. article 13).

The Ouagadougou Pan-African Conference convened under the auspices of the Organization of African Unity (OAU) brought together more than 150 participants from more than 50 countries of the continent, co-operation partners for development and numerous African intergovernmental and international organizations as well as the NGOs.

2- The workshop's objectives and summary of the Convention provisions related to it.

- A) This workshop shall lay the foundation of a regional framework for exchange of information and experiences as well as for harmonization of scientific and technical activities and methods of approach in the fields of range management and promotion of fodder crops development in order to support the implementation of CCD programs to combat desertification at all levels in Africa. A short review and assessment on the status of regional co-operation in areas of range management and fodder crops development in Africa, imperative notably regarding the on-going initiatives and programs in preparation in various sub-regions of the Continent within the framework of National Action Programs and Sub-regional Action Programs.

Consistent with article 13 of the Regional Annex for Africa and in support of programs for combating desertification and / or mitigating drought effects at all levels the Workshop shall identify:

- D) Activities on issues which are better addressed at regional level in order to ensure a good promotion of range management and**

fodder crops development as a poverty eradication strategy in Africa's pasture lands.

II) A strategy for consolidation inter-institutional collaboration and for co-ordination of initiatives among competent African research and training institutions and centers in range management and fodder crops development. To achieve these tasks, the workshop should deliberate on these issues in accordance with the relevant provisions of the Convention which can be summarized as follows:

Article 13 (regional annex for Africa : P. 50-51)

The regional action program includes measures to combat desertification and/or mitigating the effects of drought in the following priority areas as appropriate:

- A) Development of regional co-operation and co-ordination of sub-regional action programs for building regional consensus on key policy areas, including through regular consultations of sub-regional organizations.**
- B) Promotion of capacity building in activities which are better implemented at the regional level.**
- C) The search for solutions with the international community to global economic and social issues that have an impact on affected areas taking into account article 4 paragraph 2 (b) of the Convention:**
- D) Promotion among the affected country Parties of Africa and its sub-regions as well as with other affected regions, of exchange of information and appropriate techniques, technical know-how and the relevant experience : promotion of scientific and technological co-ordination of sub-regional and regional research activities, and identification of regional priorities for research and development;**
- E) Co-ordination of networks for systematic observation and assessment and information exchange, as well as their integration into world wide networks.**
- F) Co-ordination and reinforcement of sub-regional and regional early warning systems and drought contingency plans.**

Article 3 : (Main Text ; Principles P.9)

In order to achieve the objective of this Convention and to implement its provisions, the parties shall be guided inter alia, by the following :

- A) The parties should ensure that decisions on the design and the implementation of programs to combat desertification and/or mitigate the effects of drought are taken with the participation of population**

and local communities and that an enabling environment is created at higher levels to facilitate action at national and local levels.

- B) The parties should, in a spirit of international solidarity and partnership, improve co-operation and co-ordination at sub-regional, regional and international levels, and better focus financial, human, organizational and technical resources where they are needed.**
- C) The parties should develop, in a spirit of partnership, co-operation among all levels of government, communities, non-governmental organizations and land holders to establish a better understanding of the nature and value of land scarce water resources in affected areas and to work towards their sustainable use.**
- D) The parties should take into full consideration the special needs and circumstances of affected developing country parties, particularly the least developed among them (LDC).**

Article 16: (Main Text : information collection, analysis and Exchange P.18)

The parties agree according to their respective capabilities to integrate and co-ordinate the collection, analysis and exchange of relevant short term and long term and data and information to ensure systematic observation of land degradation in affected areas and to understand better and assess the process and effects of drought and desertification. This would help accomplish , inter alia, early warning and advance planning for periods of adverse climatic variation in a form suited for practical application by users at all levels, including especially local populations. To this end , they shall, as appropriate.

- A) Facilitate and strengthen the functioning of global network of institutions and facilities for the collection analysis and exchange of information, for systematic observation at all levels, which shall, inter alias:
 - Aim to use compatible standards and systems.
 - Encompass relevant data and stations including in remote areas.
 - Use and disseminate modern technology for data collection, transmission and assessment on land degradation.
 - Link national, sub-regional and regional data information centers more closely with global information sources.**
- B) Ensure that the collection, analysis and exchange of information address the needs of local communities involved in these activities.**
- C) Support and further develop bilateral and multilateral programs and projects aimed at defining, conducting, assessing and financing**

the collection, analysis and exchange of data and information including inter alia, integrated sets of physical, biological, social and economical indicators.

- D) Make full use of the expertise of competent intergovernmental and non-governmental organization particularly to disseminate relevant information and experience among target groups in different regions.**
- E) Give full weight to the collection, analysis and exchange of socio-economic data, and their integration with physical biological data.**
- F) Exchange and make fully, openly and promptly available information form all publicly available sources relevant to combating desertification and mitigating the effects of drought,.**
- G) Subject to their respective national legislation and/or policies exchange information on local and traditional knowledge ensuring adequate protection for it and providing appropriate return from the benefits derived from it, on an equitable basis and on mutually agreed terms to the local populations concerned.**

Article 17 and 18 : (main Text Research and development, Science and Technology, P.19-22)

The convention encourages co-ordination in scientific research and the co-operation of transfer of technology, Articles 17 and 18 of the main text advocate a re-orientation of the activities in those areas that benefit the communities directly and to give a particular attention to the valuation of local knowledge and competence.

Article 19: (Section 3: Par 4: Supporting measure par 4, 22-24)

The conference of the parties shall establish and/or strengthen networks of regional education and training centers to combat desertification and mitigate the effects of drought. These networks shall be co-ordinated by an institution created or designated for that purpose, in order to train scientific, technical and management. Paragraph 4 of this article (p.24 of the English version) is of particular interest for all CCD/RAP workshops. It defines the modalities for a better supporting contribution to national and sub-regional action programs to combat desertification, notably through capacity building, education and public awareness. It indicates in particular that personnel to strengthen existing institutions responsible for education and training in affected country parties, where appropriate with a view to harmonizing programs and organizing exchanges of experience among them. These networks shall co-operate closely with relevant inter governmental and non-governmental organizations to avoid duplication of effort.

II/- OVERVIEW ON ISSUES AND PROBLEMS TO BE ADDRESSED AND BRIEF REVIEW OF THE STATUS OF REGIONSL COOPERATION IN THE

FIELDS OF RANGE MANAGEMENT AND FODDER CROPS DEVELOPMENT IN AFRICA.

B.1. Some aspects of key issues and problems to be addressed.

1.1. Issues and problems related to the environmental constraints

The main objective of the development of pastoral areas (they steppes or woodlands savannas) is to increase available livestock products in order to supplement the protein food needs of growing populations as well as the raise of the standards of living.

This important task should be achieved in accordance with the global context of promoting rational use and management of various productive agri-systems within a well articulated plan in the livestock sector including fodder crops development.

Thus, it is obvious to observe that the use of rangeland natural resources alone cannot provide the entire livestock products needed on a regular basis, despite the good potentials of pastoral areas, unless more work is done and technological innovations enhanced, including traditional knowledge of herders.

This is why there is a need for an improvement of pastoral development consisting of a better use of rangeland natural resources and the promotion of fodder crops development. In fact, during drought and food shortage periods of each year, there is a need to supplement animal feed requirements by fodder crops cultivated under dry-farming conditions or by irrigation. There is also a need for re-stocking to which animal science should contribute greatly by breeding and raising of productivity.

Nevertheless, the recent history of pastoralism in Africa, during the three last decades in particular, has shown its close linkage with the drought crisis of the second half of the 20th century and the large spreading of desertification in the continent, at such an extent that it poses a problem of survival of traditional pastoralism as the most adapted land use system in the region.

In fact, in several parts of arid and semi-arid drylands of the continent, drought constitutes an important factor of rangeland degradation and this was well illustrated by the impacts of the drought crisis of the 70s and 80s on the ecosystems and economies of the effected countries. Therefore, the major problems to be addressed consist in the prevention of the degradation phenomena of these rangelands, their regeneration where the process is already occurring or at an advanced stage, as well as the promotion of fodder crops development in the production systems.

These problems should be assessed and analyzed in such a way that could facilitate a better oriented and concrete action at the ground (studies and inquiries, valuation of research outcomes policies, integrated development of pastoral areas, etc...) as well as the reinforcement of regional of regional cooperation in the fields of training, extension services and public awareness raising.

1.2. Issues and problems related to land use systems and pastoral mobility.

Two types of land use systems can be identified in African drylands areas; one, almost concerning exclusively the use of rangelands as pasture lands, and the other as mixed farming system (agri-sylvi-pastoral activities) as well as other socio-economic activities such as mining, industrial development etc...

These two types of land use correspond roughly to arid and semi-arid conditions prevailing in the dryland ecosystems in which pastoral development is taking place in Africa.

However, since the diversity of human activities in these ecosystems do not respond to the drylands existing land use systems, they should also be considered in relation with the historical evolution of land management process which characterize their colonization.

Thus, the passage from multiple use for rangelands to its use as exclusively as pasture land is a direct consequence from the historical evolution of drylands economy since Neolithic period and its adaptation to mobility and transhumance. The passage to the exclusive use as pasture land and other economic development purposes was in conjunction with the frequency of drought episodes; this was often observed in the semi-arid margins of the Sahara desert such as in the Regueibat of South Morocco.

2- Brief review and assessment of regional and international cooperation in the field of range management and fodder crops development in Africa.

2.1. Experiences before the adoption of the United Nations Convention to Combat Desertification.

In the last 15 years, the equivalent of \$600 millions of US dollars from international development funds has been invested in the rangelands of Africa, in an attempt to develop strategy of resource exploitation that would be as efficient as traditional pastoralism, but that would also have a chance of coping adequately with the greatly changed conditions of late twentieth century African life. There is, however, very little to show for that investment.

Several reasons have been suggested for the failure of livestock and rangeland projects:

- A) Domestic livestock systems have undoubtedly been introduced into some areas which are ecologically unsuited to that form of land use.
- B) It has been difficult to design projects to the required geographic scope; pastoralists are highly mobile and their cultures; economies often transcend more than one political boundary.
- C) Pastoralist systems and rangeland ecologies are insufficiently respected as a basis for planning.

D) Projects intended to improve pastoralist conditions have frequently been poorly designed and executed; there are numerous examples where development and charitable institutions have attempted to assist rangelands inhabitants without adequately assessing or understanding the total system these people live and work within.

E) Projects have been imposed without an understanding of pastoralist societies and imposed to achieve objectives which have little to do with the objectives of those societies. Thus, and before the adoption of the United Nations Convention to Combat Desertification, the big cattle losses encountered in all important pastoral areas in Africa (particularly in the Sahel region), has shown clearly that the main constraints in pastoral economy are not only the ones relevant to animal health, pastoral water management or cattle trading facilities. Thus, the re-assessment of paradigms which subtend the pastoral development policies since the independence period in Africa has brought for instance the Sahelian countries and their partners to challenge the past strategies exclusively based on economic and technical options in the benefit of new approaches which took in account several dimensions of pastoral development including social and environmental aspects (organizational frameworks, formulation of rational rangelands management strategies etc...).

Equally, the severity of rangelands degradation in Africa's arid and semi-arid drylands has been emphasized during several international meetings held under the aegis of various organizations (e.g. UNESCO, IFAN, FAO, ILCA etc...); during these occasions, the economic role of rangelands as sources of natural forage resources and animal products at cheap cost was underlined. Analysis was based on geographical scope of arid and semi-arid lands in Africa and the traditional pastoral systems in use within these environments for animal production. In the context of the United Nations Environment Program newly created in that period, the launching in 1973 of the EMASAR project (Ecological management in Africa and Near East Semi-Arid Rangeland), with the objectives of promoting criteria and directives for the improvement of quantity and quality, as well as profitability of livestock development projects, taking in account all natural resources conservation needs.

On the other hand, research initiated in the field of sectorial and dynamic ecological systems has shown some interest and demonstrated the interactions between actions and variables intervening into the population dynamics, as well as the main problem of the acceptance of proposed measures by the pastoralists. ILCA (which is now ILRI), the French IEMVT, the British ODI, UNESCO, FAO, IFAD etc.. have completed several studies and research works on these various aspects, as well as the numerous NGOs created recently to deal with various aspects of the pastoralism crisis in Africa.

In 1976, the inter-African Bureau for Animal Resources of the Scientific, Technical and Research Commission of the Organization of African Unity

(OAU/STRC/IBAR), launched an important mapping project in cattle distribution, which illustrated the actions between the distribution of desertification phenomenon. Unfortunately, that project was abandoned since some years, and it was not possible to continue its completion due to lack of financial resources. Other multidisciplinary research programs such as IPAL projects in Kenya and Tunisia, or training projects such as the UNESCO project entitled FAPIS which was implemented by EISMV of Dakar, has facilitate the collection of a large quantity of data on rangelands management in the continent as well as their potential for socio-economic development.

During the 80s and 90s, several pastoral development approaches were tested, while the pastoral crisis was deepening, causing sedentarization, collapse of the traditional pastoral social system, poverty and the vulnerability of the majority of pastoralists and agro-pastoralists, with more and more agricultural practices extending to marginal lands previously reserved as rangelands for livestock activities and causing competition and conflicting relations among pastoralists and farmers. It was in that pastoral crisis context that process for negotiations for United Nations Convention to Combat Desertification was initiated in May 1993 following the historic Rio Conference on Environment and Development held in June 1992 with a real hope for a better future for African rangelands development.

2.2. Experiences since adoption of the United Nations Convention to Combat Desertification.

Since 1993, a series of technical consultations on pastoralism, mainly among technical advisers of bilateral and multilateral agencies for development, research institutions, NGOs and Sub-regional Organizations have been initiated under the aegis of UNDP/UNSO in order to promote, on a regular basis, exchange of views and experiences on the fundamental aspects of pastoralism in the developing world. Financial institutions such as the World Bank, or bilateral agencies such as GTZ, through PRASET PROJECT for instance, USAID through the PVO/NGO/NRMS PROJECT, are actively involved in studies concerning the evolution and future of pastoralism in Africa through international seminars and promotion of pastoral organizations.

In fact, these various initiatives, are all part of the new package of approaches for the implementation of the United Nations Convention to Combat Desertification and , as indicated in article 3 of the main text of the Convention, stress on the action to be promoted in order to facilitate sustainable development at community based organizations level, through the main CCD implementation instruments such as:

- Local Action Programs.
- National Action Programs.
- Sub-Regional and Regional Action Programs.

The implementation of the Regional Action Program for Africa offers a good opportunity for updating, enriching, promoting and re-orienting if needed, regional

and sub-regional existing initiatives for rational use and management of rangelands and fodder crops development in the Continent.

**A Review of the Economic Contribution of Pastoral Production Systems to the
National Economies in Sub-Saharan Africa¹**

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I. Introduction

Pastoral range-livestock production system is practiced in rangelands defined as “land carrying natural vegetation which provides a habitat suitable for herds of domestic or wild ungulates” (Pratt and Gwynne, 1977). Range livestock-production systems are production systems based on the use of natural vegetation via domestic animals, in particular ruminants. These production systems take the form of ranching systems as in North America and Australia, and of pastoralism as in arid and semi-arid parts of Africa. Pastoralism is a mode of production and a way of life for many people who derive most of their income or sustenance from keeping domestic livestock in conditions where most of the feed that their livestock live on is natural forage rather than cultivated fodder and pastures. In most cases pastoralists devote the bulk of their own and their families’ working time and energy to looking after their livestock rather than to other economic activities. In pastoral systems livestock are regarded as income generators, stores of wealth, security, and producers of milk and meat. Livestock also perform a crop input and a farm integration function (Doran et al., 1979; Low, 1980; Sandford, 1983).

Traditional nomadic and transhumant African pastoral systems in the arid and semi-arid areas make efficient use of the vegetative resources. They are more adapted to the environments to ensure feed and food security. The systems match the erratic and seasonal patterns of primary productivity with the continual feed requirements of livestock to achieve a regular daily food supply. Pastoralism involves various strategies that enable best use of grazing resources and spreads risks of losses in livestock wealth and it has mechanisms to cope with consequences. Some of these strategies include mobility at varying length at varying times of the year (with the whole or with parts of the herd) herd species diversification, herd segregation and dispersal, opportunistic herd maximization, and social networks for information and resource use and distribution (Jahnke, 1982; Oba, 1994; Desta, 1997).

The last 35 years have experienced a failure of pastoral livestock development projects across Africa. Millions of dollars have been spent with little or no returns. Many donors and other international agencies effectively abandoned the dryland areas in their international development efforts (Baxter, 1994; Watson, 1994; UNSO, 1994; Sandford, 1983 cited in Scoones 1995). But in the 1990’s there has been a renewed interest on the part of donors, governments and NGOs in pastoral development. This change in attitude resulted from research and development efforts which showed the sustainability and the appropriateness of mobile pastoral systems to the ecological realities of drylands, the economic importance of extensive pastoral production in marginal lands, and the high price one has to pay in terms of social, economic and environmental costs by neglecting pastoralists (ITC, 1996; Sandford 1983).

International research institutes and development investors are now more concerned about the increasing poverty,

system instability, environmental degradation, and food insecurity in African pastoral systems. The main causes for the system destabilization in the sub-Saharan pastoral system are commonly identified as population growth, increasing settlements and expansion of cropping, loss of grazing lands for non-pastoral purpose, recurrent drought and declining resource base (soil erosion, bush encroachment, water constraints, unpredictability of climate), policy and program failures (Webb et al., 1991; Reckers, 1977; Desta, 1997).

Up to 40 million people world-wide rely on animal-based economies; about half are African pastoralists (Sandford, 1983; Galaty and Bonte, 1991). Pastoralism is the dominant form of livelihood in arid and semi-arid Africa. Almost all pastoralists in Africa are found in countries that are categorized as least developed. Pastoralism has immense contribution to the national income, employment, agricultural production and food requirement of these countries.

Its contribution is, however, grossly underestimated. Several factors contribute to the underestimation of the contribution of pastoralism. The study of the economic contribution of pastoralism to national economies is necessary in order that it gets the due attention it deserves by planners and policy makers. Such a study also will help improve the condition of pastoralists, increase the off-take from the system through appropriate interventions, and to understand how it interacts with other sectors of the economy. In order to appreciate the economic importance of pastoralism, one should look into the productivity of the system in a more comprehensive and broader manner. Generally annual outputs from Africa's livestock (meat, milk, fiber, manure, traction and transport) are more than the value of its annual cereal outputs (Water-Bayers, 1992). In addition to easily quantifiable outputs, measurement of the benefit of pastoralism should include the productive employment of the rural population and its role in curtailing migration to urban areas. Migration of the adults to urban areas is a serious social and economic problem in most countries in Africa. The social and economic cost incurred to deal with this problem is extremely high. Moreover, the role of pastoralism to stabilize the rural social and economic situation needs to be quantified and included in the equations. Results from any methodology that does not attempt to capture all direct and indirect economic and social contributions of pastoralism are rather misleading and underestimate the overall contribution of the system.

The objective of this paper is, therefore, to review (based on available evidence) the economic contribution of pastoral production system to the national economies in sub-Saharan Africa. Section two addresses the economic contribution of pastoralism. We introduce the concept of total factor productivity (TFP) as a suitable approach for properly measuring the productivity of pastoral systems. The third section assesses the problems that constrain the development of pastoral production

system. Finally conclusions are given in the fourth section.

II Economic contribution of pastoralism

The economic significance of pastoralism is greatest in countries with a greater share of marginal land areas. Aridity or semi-aridity of the climate (a characteristic of the large part of the area of those countries) is a major constraint to the development of their economies. At the same time, the nature of the environment dictates the type of economic activity for the majority of the people. The main source of livelihood is livestock. For these countries pastoralism is a source of employment and income; a source of food and supplier of important nutrients for a large number of people; government revenue and export earnings. It contributes also significantly to the sustainability of farming systems by providing manure and draft power. In considering the importance of arid and semi-arid production systems and the significance of dynamic, non-equilibrium ecologies, we are talking of significant areas of land, supporting large numbers of pastoral livelihoods and contributing a large amount to national economies (Scoones, 1995).

The non-food outputs of livestock such as manure, drought power, blood, urine, etc. are not adequately valued, owing to the inherent difficulty of measuring and quantifying them in monetary terms. Most of the products of the pastoral systems are also either home consumed or locally traded. In addition, significant amount of livestock and livestock products are traded illegally across borders and do not enter into official national statistics. Therefore, the contribution of the pastoral system is often underestimated. Further, it is considered as inefficient system of production and pastoralists are regarded as irrational.

Planners often tend to overlook the multiple products of livestock in pastoral systems and compare only a small fraction of the output with the total production of the commercial sector and consider the pastoral sector as unproductive. Barrett (1992) has shown how planners in Zimbabwe equated the development of cattle production with increased beef production, while it constituted less than 5% of the total product of pastoralists, and compared it with virtually all of the product of commercial beef fattening ranches to arrive at misguided conclusions.

The conventional measures of economic contribution, like the GDP are not adequate to evaluate the contribution of pastoralism. These measures suffer from many weaknesses:

- i) Lack of accurate and adequate data on production, consumption and prices. The pastoral sector, like most sectors of the economy in developing countries, is not monetized and the outputs are

either consumed in the households or locally traded, they are not fully considered in the estimation of GDP.

- ii) Because of the existence of market imperfections, the market prices used for valuation of the output are significantly different from the appropriate social valuations.
- iii) The choice of appropriate exchange rate could be complicated because of existence of multiple exchange rate system and also the relative prices of non-traded goods and services are not fully reflected in exchange rates.

Another reason why the contribution of pastoralism is not well appreciated is because of lack of proper measurement of the productivity of pastoral systems. The productivity of pastoral systems has usually been measured in terms of market offtake, thus ignoring the food used for human subsistence (Cossins, 1985). Sub-Saharan pastoral systems have wrongly been perceived as inefficient and unproductive. This misconception arose mainly from lack of understanding of the multiple functions of livestock in pastoral systems, objectives of herders and inappropriate comparisons with western type commercial ranches. Proper measurement and assessment of agricultural productivity and the efficiency of alternative farming practices is essential to the long term understanding of the competitiveness and long term sustainability of pastoral systems in low income countries. Most productivity analyses of pastoral systems are based on partial measures such as market offtake per hectare). Such productivity measures can be misleading if considerable input substitution occurs. Although partial productivity measures provide insights into the efficiency of a single input in the production process, they mask many of the factors accounting for observed productivity differentials. As a consequence, in sub-Saharan Africa for example, pastoral systems are perceived as inefficient or unproductive.

A conceptually superior way to estimate productivity as well as efficiency is to measure total factor productivity (TFP). TFP is defined as the ratio of aggregate outputs to aggregate inputs used in the agricultural production process. TFP is a more accurate indicator of sector performance than a partial measure such as labor productivity or market offtake because it measures the relationship between total output and most inputs used in the production process. The rate of growth of productivity is obtained by subtracting (a cost share-weighted sum of) inputs from the rate of growth in output. Making this calculation allows economists to determine how much of agricultural output growth is due to using more agricultural inputs versus more dynamic influences such as technological change and improvement in efficiency of the production process. Knowledge about the trend in productivity growth of the pastoral system will inform us about the competitive nature of the system compared to other systems. From a policy viewpoint, a TFP analysis can focus on factors that enhance TFP growth, such as public investment in agricultural research and development.

There are two basic approaches to the measurement of productivity: the growth accounting approach, which is based on index numbers, and the parametric approach, which is based on an econometric estimation of production, cost or profit functions. We advocate the use of the index number approach for three reasons. First, with the index number approach, detailed data with many input and output categories can be used regardless of the number of observations over time. There are therefore no problems of degrees of freedom or statistical reliability in working with small samples. Second, there is no need to aggregate outputs into a single index, thus avoiding input-output separability assumptions. Finally, under certain technical and market conditions, the econometric and index number approaches are equivalent. Recent advances in growth accounting theory have shown that non-parametric methods do indeed impose an implicit structure on the aggregate production technology (Diewert, 1976, 1981; Denny et al. 1981; Ohta, 1974).

The major difficulty, however, with the index number approach is to derive aggregate output and input measures that represent the numerous outputs and inputs involved in most production processes. Earlier approaches to TFP used a Laspeyres or Paasch weighting system where base period prices were used as aggregation weights. However, the Laspeyres or Paasch indexing procedure is inexact except when the production function is linear and all inputs are perfect substitutes (Christensen, 1975; Diewert, 1976). A better alternative is to use an index-number that is exact for linear homogenous flexible functional forms for those aggregator functions that are comparable of providing a second order approximation to an arbitrary twice differentiable for action (Christensen et al. 1975). The class of indices with this property has been termed "superlative" by Diewert (1976). The most popular indexing procedure is the Divisia index, which is exact for

the case of homogenous translog functions (Capalbo and Antle, 1988). The translog function does not require inputs to be perfect substitutes, but rather permits all marginal productivities to adjust proportionally to changing prices. Hence the prices from both production systems being compared enter the Divisia index to represent the differing marginal productivities.

There have been relatively few applications of this approach in the context of farming systems in low-income countries. Ehui and Spencer (1993) have used the Divisia approach to TFP to measure the sustainability and economic viability of alternative farming systems in Nigeria. Ehui and Jabbar (1996), used this approach to assess the impact of livestock on the sustainability of alley farming (an improved agroforestry system) and traditional bush fallow systems. Recently Gavian and Ehui (1998) used the superlative index approach to determine the relative efficiency of alternative land tenure arrangements in Ethiopia (see Ehui, 1998 for a comprehensive review of this approach). However this method has been used to measure for example the sources of agricultural productivity growth in the United States (Ahearn, 1997).

The following sections discuss the economic contribution of pastoralism in terms of:

- employment and income
- government revenue and exports
- source of food
- non-food outputs
- inputs for sustainable agriculture
- efficient and environmentally sustainable use of scarce and marginal resources

2.1 Employment and income

Pastoralism is defined as an economic system based on animal husbandry in which households derive more than 50% of their income from livestock and their products, and a substantial part of their diet from home-produced meat, blood, and milk products (Sandford, 1983). Pastoralists may also engage in cultivation, salaried labor, and trade to varying degrees to supplement their income from livestock (Webb et al, 1991). Arid and semi-arid regions of sub-Saharan Africa represent roughly 55% of Africa's land area, but account for over 59% of its livestock (Jahnke, 1982). Five per cent of the total population of sub-Saharan Africa (about 29 million people) are estimated to be pastoralists. They are concentrated in the arid and semi-arid areas of East and West Africa (Winrock, 1992). For example the lowland parts of Ethiopia constitute two-thirds of the country's land area, out of which 85% (600,000 km²) is occupied by pastoralists. There are about 6 million (more than 10% of the total population) pastoralists in Ethiopia, who depend on 6 million cattle, 6 million sheep, 13 million goats, and more than 1 million camels to support their livelihood. In Ethiopia, although the pastoral areas have fewer animals than the highlands they play an important role in the national economy (Coppock, 1994). Overall the Ethiopian highlands are considered as livestock deficits areas with the pastoral areas as the major source of supply of livestock for draught, meat and breeding animals (FLDP, 1990).

In Nigeria, approximately eleven and half of the country's fourteen million cattle are managed by pastoralists (FDLPCs, 1992, cited in Blowfield and Donaldson, 1994). Livestock and livestock products from pastoral areas are exported abroad often through intermediaries. In Somalia over 70% of the population practice pure pastoralism (Reusse, 1982). Therefore, the pastoral livestock production system is the backbone of its national economy. Its contribution is a net value added to the GDP since it comes from rangeland resources produced and marketed with little input from outside the system (Elmi, 1991). In Sudan pastoralism contributes considerably to the national economy and supply domestic markets with meat, milk and hides. There are 3.5 million pastoralists representing 14.1 % of a total population of about 20.6 million (NOPA, 1992). See appendix table 1 for a population of pastoralists in some selected SSA countries.

2.2 Government revenue and exports

In Ethiopia pastoralists pay livestock taxes to the state. Before 1974 they were administered and paid taxes through the clan leaders. But since then local associations and state officials collect the taxes. The taxation is based on the number of animals a pastoralist owns. Livestock sales tax and livestock marketing fees are also other sources of government revenues. Cattle tax collected from pastoral areas in 1969 contributed 3% of the total direct tax revenue from agriculture (Fekade, 1994). However, because of absence of market and transport facilities in the pastoral areas and ethnic diffusion of pastoralists across national boundaries, significant amount of livestock and livestock products are exported illegally and hence are not accounted for in national statistics. A study of the Ethiopian Ministry of Agriculture (MOA, 1985) estimated that the annual illegal export of livestock to neighboring countries is about 55,000 cattle and 330,000 sheep and goats. Other studies put the estimate at 260,000 cattle and 1,200,000 sheep. The study estimated that these illegal exports represent a gross foreign exchange loss to the Ethiopian Government of US\$ 44 million per year. After adjustment to FOB values for compatibility with published trade statistics, this is equivalent to 450% of recorded livestock exports and 9% of total recorded exports in 1983 (MOA, 1985).

In Somalia pastoralism contributes more than 60% to the gross domestic product (GDP) and 80% to the country's exports (Reusse, 1982). In 1986 livestock contributed 10-12 % of the GDP and 23.5 % of foreign exchange earnings from export of live animals and meat in Sudan (Salih, 1991). Similarly in Chad pastoralism contributes 12.5 of the GDP and more than 30% of the exports. Table 2 shows the contribution of pastoralism to the GDP and export earnings of some SSA countries.

2.3 Means of saving and investment

For many countries, livestock are also used as a means of saving and capital investment in areas where there is no credit and banking services and they are also signified as social or cultural assets. Cattle may be a good investment in unstable political and economic circumstances. In western Zambia, the return from investment in cattle goes up to 10% with protection against inflation and with considerable income from use benefit 20-30% of the value of the animal (Wood, 1989). It is a common practice for civil servants and other urban residents in Lesotho to invest in extensive livestock production, as they believe it is remunerative and a hedge against inflation under unstable financial market situations. However, Gardiner and Cavalho (1990) noted that with expansion of financial services and decrease in transaction costs to households in Lesotho, more producers would find financial institutions advantageous. Similar situation also prevails among Boran of southern Ethiopia (Desta, personal observation).

Herd maximization is one of the traditional pastoral strategies to maintain sufficient livestock reserves to rebuild herds lost to drought, disease and raid. Fratkin and Roth (1990) and Roth (1996) revealed the effectiveness of this strategy among the Rendille during 1984/85 drought in Northern Kenya. However, Roth (1996) noted the insufficiency of this strategy if not combined with the other traditional pastoral production strategies, such as mobility, diversification and dispersion (redistribution). Fratkin and Roth (1990) reported that wealthy Rendille herd owners suffered a higher livestock loss in absolute numbers but proportionally lower or equivalent compared to the poor and the middle pastoralists. They both noted increased polarization of wealth classes among the Rendilles following the 1984/85 drought. This contradicts the widely accepted "truth" of "environmental egalitarianism" of African pastoralism. In contrast to the above argument of differential livestock loss to drought, Sperling (1989, cited in Roth 1996), reported that Samburu pastoralists in the 1984/85 drought suffered no differential animal loss, based on pre-drought herd size. Despite the ongoing debate on the effectiveness of herd maximization strategy and its social, economic and ecological consequences, under the current situation of growing population and declining grazing lands available for pastoral use, there exists a lot of evidence that drought losses of livestock amounts to in excess of 50 % of pre drought inventory (Fratkin and Roth 1990, Roth 1996, Coppock 1994, Desta 1998). The effectiveness of herd maximization strategy may vary for different ecological situations i.e., equilibril situations as in Borana (Coppock,1994), non-equibrilial as in Turkana (Ellis 1993) and a mixture of equilibril and non-equibrilial as in Zimbabwe (Scoones 1993).

2.4 Source of food supply and nutrition

Animals are a significant source of food, particularly of high quality protein, minerals, vitamins and micronutrients, for the majority of African peoples. Animal products are of much greater importance to the diets of pastoral peoples and among groups with high animal-to-people ratios. The value of dietary animal protein goes beyond its proportionality in diets, because it contains amino acids essential to human health that are deficient in crops (Winrock, 1992). Milk production is the most important function of livestock in pastoral systems. It forms an important part of the diet; its share ranges from 25 to 76% of total consumption according to season and ethnic group (Swift, 1979; Sandford, 1983). Animals in pastoral areas also make indirect contribution to human nutrition. Sales of livestock and milk are the primary source of cash income that pastoralists use to buy food grains. In many cases sales of livestock and pastoral products are the main sources of purchasing power used by the pastoralists to acquire food and non-food items from outside their own sector. Many poor herders rely on the sale of their stock, much through unofficial channels and through barter, to buy cereals to supplement their diet (Behnke and Lane, 1993).

2.5 Non-food outputs

Livestock provide not only foodstuffs but also various other raw materials such as wool, hair, hides, feathers and bones which can be used for clothing, furnishings, implements etc., for both household use and for sale. The added value of processing such raw materials can be a further source of income for both men and women within rural communities (Waters-Bayer and Bayer, 1992).

2.6 Sustainability of Agriculture and increased farm productivity

In agropastoral parts of sub-Saharan Africa herders keep their animals mainly for manure and draft power. With the expansion of cultivation in the traditionally pastoral areas, pastoralists in sub-Saharan Africa are at the border to mixed farming. Out of 79 surveyed households in one district in Borana plateau of southern Ethiopia 70% are involved in crop cultivation to augment their income (Desta, 1997). Pastoralists develop arrangements with crop farmers, whereby the pastoralists have access to the crop residues and crop producers benefit from the recycling of nutrients to the soil via animal manure. Both the crop and animal systems are managed by distinct decision makers, but decisions are closely interrelated (FAO, 1996). For example, Mambara farmers in Mali have managed to expand production of fast growing millet, without any chemical fertilizer, by having wells dug in their fields to attract transhumant herders to camp there during the dry season. The increased manure deposits brought additional millet yields worth up to seven times the cost of well digging (Toulmin, 1983). Cossins (1985) estimated that 3-5 t/family/year of animal manure is readily available from Borana encampments where the night enclosures are cleaned out daily. The animal manure contains at least 1% N, which adds 600-1000 kg grain/ha to present yield levels if applied at about 2 t DM²/ha.

Moreover, the pastoral system provides the animals that are used for draft purposes in other production systems such as pulling agricultural implements, threshing, transportation, and pumping irrigation water. These two important outputs of pastoralism are not accurately valued in measuring the contribution of pastoralism or are wrongly included in the crop sector to inflate its value added.

2.7 Efficient and sustainable utilization of scarce and marginal resources

Traditional nomadic and transhumant pastoral systems, which prevail in the arid and semi-arid zones of Africa, make efficient use of the vegetative resources of the zones. In the vast semiarid or arid areas where

² DM= dry matter

crop production is extremely risky, livestock use vegetation that would otherwise be wasted and convert it to valuable, high-quality products. Based on extensive mobility and ecological opportunism, pastoralism capitalizes on its ability to transform scarce resources into economic goods and calories (Webb et. al, 1991).

High stocking rates were considered to cause low productivity and degradation of the rangelands. Waters-Bayer and Bayer (1992) argue that the conventional measures of productivity which are based on products marketed in a “modern” economy are inadequate because they ignore many of the other use values of the rural economy. When all the benefits are included in the calculation, “traditional” systems can be more productive than modern ones-particularly if calculated per animal or per unit of land (de Ridder and Waagnar, 1984, cited in Waters-Bayer and Bayer, 1992). Yet even if productivity calculations include only food output, it has been found that traditional livestock systems in semiarid Africa can yield up to ten times more protein per hectare than ranching in comparable region of the United States or Australia (Berman and de Wit, 1983, cited in Waters-Bayer and Bayer, 1992). Cossins (1985) and Bhenke and Lane (1993) others have shown that the pastoralist system is more productive per unit of land than modern industrial ranches. The pastoral Borana of southern Ethiopia produce about 2 kg AP³/ha/yr compared with about 1.9 kg AP/ha/yr from ranches in Laikipia district of Kenya. In terms of energy output the Borana pastoral system produces about as much animal protein as, and 56% more energy per unit area than commercial ranching in Kenya’s ecologically equivalent Laikipia district, and does so more cheaply (Cossins, 1985). A summary of studies comparing the productivity of pastoral system with modern ranches is shown in table 3.

Views about the rationality and functioning of the pastoralist system are increasingly gaining ground. It is now acknowledged that pastoralists are making a relatively efficient use of the rangeland resources, although substantial increases in output are improbable and partial interventions are rarely successful (FAO, 1996).

III Constraints to livestock pastoral development

A number of interrelated problems are threatening the sustainability of the pastoral production system in sub-Saharan Africa. There is a concern that traditional African pastoralism is now in crisis (Sandford, 1983; Little, 1985; Hogg, 1986; Desta, 1997). African pastoral systems are currently experiencing increasing instability, poverty, and environmental degradation. The main causes of change in the sub-Saharan pastoral system are commonly identified as population growth, increasing settlements and expansion of cropping frontiers, loss of grazing land for non-pastoral purpose, recurrent drought and declining resource base (soil erosion, water constraints, bush encroachment, unpredictable weather), and policy and program failure (Webb et al, 1991; Desta, 1997).

Table 4 shows the Borana pastoral system trend over the past 17 years as perceived and described by the Boran respondents (N=79). Sixty-four of households interviewed (81% of the respondents) expressed lack of confidence on livestock production as the only source of income and consumption to support their family in the future. Recurrent drought, declining annual income from livestock, decreasing grazing lands and a declining productivity of the herd over time mentioned as major factors for lack of confidence on livestock as a means of livelihood. Eighty seven percent of these households are involved in one or other form of non-pastoral income generating activities; out of which 70% are engaged in cultivation. Although the pastoralists are focusing on cultivation as a response to past drought and famine in the area, it may not be the best and appropriate diversifying component to livestock to stabilize variability in income and smoothen consumption as it is also affected by environmental perturbations (Desta, 1997). It may also not be the best alternative in terms of being appropriate to the ecosystem and of sustainability using the arid, marginal environments.

Pastoralists are believed to have lower population growth rates than farmers. But they also have very low emigration rate out of the system. Nevertheless, growth in milk production is lower than population and it is becoming increasingly difficult to support the growing population. The future of pastoral areas will be difficult without the development of investment and employment opportunities outside livestock production

³ AP= Average protein

(Coppock, 1994). As livestock-to-people ratio decline, social networks are unable to assist those families that fall below self-sufficiency and recovery (Desta, 1997; Oba, 1994). Pastoral planning must address this issue and develop strategies that allow poor households or individuals to move successfully between livestock production and other economic activities (Jahnke, 1982; Coppock, 1994; Swift, 1995). Population growth in the non-pastoral sector has increased the demand for food and expansion of cultivation into the grazing lands. The cropping frontier is not pushed out solely by farmers, but also by pastoralists who become more sedentary due to development schemes or pauperization, are pushed from arid and semi-arid areas by drought, or adopt cropping as a means of diversifying their income sources (Webb et al, 1991). The fact that land use rights are gained by cultivation is restricting the mobility of pastoralists, which is the essential element of the pastoral system. Population growth has increased the competition for the meager feed and water resources leading to conflicts between farmers and pastoralists and also among pastoralists themselves. Land tenure systems must provide livestock producers as well as cultivators with rights to land, particularly in dry-season grazing areas (Winrock, 1992).

In addition to the “normal” exigencies of livestock husbandry there is the overwhelming risk of the catastrophe which either takes the form of prolonged drought reducing carrying capacity and production dramatically or of sweeping disease decimating the herds (Jahnke, 1982). Low rainfall and series of drought have decreased the productivity of rangelands and feed availability. Annual rainfall through out Gourma region of the Sahel has been below average for two decades, and this climatic drying explains the decline in rangeland productivity and the associated structural and floristic changes that have taken place (Hiernaux, 1996). Apart from rainfall risks, there are also environmental risks associated with wild ungulates and disease, property risks that a household or group will lose access to or control over resources and market risks that the terms of trade by which pastoralists exchange livestock products for production inputs and subsistence goods will worsen (Ehui et al., 1994). But livestock and pastoralist are blamed for these changes, with drought being considered merely an aggravating factor. Pastoralism has been accused of a variety of environmental sins that are often aggregated under the term ‘desertification’ (Ehui et al., 1994). Herd maximization, diversification of species of animals, and keeping a large proportion of females among all species are some of the responses of pastoralists to the risks.

Generally governments’ attitude towards pastoralism does not favor pastoralists. Both governments and financing organizations seem to favor sedentary (crop agriculture) over mobile livestock herding. This emanates from apparent sedentary/crop bias in rural development thinking and practice which regard crop farming as the future pastoral regions (Dietz, 1987). Many development interventions are blamed for causing more problems than they solved, such as reducing food productivity, increasing degradation, and increasing pastoral vulnerability to food insecurity (Sandford 1983; Snow, 1984; Ellis and Swift, 1988). Pastoralists move in response to environmental constraints. Interference with pattern of herd mobility will necessarily produce a decline in herd performance, unless restrictions on mobility are offset by the availability of new inputs which dampen seasonal and inter-annual resource fluctuations in the area of settlement (Bhenke and Lane 1996).

Morris (1988) states that many of the interventions have shown very poor fit between the technologies being promoted and the recipient systems. He lists the points of friction as:

- The preoccupation of project intervention with cattle, to the exclusion of small ruminants and camels;
- An end-sale meat production orientation whereas indigenous systems emphasized production of milk and breeding stock;
- Promotion of rotational grazing in environments where this practice increased risks and did not outperform indigenous grazing methods;
- lack of technical solution for period of extended drought ;
- failure to protect pastoralists terms of trade vis-à-vis grain producers, especially evident in dry years;
- introduction of unsuitable breeding stock requiring high management skills;
- rapid deterioration of facilities provided to pastoralists;

- inability to offer attractive prices to superior stock.

Development interventions should be based on sound understanding of the special conditions of pastoralists and their objectives. They should focus on the minimization of the risks posed on the system instead of on increasing market offtake. The basic limitations on livestock productivity in pastoral areas are set by the combination of livestock density and the environment, not by the pastoralists only (Coppock 1994).

IV. Conclusions

Pastoralism is an efficient system of livestock production because the vast semiarid or arid areas where crop production is extremely risky, livestock can use vegetation that would otherwise be wasted and converts it to valuable, high-quality products. It is a system of production that is well fit into the environmental condition.

Pastoral system contributes a lot by providing food, employment, and cash income to a large number of people in sub-Saharan Africa. It contributes to export income, government revenue and GDP. It also provides important inputs to other production systems such as manure and draft power, which contribute to the sustainability of farming systems.

However, its contribution has been underestimated because products such as milk, blood, skins, manure, draught power are either home consumed, locally traded or used in other production process and hence very few officially recorded offtake. Lack of understanding of objectives of pastoralists and inappropriate basis for comparison of productivity of pastoral system with commercial ranching have contributed to underestimation of its economic contribution. A productivity analysis based on the total factor productivity approach (instead of partial measures such as offtake per unit of land) will be necessary to assess the productivity of pastoral areas.

The value-added method is the most common method used for estimating the GDP by economic activity. It involves the valuation of gross output of the sector and deducting the cost of intermediate inputs used in the process of production. Arriving at an accurate figure of sectoral GDP is a complex task. Usually, compiling the gross value of final output of each sector is based on estimates and sample surveys. Therefore, improving the information gathering system would allow better data to calculate the contribution of pastoralism.

Development interventions should be based on sound knowledge of pastoral systems and its productivity. They should involve local communities and focus on increasing input instead of output into the pastoral system.

Webb et al. (1991) argues that to achieve sustainable growth in pastoral Africa the focus should be on increasing inputs rather than outputs. He further argued that new policies and programs, rather than aiming to increasing productivity and output per unit animal, can focus on reducing the risk of output losses, even at current levels of productivity, particularly during drought. Given high population growth rates, drought impacts, the poor performance of public interventions, and ongoing resource degradation, the more immediate priority must be a stabilization of current condition.

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Table 1: Population of pastoralists in selected sub-Saharan African countries (in million)

Country	Total population	Pastoralist population	% of total
Burkina Faso	9.0	0.5	6
Chad	0.5	1.0	20
Djibouti	5.7	0.1	15
Ethiopia	49.2	5.0	10
Kenya	24.0	3.5	15
Mali	9.2	1.0	11
Mauritania	2.0	0.3	15
Niger	7.7	1.0	13
Senegal	7.3	1.0	13
Somalia	7.5	4.5	60
Sudan	25.2	3.5	14
Tanzania	27.3	0.5	1
Uganda	18.8	0.6	3
Total	193.4	22.5	12

Source: NOPA, 1992

Table 2: Contribution of pastoralism to GDP and export in some SSA countries

Country	Contribution to GDP (%)	Contribution to export (%)
Burkina Faso	12	5.4
Chad	12.5	30
Djibouti	3	NA
Sudan	12	23.5
Somalia	60	80

Table 3: Comparisons between ranching and pastoral production systems in Africa

Country	Comments	Source
Zimbabwe	All studies show that the value of the communal area (CA) cattle production far exceeds returns from ranching. If actual stocking rates are used, CA returns are 10 times higher per hectare.	Danckwerts(1974) Jackson (1989) Barett (1992) Scoones (1992a)
Botswana	Communal area production (in cash, energy and protein terms) per hectare exceeds by at least three times per hectare returns from ranches, even though technical production parameters are lower. The difference in soil erosion levels between the two production systems is negligible, despite differences in stocking rate.	Rennie et al. (1977) Carl Bro (1982) Hubbard (1982) De Ridder and Wagenaar (1984) Abel (1993)
Mozambique	Traditional systems have higher overall returns per hectare because of the multiple benefits of draught, transport, manure, milk and meat compared to the single beef output from ranches.	Rocha et al. (1991)
South Africa	Cattle production systems in the Transkei show higher returns per hectare, but lower productivity indicators, compared to ranches on a per hectare basis.	Tapson (1991, 1993) Richardson (1992)
Kenya	Gross output levels in individual ranches and undeveloped group ranches are comparable. Maasai multi-product outputs are higher than ranches on a per hectare basis.	De Leeuw et al. (1984) Bekure et al. (1991) Western (1982)
Tanzania	The productivity of pastoral herds in the Ngorongoro Conservation Area were found to be comparable to commercial herds. The patterns of productivity were similar to those found in Kenyan Maasai herds. Similarly high levels of productivity were found among livestock in Sukumaland.	Birley (1982) Homewood and Rogers (1991) Homewood (1992)
Uganda	Recalculations of figures to include the full range of costs and benefits show that dollar returns per hectare under pastoralism are two times higher than for ranching. Dollar returns per animal are a third higher.	Ruthenberg (1980) Behnke (1985a)
Ethiopia	The pastoral Borana system has higher returns of both energy and protein per hectare compared to industrialized ranching systems in Australia. Australian Northern Territory ranches realize only 16% of the energy and 30% of the protein per hectare compared to the Borana system.	Cossins (1985) Upton (1989) Cossins and Upton (1988)
Mali	The transhumant pastoral systems yield on average at least two times the amount of protein per hectare per year compared to both sedentary agropastoralists and ranchers in the US and Australia.	Berman and de wit (1983) Wilson et al. (1983)

Source: Scoones (1995).

Table 4: Trends in the Ethiopian Borana pastoral system

Description	No change N (%)	Increasing N (%)	Decreasing N (%)
Availability of milk for people	1 (1.3)	1 (1.3)	77 (97.5)
Availability of milk for calves	3 (3.8)	1 (1.3)	75 (94.9)
Availability of grain for market	1 (1.3)	60 (75.9)	18 (22.8)
Dairy sales		47 (62.0)	29 (38.0)
Thievery/raid of livestock		3 (3.8)	75 (95.0)
Human population	2 (3.8)	76 (96.2)	
Need for cash income	1 (1.3)	78 (98.7)	
Cattle health		68 (86.0)	11 (14.0)
Cattle mortality		4 (5.1)	74 (94.0)
Cattle population		65 (82.3)	14 (17.7)
Sheep production		37 (46.8)	42 (53.2)
Goats production		41 (51.9)	38 (48.1)
Camel production	1 (1.3)	65 (81.2)	13 (16.5)
Cultivation of grain		79 (100)	
Hunger of people		23 (29.0)	56 (71.0)
Availability of grazing land	1 (1.3)	1 (1.3)	77 (97.5)
Urban employment	3 (3.8)	62 (78.5)	11 (13.9)

Source: Solomon Desta ongoing research

CONVENTION TO COMBAT DESERTIFICATION
(UNCCD)

Regional Programme of Action for Africa

Rational management of rangelands and development of fodder crops in Africa.

(ILRI, Addis Ababa, Ethiopia, 4 – 7 August 1998)

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This document is intended to contribute to the preparation of a workshop to help define the Regional Programme of Action for Combatting Desertification (RPA), under the aegis of the Convention for Combatting Desertification (CCD) in Africa.

We have, therefore, been requested to write a report on the status of the management of rangelands and the development of fodder crops in the major regions of Africa, together with a critical analysis of past experience and current initiatives. This necessarily involves:

- Considering the main aspects of problems of continental importance in the two areas;
- Conducting a comparative study of the technological options which exist and of the dissemination of technology in Africa through the framework of institutional policies, giving proposals for integrated approaches;
- Considering the future prospects of the livestock sector, taking into account the problems identified.

The study should also include:

An overview of the situation of rangelands in Africa, with:

- a – current modes of use and possible conditions for sustainability;
- b – a study of the progress achieved towards their more rational use and management;
- c – the economic potential of pastureland in the context of the RPA and the CCD.

The prospects for the development of fodder crops in Africa, with:

- a – any significant progress achieved;
- b – the promotion of networks to develop research and conservation strategies in view of technological changes/adaptations
- c – the management and/or development of regional or sub-regional programmes for germplasm exchange.

The complete terms of reference for the study are given below.

BACKGROUND - INTRODUCTION

Although there are differences between the regions, all of sub-Saharan Africa is dependent on imports for its supply of livestock products. Imports of meat alone (460,000 tons) represented an outflow of approximately FF 12 billion (1.8 billion ECU) in 1994. Moreover, given the differential growth rates of production and population, this deficit is likely to increase significantly.

Despite this, average meat consumption is still very low and decreasing, particularly given the effects of inadequate local production and the insufficient accessibility of products. Annual per capita meat consumption is 12.75 kg on average, a drop of around 5 kg over the last three years, as compared to 80 kg in the developed countries. Minimum nutritional needs may soon not be met.

An average increase of only 20 % in meat consumption would require approximately FF 26 billion (4 billion ECU) in additional imports per year. In regions such as East Africa, which are net exporters of meat, the trends are similar, and are having a negative effect on foreign trade.

If nothing is done to remedy the situation, there will be very serious medium- and long-term macro-economic consequences on the populations of Africa, with drastic repercussions in human terms. African livestock production, which represents no more than 5 % of world production, is still primarily based on cattle or small ruminants concentrated in the arid regions. Production levels are low and unreliable, depending, as they do, on the rains.

Africa's environment is fragile and susceptible to erosion, but has a significant capacity for regeneration. Livestock is often the only way of making use of the land and the major, if not the only, source of income for local populations. Traditional pastoralists have adapted to the hazards of their environment by using very specific systems developed over thousands of years, which have indeed become ways of life: they move to find water and pasture, they have large herds to compensate for losses, their social organisation is both collective and hierarchical, promoting cohesion and mutual assistance, as well as the trouble-free transfer of livestock as capital, and their land and watering places are strictly distributed. If their system is to be preserved, their animals have to be fed and watered.

Feed (that is, fodder availability) is recognised as being the greatest constraint on the development of animal production in the region (seminar on the study of constraints on the development of animal production in sub-Saharan Africa, Abidjan, February 1997). In many areas, fodder is only available for short periods of the year, and is much less nutritional during the dry season. It is a fact that ruminant production in sub-Saharan Africa depends mainly on the availability of fodder: natural pasture, harvest or crop residues, agro-industrial by-products, tree fodder, etc., all of which depend on the climate.

The current ecological crisis is thus leading to a shortage of resources, which creates ever greater competition for space between agriculture and livestock. The result of this is a multitude of conflicts and friction between different groups claiming the same rights over the resources they need to survive; which necessarily demands the attention of the authorities.

In Senegal, for instance, Decree No. 80-268 governing the organisation of rangelands and establishing the conditions for the use of pastures, attempted to attenuate these conflicts by establishing areas reserved for livestock within village lands. These areas consist of "all the free space used or likely to be used to feed animals".

However, vegetation has been as much affected by environmental degradation in the pastoral and agro-pastoral zones as have the fauna and the soils. The causes of this degradation include the arid conditions, and unreliable rainfall is a predominant factor.

Conventions on the environment, particularly the Convention for Combatting Desertification (CCD) and the Convention on Biological Diversity, provide Africa with opportunities which must be exploited to their fullest extent, so as to ensure the best possible management of rangelands and the development of fodder crops in Africa with the aim of improving animal production and preserving the environment.

The expression "combatting desertification" covers activities which contribute to the integrated development of land in the arid, semi-arid and dry sub-humid regions, in the context of sustainable development, and are intended to:

- prevent and/or reduce land degradation;
- rehabilitate partially degraded land;
- restore desertified land.

The Convention aims to guarantee the commitment of the States, land users, local groups, NGOs and scientists to the fight against desertification, and to attenuate the effects of drought in the most seriously affected countries, particularly those of Africa, through effective measures to be adopted at all levels, backed up by arrangements of cooperation and partnership, in order to help achieve sustainable development in the affected regions.

The better management of rangelands and the development of fodder crops should form part of these measures.

That is the subject of this study, which will consider the following areas:

- Livestock systems in Africa;
- Feed resources available for domestic ruminants;

The management of rangelands, current situation, general problems;
The development of fodder crops, current situation, general problems;
Prospects for improvement, networks and the regional plan of action with respect to the Convention.

This study was conducted over only a very limited period, of less than two weeks. It cannot, therefore, claim to be exhaustive, either geographically or in its different aspects; the examples used are solely those already known to the consultant.

Resource persons identified during the workshop will help to finalise a real RPA on the management of rangelands and the development of fodder crops in Africa.

UNCCD/DESERTIFICATION - REGIONAL WORKSHOP
 ADDIS ABABA – 4- 7 August 98.
 DEFINITION OF A REGIONAL PROGRAMME OF ACTION (RPA)
 (NETWORK FOR THE RATIONAL MANAGEMENT OF RANGELANDS AND THE
 DEVELOPMENT OF FODDER CROPS).

 SUMMARY BY THE EISMV STUDY BUREAU

1 - INTRODUCTION

The primary task is to set up a coherent and practical network involving institutions and resource persons, to conduct a more detailed analysis of the management of rangelands, so as to introduce the cultivation of fodder crops into the habits of pastoralists in sub-Saharan Africa.

2 - ANIMAL FEED: An inescapable factor in increasing livestock productivity in Africa.

The Abidjan seminar organised by the EISMV and development agencies provided an opportunity to examine the constraints on the development of animal production and to propose solutions (seminar report, EISMV Dakar, 1998).

It identified the fact that increased productivity is dependent on action being taken on animal health and the genetic improvement of local breeds, but also, and particularly, on the proper management of livestock and agro-sylvo-pastoral land.

Livestock management and animal feed

2.1.1. Statement: population pressure (average population growth rate of 3 %) has led to an increase in the land under cultivation, with deforestation and a decrease in the land available for pasture as its corollary. Over-grazing and reduced fallow periods mean poorer soils in terms of humus content and fertility, and hence lower yields in terms of fodder biomass.

This situation has unfortunately been exacerbated by the cyclical droughts and uncontrolled deforestation. Livestock management systems have sometimes had a harmful effect. The transhumance, a common practice, particularly in the Sahel, makes it impossible to monitor the state of pastures. Experiments with the rotation of pastures and watering places to the east of Gao, Mali, since 1978, under the framework of managing pastures, have shown that it is possible to manage natural pastureland with the active participation of the pastoralists. However, in more southerly regions, where agriculture and livestock exist side by side, the problem is more complex.

The lack of "corridors" between pastures and farmland leads to serious conflicts between pastoralists and farmers. The creation (and management) of such corridors is thus of fundamental importance. Natural pastureland is inadequately managed, as was shown by the study conducted in Cameroon in 1995 (BDPA/IBRD).

We are witnessing not only the degradation of natural pastures (over-grazing), but also an increase in the weeds and toxic plants which are more invasive than the grasses and legume species of nutritional value to animals, and are taking over from them (example of the Central African Republic and Laos grass).

Define priority areas of action on fodder

This statement shows the urgent need to develop fodder production and to define priorities for action. Fodder harvesting is a marginal activity. During the "hungry gap", animals are only able to find dry grass of no feed value, containing very little which is either nutritional or digestible, only cellulose and lignin.

One solution would be to establish reserve natural pastures by:

* harvesting natural fodder: after the first rains, grasses begin to grow quickly, before heading and flowering. At this stage, they should be cut and dried to bring the moisture content down from 90 % to 15 %. Fodder produced in proper conditions can provide the fodder units an animal needs (maintenance + growth + gestation + lactation + labour). The provision of digestible nitrogenous matter (DNM) and minor nutrients (minerals) and vitamins can be monitored by an analysis of digestibility and the nutritional value of fodder harvested.

The use of fodder in sub-Saharan Africa is still at a very preliminary stage. The network for the rational management of rangelands should examine the methods available for disseminating simple techniques for the harvesting of natural fodder to the pastoralists.

* Artificial grassland: tropical fodder, particularly tropical grasses, is not easily digestible. Its nutritional value is much lower than that of species from the temperate zones. One solution for obtaining better quality fodder would be to create artificial pastures with a mixture of legumes and grasses. The introduction of annual or perennial legume species, such as Alexandria clover, fodder cowpea, Stylosanthes, Desmodium, etc., could increase the DNM per 100 g of dry matter from 3.7 g (for grasses) to 12 g (for legumes).

But here again, what we find is disappointing. Fodder crop production is still a very marginal activity in sub-Saharan Africa whereas, if it were well promoted, it could be a determining factor in increasing the productivity of African livestock.

It is, however, important to point out the difficulty of maintaining a balance in mixed species grasslands, and preventing them being taken over by shrubs. Adequate research work might provide a satisfactory solution to the problem.

* Shrub fodder reserves

In those parts of the Sahel which have very low rainfall (150/200 mm/year), it is shrub fodder reserves which are especially exploited (from Mauritania to the Horn of Africa). In times of drought, the various Acacia species allow at least some of the sheep, goat and camel herds to survive. But here too, we see that there is no rational exploitation of these reserves. The network should therefore consider putting this important potential form of fodder production into extension: research shows that *Leucaena leucocephala* leaves contain 200 g of TNM (total nitrogenous matter) per kilo of DM (dry matter), *Gliricidia maculata* contains between 230 and 270 g, etc. Shrubs are of particular importance in the Sahel, where the type of soils (sandy) make it difficult to establish artificial grasslands.

Assess the means available

It is a complex matter, but action must be taken. Traditional livestock practices cannot be changed from one day to the next. What has to be done, therefore, is:

- * to encourage the pastoralists to choose fodder production from the various alternatives they have;
- * to disseminate simple methods of fodder production, demonstrating their practical interest to the pastoralists. The slow growth rates of African livestock, low levels of milk and meat production, and the long intervals between births are all linked to the inadequate nutritional content of domestic animals' daily diet.
- * Given this, it is fundamental that rangelands be properly managed, by:

Setting aside natural pastures, possibly improved through the broadcasting of colonising fodder crop seeds, for fodder harvests;
The creation of protected artificial grasslands;

A plan for the rotation of pastures in areas grazed by animals;
 The establishment and management of corridors between rangelands and natural pastures set aside for fodder production;
 Crops which create conflict between pastoralists and farmers.

It is fundamental that such "corridors" be managed, through: their demarcation, lay-out and monitoring, and controlled self-discipline by the pastoralists themselves and the farmers in regions which produce food crops for humans or cash crops, such as cotton.

Experience from different countries of Africa (Senegal, Benin, Mali, Cameroon, Tunisia, etc.) has shown the problems in managing:

pastures (plans for pasture rotation and set-aside),
 watering places (plans for the use of wells),
 rangelands and corridors (movement of animals outside of pastures and croplands).

What must be managed, therefore, is the interface between:

the land tenure system,
 land management: pastures, fodder crops, corridors, etc.,
 the strategies of livestock systems (transhumance, sedentary breeding, food and cash crops, etc.).

3 - PROSPECTS FOR IMPROVEMENT

If this synthesis of the pasture and fodder crops situation is to be built upon, it must be set in the wider context of:

land and cropping systems,
 herds (and livestock systems),
 pastoralists (social organisation, ethnic groups, families, economic organisation).

3.1. In terms of the land and fodder crop systems, correct choices have to be made concerning the species to be promoted, fodder crop maps should be drawn up, gross production and the stocking rate of pastureland assessed, and a FODDER BALANCE drawn up with an area typology map.

3.2. In terms of the animals, the various livestock systems should be assessed from the aspect of herd "performance" and feeding with respect to numerical productivity, genetic selection, and production (reproduction, milk, meat, labour, etc.).

3.3. In terms of the pastoralists, their socio-economic logic (requirements/income) should be determined, as should the evolution of their social organisation as a factor of progress: intra-community relations; support projects, relations with the livestock departments or other organisations.

An analysis of all the possible interfaces will identify ways of increasing the value of the system, and will define the tools to be used by the network for the rational management of rangelands and the development of fodder crops.

4 - IDENTIFICATION OF RESOURCE PERSONS AND INSTITUTIONS

After this tentative "synthesis" on the management of rangelands and fodder crops in Africa, it is important that the network go more deeply into the analysis, in terms of current knowledge and prospects for the future.

The resource persons and institutions are there. We feel that it is up to the NETWORK to put them in touch with each other within the context of a coherent programme of work with a detailed time schedule.

5 - RECOMMANDATIONS FOR SPECIFIC ACTIVITIES

- 5.1 Decide on which of the proposed programmes of work to focus activities.
- 5.2 Identify more clearly the resource persons and institutions to make up the network for the management of rangelands and the development of fodder crops under the CCD;
- 5.3 Establish a committee to monitor the decisions taking during the workshop to ensure that it does not become simply another meeting, given the problems to be identified, which are already known;
- 5.4 Request the permanent secretariat of the CCD to provide the financial, material and human resources for the network to implement the programmes agreed and decided upon;
- 5.5 Request the monitoring committee to establish and, according to the funding available or to be sought, to draw up project documents, taking account of the programmes of work agreed upon, with precise time schedules.

Specialised regional organisations could be contacted in the context of the CCD. As concerns the EISMV, the Study Bureau and the Livestock Trades Observatory will help where they can.

I – LIVESTOCK SYSTEMS

We must remember that one of the major constraints on livestock production is the provision of feed. This, therefore, has a fundamental influence on the system used.

If, for example, fodder resources are abundant, water is easily accessible throughout the year, and the animals can be kept on small areas of land, the system will be a sedentary one.

If, for whatever reason, water or fodder resources are inadequate at some point during the year, for example during the dry season, the system can only remain sedentary if the pastoralist establishes stores during the period of abundance, or uses farming techniques to intensify fodder production on the land available, or if fodder or water available elsewhere are imported to the area concerned.

If none of this is possible, the animals will have to be moved elsewhere so as to make use, at the appropriate times, of water and fodder resources available in other ecological regions (GONGNET, 1998).

On the basis of the ecological region and particularly of water and fodder availability, it is possible to make a theoretical distinction between different types and techniques of livestock production.

1. Nomadism

This is a livestock system based on a series of frequent moves, to destinations and at times which cannot be predicted, made by some pastoralists and their herds. These moves are dictated by the search for pasture and watering places.

2. Transhumance

The transhumance is the coordinated movement of animals towards agricultural land or swampy grassland in the sub-humid and humid regions, with a predictable time for returning to the place of departure.

This movement takes place during or just prior to the dry season. During the rainy season, the herds remain on pastures in the Sahel and feed on the natural grasses which exist in adequate quantity and quality.

3. Extensive sedentary livestock production

In this livestock system, the animals live practically in the wild on vast areas of land, continually moving in search of the pastureland and watering places they need. There would seem to be no regulations concerning the distribution of herds on the pastureland, and their movements follow no specific rules. The result is a very anarchic use of pastureland.

This system does, however, offer certain advantages:

- the beginnings of a general sedentarisation of livestock production;
- easy maintenance and management of herds;
- easier monitoring and training of pastoralists.

4. Large-scale livestock production

The economic development and opening up of the pastoral world to the world outside have favoured the emergence of large-scale sedentary livestock production as, for example, in the various types of feedlots now found in several countries of sub-Saharan Africa.

The main types of large-scale livestock production are: ranches and feedlots.

Ranches

There are many different definitions of this method of livestock production. It is perhaps best described by the following characteristics: ranching is a method of open-air livestock production, based on the exclusive use of usually natural pastures, in a system which makes minimum use of human labour.

Ranches are generally found in areas relatively rich in fodder resources, along rivers or around lakes.

The various State ranches established have not always achieved their objectives. Animal production has not been significantly increased. Private ranches have been set up in many places, with varying objectives, in the hope of improving animal production.

For all these farms, the major constraint is the availability of adequate good quality fodder, since the main feature of a ranch is its exclusive use of pastureland. Since ranches are an improved form of grass-based livestock production, they apply some of the indispensable techniques for pasture management:

- rotation of pastures;
- maintenance of pastures;
- improvement of natural pastures;
- the establishment of fodder reserves;
- fertilisation of pastures.

Feedlots

Increasing the yield of the feedlot can be achieved by the genetic improvement of the animals, by improving the environmental conditions, which also covers disease control and, especially, by improving the feed.

This improvement can produce satisfactory and even surprising results with local breeds, and with locally available fodder and/or agro-industrial by-products.

There are two main types of feedlot:

- grass feedlots;
- intensive feedlots.

° Grass feedlots

Grass feedlots involve reserving the best pasture for animals intended for meat production. The feed is exclusively fodder, with an occasional small mineral supplement or concentrated agro-industrial by-products.

The animals are kept permanently on pastureland. This technique is subject to the seasonal fluctuations in fodder production. It is thus still an extensive system.

° Intensive feedlots

In this technique, the animals are kept in enclosures or stables and are manger-fed a complete balanced diet of fodder, concentrates and agro-industrial by-products.

There are clearly several distinctions between the forms of livestock production.

Cattle production can, for instance, be classified on the basis of the end product: meat, milk or both.

The level of intensification is another criterion: production systems can be extensive, semi-intensive or intensive. In this respect, the terms 'traditional' and 'modern' livestock systems are sometimes used.

The movements of pastoralists and their animals can also be used to classify the different systems: there are sedentary and nomadic systems, transhumant or not.

The way in which livestock production is combined with other farming activities can also be used: there is pure livestock, livestock production with a small farming component, farming with a small livestock component, livestock production by delegation, and ranching.

The classification of livestock (especially cattle) production systems on the basis of their integration with other activities would seem the best to take as a basis, particularly with the idea of defining the development strategies chosen by the farmers (BDPA-SCETAGRI, 1995).

We should therefore note the following possibilities:

The pastoral type system in which the farmer makes most of his/her income from animal products or direct exploitation of the herd;

The agro-pastoral type system in which the farmer's income comes more or less equally from animal products and crop production;

The agricultural type system, in which the farmer earns the greater part of his/her income from crop production.

In addition to these 3 systems, there are the urban and peri-urban systems at present growing up around the main centres of population, which involve various products, techniques and methods of exploitation.

However, the functioning of these systems is becoming more and more compromised by the significant imbalance between feed needs at different times of the year and the number of animals involved. This imbalance is getting worse from year to year because of the increasing numbers of animals and the advance of the desert.

We should remember the importance of principle No. 4 of the World Nature Charter, according to which ecosystems and organisms, along with the land, sea and air resources used by human beings, should be managed so as to ensure and maintain their optimum and continuous productivity, without, however, compromising the integrity of the ecosystems or species with which they coexist..

II- FEED RESOURCES AVAILABLE FOR RUMINANTS

A- Natural pastures

Natural pastures play a very important role in the diet of tropical ruminants. They form the basic and, in some cases, the only food resource for these animals.

In sub-Saharan Africa, the pastures of both the Sahelian rangelands and the sub-humid and humid regions are very variable. The availability of good quality feed in adequate quantities depends on climatic factors and particularly rainfall, soil and geology. Natural tropical pastures consist of a complex which includes both grass and tree strata. In the arid, semi-arid and sub-humid zones, in which 70 % of sub-Saharan Africa's ruminants (cattle, sheep and goats) are found, there are three main types of pasture, depending on rainfall (RIVIERE, 1991):

Sahel pastures, in regions with between 200 and 550 mm rainfall over 2 to 3 months, with a short growing period;

Sudan pastures, with rainfall of between 550 and 1550 mm over 4 to 5 months;

Guinea pastures, with more than 1600 mm in two more or less clearly defined rainy seasons.

The value of the pasture depends on:

its productivity, that is, the quantity of biomass produced, expressed in kg of dry matter (DM) per hectare; the nutritional value of the species found there;

the voluntary consumption of the dry matter by the ruminants.

The following productivity levels of the different types of pasture have been proposed by Rivière (1991):

Sahel pasture: from 400 to 3000 kg DM/ha ;

Sudan pasture: from 800 to 8000 kg DM/ha

Guinea pasture: from 2500 to 13 000 kg DM/ha.

The voluntary consumption of dry matter by ruminants is influenced by a number of factors, including the type and vegetative stage of the plants, both of which affect digestibility.

At the beginning of the vegetative stage, the plants have high energy, protein and mineral contents. However, in the tropics, fodder plants generally have very short growth cycles, and reach flowering and maturity very quickly. At these stages, the nutrients are mobilised for grain formation, and the plants become less rich in proteins and phosphorus, in particular. This means that the animals' basic needs are no longer met by these natural pastures (GONGNET, 1998).

Natural pastures represent a significant production potential, which is increasingly threatened and fragile. Hence the real need for the rational management of rangelands, together with the development of fodder crops so as to reduce the critical periods of fodder shortage.

2. Harvest or crop residues

Residues are a direct result of the harvesting of most agricultural products. They are linked to farming activities.

Balch (1977) defines them as crop "by-products", such as stems in the form of straw, stubble, etc., with a greater or lesser proportion of leaves, glumes, cobs, pods and other residue from the grain-bearing structure of the plant. They consist of everything left once the grain, seed or fruit considered as the main agricultural product have been taken.

The main crops concerned are:

food crops: rice, sorghum, maize, millet, wheat, cowpea, groundnut, sweet potato, etc.

cash crops: sugar cane, cocoa, coffee, etc.

3. Agro-industrial by-products

Agro-industrial by-products are the matter produced during the small- or large-scale processing of natural products.

The main by-products used are:

the by-products of oil seeds;

the by-products of milling and rice processing;

the by-products of sugar processing;

the by-products of citrus and other fruit, and vegetable processing;

the by-products of breweries;

the by-products derived from coffee and cocoa.

The by-products of oil seeds

Oil-seed processing mainly produces cake, which is a very good source of protein used in feed supplements, particularly for ruminants, and especially in the dry season.

Oil-seed cake is classified according to its crude protein content, as a percentage of dry matter:

rich cake, containing 45 to 55 % crude protein content (CPC) ;
 average cake, containing 30 to 45 % CPC ;
 poor cake, containing 15 to 25 % CPC.

The by-products of milling and rice processing

Mills and rice processing units process cereal grains to make them edible in the form of flour or hulled grains.

The main crops milled in sub-Saharan Africa are rice, maize, millet, sorghum and wheat. Bran is the principal by-product from the milling of these cereals, and represents up to 30 % of the total grain. It is used as a source of energy for animals, but is relatively rich in cellulose, depending on the type of grain. Its nutritional value is improved by mixing with low-grade flours.

The by-products of sugar processing

The main product used in sugar processing in the tropical and sub-tropical regions is sugar cane.

Sugar cane cultivation and sugar processing produce several by-products which can be used for animal feed, the most important being:

- by-products of the crop: the tips, which consist of the green ends of the cane, and leaves which are cut with the stem at harvesting.
- the bagasse (the dry pulp remaining after the juice has been extracted);
- the molasses.

The by-products of citrus and other fruit, and vegetable processing

Prior to the processing of citrus, other fruits, and vegetables, large quantities of waste consisting of damaged fruit unfit for human consumption are produced.

The processing itself also produces considerable amounts of waste.

The by-products of pineapple are the peel and the pulp, or "bran", which represent between 40 and 50 % of the total weight of the fruit. These are excellent sources of energy because of the pectin and cellulose they contain.

III - RANGELAND MANAGEMENT

As we have seen, Africa has three main types of rangeland, according to eco-climatic zone: the Sahel, the Sudan savanna and the Guinea savanna. The traditional systems of use are extensive, either pastoral or agro-pastoral. In attempts to improve the management of natural pastures, several projects in Senegal, Burkina Faso, Mali, Guinea and Cameroon have been faced with diverse and often complex problems: the variability of the environment and the vegetation, socio-economic factors, approach and methodology, and institutional problems.

The uncontrolled and anarchic use of rangelands, exacerbated by the persistent droughts and rampant population growth, are responsible for the degradation and the decrease in rangelands. The example of Senegal, a country with all three eco-climatic zones, is instructive, in that studies show that rangelands are decreasing in area by 3 % every year, and that there is a gradual movement of isohyets from the north to the south because of a 22.5 % reduction in annual rainfall since 1970.

Over the last two decades, the negative effects of successive droughts, exacerbated by the increase in human and animal population pressure, have led to a decrease in the area of rangeland, without any real change in the system of extensive livestock production.

This disruption of land area as a resource, the degradation of that land area, and pressure on pastoral resources have often led to serious conflicts (social conflicts or concerning border policy), a decline in practices and the non-respect of the rules governing the collective management of resources, with the pastoral and agro-pastoral systems thus being put at risk.

Of all the regions of Africa, the Sahel is doubtlessly the one where the management of rangelands is most problematic, because of the demographic, social and ecological changes, the crises in farming systems and the lack of food security, which make it difficult for those involved to find a solution capable of producing effective and sustainable improvements.

The policies of the international organisations and States, as well as the strategies of local people, in the management of rangelands, become tangled together in a state of confusion.

So as to note the changes which have occurred and to assess what is at stake if the management of rangelands is to be improved, the current situation of those rangelands will be analysed, together with the problems of managing rangeland and the prospects of achieving a rational system of management.

A – Characteristics of the Eco-Climatic Zones

According to Thébaud (1988), the term "rangelands" covers all the water and pasture resources and agricultural by-products, including the more southern resources.

These are linked to the eco-climatic zoning, and exploited by an extensive livestock production system, which involves increasing numbers of people, because of the current population explosion. As a result of this, there are areas in which, because of the methods used to exploit the land and natural resources (overuse or inadequately coordinated use), pastoral activities are as responsible as the poor climatic conditions for the degradation of natural pastures. In other areas, however, the main causes are bush fires and the extension of farming.

In a recent study (BDPA, 1995), it has been noted that there are four main features to pastures in Cameroon:

- Their relative importance compared to the total land area of Cameroon;
- Great diversity, due to the climatic, geological and soil heterogeneity in the various livestock-producing regions of Cameroon ;
- A significant, but increasingly threatened and fragile potential for production. The pastoral land is fragile, and threatened by the scattered nature of agricultural development, the extension of reserves, the lack of legal security for the pastoralists and farmer-pastoralists to have at least minimum guarantees if they are to make investments needed to halt the degradation and promote the regeneration of the pastures;
- Strong possibilities for intensification through a land management system designed in consultation with, and not imposed by, the farmers.

Africa as a whole has three main zones created by the differences in land and rainfall, together with differences in the production systems: the Sahel, the Sudan savanna and the Guinea savanna.

1. The Sahel zone

This is characterised by an arid and semi-arid climate and covers 5.3 million km².

Annual rainfall is between 100 and 1000 mm, varying according to place and time. According to research conducted in the Ferlo and Sine Saloum regions of Senegal, and Yatenga in the north of Burkina Faso, the

rains are generally adequate for the growth of annual grassy steppes (*Aristida*, *Cenchrus*, *Eragrostis*) and usually thorny trees (*Acacia*, *Balanites*, *Ziziphus*) on the rangeland.

The length of growing period on the natural rangeland is less than 180 days. This ecological zone is used for mobile extensive livestock production. The herds move across the natural rangeland during the rainy season and then over greater or lesser distances during the transhumance. Sahelian livestock production is very dependent on these pastures (for more than 90 % of the animals' diet). It has to be enough for the pastoral groups to survive the 9 months of dry season.

In the harsh context of the Sahel, which is made even more difficult for livestock by the lack of rain, the weight value of the fodder produced by natural pastures is extremely variable and difficult to predict.

An analysis of the pasture vegetation and water resources in the north of Burkina Faso and the pastoral areas of Niger, Mali and Senegal, has shown that, in a single site, resource availability can vary by 100 % from one year to the next, with the gradual elimination of some annual grasses. Land in the Sahel is thus subject to two major constraints: environmental degradation and drought, which combine to place livestock production in a very critical situation. Despite this, the Sahel zone still has the capacity to cope with extensive livestock production, if the resources are managed rationally.

2 . The Sudan savanna

This covers 21 % of Africa's land area, or 4.8 million km², and is characteristic of the sub-humid climate. The Sudan savanna covers part of the countries of the Sahel, the coastal countries of West Africa, and Cameroon.

Annual rainfall in the zone varies between 900 and 1500 mm. The growing period lasts for between 180 and 279 days, depending on the rainfall and soil type (skeletal to hardpan, skeletal to gravely, ferruginous). Aside from the crop and fallow land, the rangeland is characterised by forested or woody savannas (open forest).

Woody fodder is the main component of animal feed, particularly during the cropping season and at the end of the dry season. At the beginning of the dry season, the animals feed on crop residues in the fields.

Farming is the main activity. Livestock production is more integrated into the farming system, with pure farming systems without livestock, sedentary agro-pastoral systems and even sedentary livestock systems. The animals, particularly the small ruminants, are of trypanotolerant breeds and are kept in herds on natural pastures or land belonging to the rural community.

This ecological zone is also a place of contact between Sahelian pastoralists and sedentary farmers during the transhumance. In recent years, because of the degradation in the Sahelian region, the numbers involved in these migrations into the sub-humid region have increased, and at the same time, more land is being cultivated, to the detriment of the rangelands; the consequences of this have been conflicts between farmers and pastoralists, political conflicts in border regions, and over-grazing.

3. The Guinea savanna

The Guinea savanna covers 4.1 million km², with both tropical and equatorial climates. It includes the coastal regions of West Africa, part of Central Africa, the eastern part of Madagascar and part of Mozambique. High altitude areas, such as Adamawa province in Cameroon and the Fouta-Djallon region of Guinea, can also be included in this zone.

Annual rainfall is more than 1500 mm. The preforest growing period is more than 270 days. Rangelands consist of strips taken over from the forest, by repeated clearing or mainly by bush fires. The natural pasture of these rangelands consists of fodder trees and shrubs, and perennial grasses.

Overall, Africa has different types of rangeland according to eco-climatic zones. Unfortunately the climatic problems, exacerbated by socio-economic factors, have led to degradation and a decrease in area of the rangelands. For example, because of its position, Senegal has all these different environments. An analysis of annual rainfall has shown that the effects of the drought are not restricted to the Sahel region, but are a general phenomenon at national level, with 22.5 % less rain now than prior to 1970. The result of this is a southerly move in the isohyets. The Kolda region, which was at isohyet 1200 before 1970, is now at isohyet 1000.

B – Current situation of rangeland management

The systems of rangeland management are determined by land organisation typical of the Sahel, the Sudan savanna or the Guinea savanna, with more or less fixed limits. An analysis of the use of pastoral resources inevitably concentrates on the primarily traditional use of rangelands, based on the two systems already mentioned: pastoral and agro-pastoral.

1. Traditional management systems

Pastoral system: This is the predominant system in the Sahel and, to a lesser extent, in the Sudan savanna during the dry season. The herds (especially cattle) move about on the natural rangelands in search of green grass.

In the Ferlo region of Senegal, for instance, it has been found that, during the rainy season, these moves involve small distances (less than 5 km), whereas during the dry season, the herdsmen make use of pasture much more distant (10 to 20 km) from the central camp, generally towards the less arid south. It is during this period that trees suffer the greatest damage due to over-grazing.

The herds are mobile, but instead of moving periodically in a single direction, that movement is much more anarchic, which makes it very difficult to identify the real limits and organisation of the pastoral system.

Agro-pastoral system: This is how land is used in the Sudan savanna, where the main activity is upland agriculture. This traditional use of the land is determined by the influence of crops on the land, and the repercussions of the great transhumance. During the rainy season, the herds stay close to the villages and use the fallows and natural pastures between villages and between crop fields. In the Atacora region of Benin, it has been found that the rainy season begins with grazing in areas of regrowth (June-July), and is followed by a small transhumance (August-September) to pastures on new land and fallow land. After the harvest, the herds range through fields and outlying pastures.

This type of system is also found in the Guinea savanna zone. Trypanotolerant animals range through the pastures close to villages, along paths and on fallow land. The system involves practically no fodder management. Extensive cropping practices and a reduction in the length of the fallow period mean that rangeland is becoming increasingly scarce.

The gradual decrease in the pastureland available, due to crop cultivation and increased population pressure in the region means that this livestock production system leads to over-grazing, and has a perceptible impact on trees.

A study of the Guinea savanna in southern Senegal, on the basis of aerial photographs taken in 1970 and 1983, shows three types of land use: forests, fallow land and crops, occupying 62, 10 and 28 % of the land respectively in 1970 and then 34, 2 and 64% of the land in 1983. This indicates a significant decrease in forest and wooded areas (3%/year) and a clear decline in the land under fallow.

In the aforementioned study in Cameroon, a broad research programme on pastureland begun in 1956 has established the following four zones for the Adamawa region:

- permanent intensive pastures;
- permanent moderate pastures;

dry season pastures;
 virgin lands.

The first two zones are evolving dynamically under the influence of animal and human activities: grazing, cultivation and fires. An analysis of the vegetation structure shows that the permanent presence of animals, which leads to trampling and the soils being enriched in nitrogen, encourages certain unpalatable perennial grass species. The over-grazing encourages annual grasses and perennials of little fodder value. Farming activities favour an increase in the proportion of annual and perennial legume species, annual grasses and other species of little pastoral value.

The Cameroonian study highlights the major constraints on pastures, according to ecological zone:

In the Sahel-Sudan savanna pasturelands, the constraints are:

over-grazing;
 drought;
 agricultural development;
 tsetse infestation;
 competition between protected areas (national parks, forest and hunting reserves) and pastures.

In the pastures of the Guinea savanna, the constraints are:

over-grazing;
 invasion of pastureland by an unpalatable species (*Chromolaena odorata*);
 persistence of tsetse flies;
 the existence of toxic plants.

Leading animals to new grounds is hence a complex activity which is generally based on the need to find both pasture and water for the herds. Hence most movement is from the Saharo-Sahel zone to the more humid areas of the south.

There are different impressions of these movements in the different areas. The most commonly mentioned problems are the social aspects of conflicts with farmers, due to the competition between pastoral and farming activities on the land.

Other consequences are also mentioned, including the different types of degradation of the natural environment, the over-use of watering places, the use and degradation of protected areas, the dissemination of epizootics, etc.

Several initiatives have been taken at national and/or regional level in an attempt to attenuate the main drawbacks. However, most of these, although aware of the need to establish structures to ensure the coherent organisation and gradual integration of farming and pastoral activities, have not managed to establish rules for rangeland and pasture use clearly and acceptably to all involved.

2. Security for pastoralists: land rights

In practice, pastoralists are excluded from land ownership; they can only be given the use of all the main resources, such as pastureland.

In Senegal, Decree 80-268 of 10 March 1980 attempted to establish conditions for the use of pastures, and created commissions for the arbitration of conflicts at different national levels.

The Decree describes pastures as all the free space used or likely to be used to feed animals. It differentiates between 4 types of pasture:

Natural pastures or rangelands which cover all the natural free spaces traditionally used for pasturing animals;
 Fallows or cultivable land left fallow or not used;
 Pastures on land no longer cropped or cultivated areas already harvested, covered by remnants of agricultural by-products (straw, hay, etc.), volunteer plants and unharvested grass, as well as grassy land between fields.

The Decree forbids any clearing or cultivation of natural pastures or in demarcated areas around fodder fields, livestock markets, vaccination centres, and livestock assembly or watering places.

Livestock access and passage corridors and paths are provided throughout the land.

The Decree notes that protecting a field still occupied after the opening-up of post-crop pastures is the sole responsibility of the owner.

Many of the Decree's provisions will not manage to avoid the conflicts between pastoralists and other sectors of society.

It is always difficult for farmers to protect their fields during the transhumance. The conflicts which occur often lead to the death of pastoralists and farmers. Newspaper articles often recount these extremely problematic disputes.

In Niger, the need has been recognised for a legal instrument to promote the rational management of natural resources. Since 1986, initiatives have been taken to develop a rural code to cover all production activities in the rural environment (agriculture, sylviculture, pastoralism, etc.).

In June 1994, Mali established the Land Tenure Observatory, which is conceived as a system for observing land ownership practices, the ultimate aim of which is to help define enlightened land tenure policies, which would be both operational and adapted to the needs of those concerned in the countryside.

The different discussions and consultations begun in various places show that the situation is a real constraint to the development of pastoralism in the Sahel.

There was, for instance, a regional workshop on pastoral land tenure held in Niamey from 16 to 20 June 1997, organised by PRASET.

It had the following objectives:

- To promote an exchange of national and local experience on making land tenure more secure for pastoralists;
- To identify the main lines of a policy to make land tenure more secure for pastoralists;
- To define the practical elements of a strategy for the development of pastoral codes.

Discussions during the workshop showed that, over and above the specific characteristics of the different livestock regions, the Sahelian and West African pastoral systems function in similar contexts, dominated by:

- The worsening ecological crisis, which is reducing the availability of natural resources;
- Growing populations, which mean continual pressure on land and severe competition for the control of natural resources;
- A lack of organisation amongst pastoralists, which restricts their capacity to play a part in the decision-making process;
- The fact that land tenure and development policies are ill-adapted, which further marginalises pastoralism.

From these arguments, the workshop identified four major challenges to pastoralism:

To restore social peace so as to maintain a climate favourable to local development, particularly through the prevention and resolution of conflicts, in order to reduce the risk of political destabilisation they bring upon States;

To promote the economic and social development of pastoralism in order to improve the income and living conditions of pastoralists and to increase the contribution of livestock to the Sahelian economy;

To guarantee the sustainable management of natural resources by protecting the land tenure rights of pastoralists;

To encourage the adaptation of pastoral societies to current socio-economic changes, whilst still preserving their cultural identity.

Thus, one of the major tasks facing pastoralism is to define a basis for making land tenure more secure, taking into account the vital need of pastoralists to have access to natural resources.

Several initiatives have been taken in the context of the UEMOA (West African Economic and Monetary Union), notably the CEBV (Economic Community for Cattle and Meat), to ensure better organisation of the transhumance and the commercial movement of livestock, so as to avoid their negative repercussions. These have involved the development of infrastructure (livestock trails, watering places, etc.) in the areas where the animals arrive, the issuing of transit documents (International Transhumance Certificate, a passport for livestock). Regulation of herd movement has already begun (CEBV: agreement concerning the regulation of the transhumance).

In spite of all these initiatives, the problem remains extremely complex, and bloody conflicts between farmers and pastoralists over access to natural resources are the most obvious expression of this (UEMOA, elements of a first-generation community programme).

The reasons given for the lack of impact of these initiatives include, amongst others, the non-application of texts governing livestock trails, lack of familiarity with the rules of the transhumance, the inadequacy (or, in some cases, inexistence) of land tenure legislation adapted to the specific context of pastoralism, and the diminishing area of pastures available because of pressure from agriculture.

Moreover, since the droughts of 1973/1974 and 1984/1985, we have witnessed an often permanent transfer and sedentarisation of part of the Sahel's livestock towards the northern regions of the coastal countries. The result of this is that the point of departure for the transhumance is no longer exclusively within the Sahel, but within the coastal countries themselves, with the itinerary heading towards the coast. The transhumance has thus become a permanent feature of the livestock systems in these countries, with all the consequences that implies.

PROBLEMS IDENTIFIED

Rangelands constitute the basis for pastoral and agro-pastoral livestock systems. Their maintenance and/or improved management will determine the future of these systems in the various agro-climatic zones of Africa.

1. The context of the pastoral and agro-pastoral problem

The main features of the pastoral and agro-pastoral problem are environmental variability in space and time, and the questioning of the pastoralists' authority in the competition for space.

The variability of environmental conditions, together with the variability in vegetation from one year to the next, results in the anarchic movement of animals, and the over-loading of already fragile rangelands.

The lack of any land tenure rights in many countries has meant a loss of authority of the pastoralists with respect to farmers in the matter of land use. The traditional land rights system has moved towards the predominance of family group rights over and above the rights of other members of the community. This has led to the weakening of collective forms of land appropriation and management. Moreover, States have passed legislation, firstly, withdrawing large areas of land from farming and pastoral activities (protected zones) or banning certain practices (bush fires, the transhumance), and secondly, doing away with community land rights. The question of land rights raises the fundamental problem of land management.

3. Experimental approaches to the rational management of rangelands

The continuous monitoring of pastoral ecosystems: a pilot project set up in Senegal in 1980 conducts temporal and spatial monitoring to analyse the quantitative production of vegetation and the qualitative production of flora on natural rangelands throughout the country.

The statistics for 1987 to 1997 show a quantitative variation in vegetation directly linked to the rainfall gradient, without, however, revealing the appearance or disappearance of any herbaceous species.

Land tenure control and land management; the Decree adopted in Senegal mentioned above has far from solved the problems.

The high cost of investment.

A lack of communication and of any participatory approach to resource management.

Local development not being taken into account in the implementation of development projects.

Lack of social availability of techniques to resist what is occurring.

Poorly defined rights of both the State and local groups.

D - PROSPECTS FOR RATIONAL MANAGEMENT

Improved management of rangelands would seem to be an essential condition for the sustainable development of livestock production in Africa. It is clearly a technically complex matter, because of the very diverse environments and ways in which they are used, but primarily because of the extreme social complexities involved.

In Guinea, the Regional Programme for the Integrated Development of the Fouta Djallon Massif began on a very small scale in 1984 to promote technical methods, approaches and action to be taken to ensure the better management of natural resources.

In the north of Burkina Faso, the Pilot Project for Livestock Development, initiated in 1980, deals with the restoration of pastureland and conducts trials to integrate this activity into the livestock system. It has shown that protective measures, together with tillage, can encourage greater grass cover, increase biomass and accelerate natural wood regeneration. The transfer of these techniques to the pastoralists is, however, restricted by the high investment costs.

Between 1978 and 1987, PRODESO (the Project for the Development of Livestock Production in the Western Sahel), through a section of the Mali Livestock II project, initiated the development and improved management of pastures:

By creating permanent and temporary surface watering places by collecting run-off water, and creating wide firebreaks;

By drawing up a rangeland management plan, under the responsibility of the pastoralists' association;

By dividing pastoral land into plots corresponding to a calendar of seasonal use, and concentric and centripetal use.

The project achieved satisfactory results, but its implementation was hindered by problems linked to infrastructure, to the application of regulations governing installation and exploitation and to sociological factors (misunderstandings, laxity).

Since 1982, attempts to protect fodder areas and restrict grazing in the Ferlo region of Senegal have shown their potential in terms of woodland regeneration, in comparison to uncontrolled areas. Unfortunately, these plots are of no long-term value.

A pilot agro-sylvo-pastoral development programme which follows the land management approach was attempted in the Nouaho region of Burkina Faso, with encouraging results. It is based in the northern Sudan savanna eco-climatic zone (815 mm average rainfall), and is intended to provide land tenure security for the farmers by demarcating areas and promoting the sustainable exploitation of natural resources.

All together, several experiments have been conducted in the different eco-geographic zones. The results vary according to the environment and to expectations. However, some significant achievements have been realised in the pastoral and agro-pastoral zones:

Organisational proposals concerning the sustainable management of pastures (water development, protection, oasis farming);
 Technical and organisational proposals on making better use of pastoral land in the different environments (reclamation of degraded land, control of run-off, re-afforestation);
 The conditions in which these development techniques can be used (means of production, land tenure rights).

THE RESPONSE REQUIRED

At national level:

Meeting the challenge of new changes and new types of development which can take account of all the problems involved demands as much effort from the central authorities and international organisations as it does from rural societies. In order to do this, the action taken should be based on two logics of development:

That of an urban, liberal movement, with professional producers (no State involvement) and the support of a well distributed urban infrastructure within a well organised economic area;
 And that of a locally initiated movement.

The approach to be adopted should also take account of four guiding needs, given the many variations according to context:

- a – to take local diversity (socio-economic complexity) into consideration, exploring and understanding its organisation and the way in which this is articulated at several geographic levels;
- b - to understand rural situations as a whole, to establish the relative places of disciplines, sectors and systems (systems approach: each with its own character and economic environment);
- c - to think through actions in the short as well as the long term, with respect to both the past and the future;
- d - to establish links between the reasoning of those involved and deduce the institutional consequences of this (pastoralists as actors, officials as service providers).

The implementation of these guidelines should put particular emphasis on decentralisation, with everything local involving participation. The State should only intervene when the development approach concerns large areas of land. Hence, the following must be done:

Specify the purpose of each land area, after a multidisciplinary survey. From the steering programme for the land area, development should be prioritised (agriculture, livestock, integration between agriculture and livestock production).

Reorganise the institutional framework to ensure a level of decentralisation in the application of regulations, and hence the proper use of collective fire-protection, rangeland-restoration and water-recovery equipment;

Define not only the legislative framework and procedures which would allow the local people affected to participate in the drafting of a modern law, but also ensure the coherence, effectiveness and equity of the proposals made by those people: only a permanent right of use, recognised for all, will ensure the preservation of natural resources.

2. At regional and sub-regional level:

Promote research and development for the sustainable use of rangelands;
 Define a regional development plan governing the activities of farmers and pastoralists;
 Extend ecological monitoring programmes to the Sudan savanna and Guinea savanna zones;
 Harmonise rangeland management and development programmes, according to eco-geographic zone, by establishing sub-regional collaboration between competent institutions, within the framework of the CCD;
 Analyse communication and information strategies, and the tools of communication with the aim of introducing participatory management;
 Review the institutional and legal framework in terms of borders, and improve coordination between inter-governmental bodies.

IV – THE DEVELOPMENT OF FODDER CROPS

The cultivation of fodder crops is one proposed method of reducing periods of fodder shortage. It represents a farming sub-system involving the cultivation of various known crops, of interest for their nutritional quality, with the exclusive aim of feeding animals.

The cropping techniques and methods used depend on the fodder species, as well as on the socio-economic context.

In tropical Africa in general, direct cultivation of fodder for animal feed is rarely, if ever, part of the traditional farming system. There are three main reasons for this: the nature of animal production in certain areas where any costly activity (hired labour, land, other resources) is automatically excluded, the pastoralist system of management, and land tenure models which do not encourage the development of pastures.

It is becoming increasingly obvious that, if the food needs of the growing African population are to be met, production will have to be intensified, which implies the appropriate management of natural rangelands, the sedentarisation of pastoralists, and the production of herbaceous and leguminous pastures, including fodder trees.

A – CURRENT STATUS OF FODDER CROPS IN AFRICA

In Africa, animal feed is still mainly derived from pastureland.

Fodder must be rich in energy and nitrogen, and produce high yields. This requires a proper understanding of the techniques of cropping and harvesting the fodder by cutting or grazing, respecting the growth periods which ensure good quality fodder.

1- Fodder Production

Fodder production was introduced into sub-Saharan African livestock production systems towards the end of the 1970s. It was intended either as a way of establishing reserves (hay, silage) for the dry season, or for green production from specific areas (inland valleys, after the period of flooding), or those with access to irrigation.

Several fodder crops (grasses and tree species) adapted to the different eco-climatic contexts and planting techniques have been experimented with in various countries, with the aim of intensifying fodder production.

Fodder production according to eco-climatic zone

- In the Sahel, fodder production has been planned at permanent water sources, and along the large rivers (using irrigation). Haymaking, using either oxen or manual harvesting, has been attempted in Niger and Senegal.
- In the Sudan savanna, the coexistence of agriculture and livestock production could favour the intensification of fodder production. Fodder can be produced on land between crop fields or on fallow land. The harvest is either grazed in situ or used for silage or haymaking.
- In the Guinea savanna, fodder can be produced in the peri-forest areas, on fallow land, or immediately after the forest is cleared.

At present, fodder production is limited to a few cases of commercial livestock production (dairy animals) on private or state ranches and research institutes.

b- Main fodder species grown

The fodder crops most commonly used in the African tropics are legumes or grasses. The choice depends on the eco-climatic zone, basic productivity of the species, ease and cost of establishment, and bromatological quality at harvest.

Herbaceous legumes:

Stylosanthes: a perennial legume which can be used to enrich the flora of natural pastures where there is limited herbaceous cover.

Macroptilium: a legume for the Guinea and southern Sudan savannas, producing up to 5 t/ha of DM. Grows well with grasses.

Centrosema: a permanent grassland fodder crop of the Guinea and southern Sudan savannas.

Pueraria: can be used on permanent grasslands at the edge of flooded areas in the Sudan savanna.

Dolichos lablab: an annual or multi-annual legume for fodder fallows in the Sudan savanna, used for in situ grazing during the dry season.

Phaseolus: a multi-annual legume which grows well in the Guinea and southern Guinea savannas. Can also be used in the Sahel with irrigation.

Vigna (cowpea): performs very well as a seasonal crop (rainy season or irrigation).

Fodder maize: a seasonal crop with a high yield. (8-10 000 FU/ha). Maize is very susceptible to drought.

Leguminous shrub species:

Parkia and Butyrosperum (Shea butter tree): fodder trees used in the traditional intercropping system in the Guinea and Sudan savanna zones, whereas Acacia albida is well adapted to the Sahel environment. These legumes are integrated into the farming system not only for fodder production, but also to improve soil fertility and for other products for human consumption.

Leucaena: a perennial which grows well in the Guinea and southern Sudan savannas, planted as windbreak hedgerows. Low fodder production.

Ziziphus mauritiana: a tree species with rapid growth. Can withstand transplanting and the strong heat at the end of the rainy season.

Grasses:

Andropogon: recommended for fodder fallows, particularly in the Sudan savanna.

Cenchrus: a perennial grass which grows well in the Sahel (alleys between dunes on sandy-silty soil) and the Sudan savanna.

Panicum: used in situ, as silage or as hay.

Brachiaria: grass used in the Guinea and southern Sudan savannas either for grazing or as hay. It is intercropped with Stylosanthes.

Chloris: a grass which grows well in rainfall sites in the Sahel, or as a permanent crop in the Sudan savanna for hay production (4 to 8 t/ha DM). Can be intercropped with Macroptilium.

c) Planting and distribution techniques for fodder production

The classical techniques use cropping methods involving tillage and land preparation at the beginning of the rainy season, or seeding during the final weeding of food and possibly cash crops. There are also modern techniques which plant the crop in a permanent grass or legume cover (Seguy technique).

d) Case studies:

In Senegal, the Western Senegal Livestock Development Project (PDSO) introduced rainy season fodder production of *Stylosanthes humilis* in 1977, with the aim of improving livestock feed on the natural rangelands. Faced with disappointing technical and socio-economic results, the experiment was quickly stopped in 1980, due to a lack of maintenance (collective plots), the effort required from the pastoralists (cropping period), and poorly defined objectives (Ouédraogo, 1983)

The O.M.V.S. (Organisation for the Development of the River Senegal), an organisation for cooperation between the States bordering the River Senegal (Mauritania, Senegal, Guinea and Mali), works on the integrated development of the River Senegal basin. The agronomic part of the project has introduced several fodder species, the seeds of which are brought from Casamance. It tries to identify high-yielding varieties, to multiply their seed, and then have these tested on a wider scale. Fodder maize, grasses (*Brachiaria*, *Echinochloa*, *Euclaena*, and *Panicum maximum*) and legume species (*Macroptilium*, *Stylosanthes* and cowpea) have given satisfactory yields. The crop produces a good yield with certain grasses (*Tripsacum laxum*, *Cenchrus*, *Centrosema* and *Phaseolus*), but a poor yield with *Chloris gayana*. It would seem, therefore, that there are possibilities for growing fodder crops in the river valley. However, the dissemination of this technique is hindered by practical problems (seed availability, familiarity with cropping techniques), and economic factors (increase in cash crops produced, low yield of fodder crops).

In Casamance, again in Senegal, Diatta et al. (1977) achieved, from the 2nd year, an improvement in above-ground biomass of 186 % and 141 % by replacing the natural fallow vegetation in experimental plots with *Andropogon gayanus* and *Panicum maximum* respectively. They note that these two perennial grasses, which are of good fodder quality, established well in the 1st year of the experiment.

Mali began its first campaign to introduce fodder crop production in an agro-pastoral environment in 1979 through the Fodder and Improving Crops Development Project for the Sudan-Sahel zone (Traoré, 1985). The use of lablab (*Dolichos lablab*), a strong annual already known in the area, was easily accepted, whereas perennials such as *Macroptilium atropurpureus* or *Siratro* and *Cenchrus ciliaris*, which give a low yield in the first year, were not adopted because of the unfavourable ecological and socio-economic conditions. The main problem in ensuring the continuous production of lablab was local seed production and management.

In Benin, fodder production is still not common. Fodder plots have been established in state-owned livestock farms and research stations, and from there, current livestock production projects, such as the Project for the Promotion of Livestock Production in Atacora (PPEA), the Cattle Production Development Project in Borgou Province (PDEB) and the Livestock Development Project for East Borgou Province (PDEBE), have been able to disseminate some species, such as *Panicum*, *Andropogon* and *Brachiaria*, to pastoralists and farmers who use animal traction.

Between 1985 and 1994, production increased to approximately 211 ha, particularly in the north of the country. The PDEBE, for instance, worked with pastoralists and farmer-pastoralists organised in Pastoral Units (UPs) to introduce the principle of fodder crops and the use of fodder fallows. Fodder shrub species (*Leucaena leucocephala* and *Cajanus cajan*) and herbaceous species (*Stylosanthes hamata* and *Dolichos lablab*) have been well accepted. Attempts at legume-grass intercropping led to the disappearance of one of the species, generally the legume. The constraint identified was farmer availability during the cropping period.

There are also some experiments with short-term fallows within the rotational system, using high-yielding species such as *Stylosanthes hamata*, in the cotton-producing areas of Burkina Faso and Mali. Experiments with semi-intensive fodder production, restoring fallows with high-yielding fodder varieties of *Vigna unguiculata* and *Dolichos lablab*, are also being conducted in northern Senegal, in the river valley (Diatta et

al., 1994). In Benin, the National Institute of Agricultural Research of Benin (INRAB) is introducing improved short fallows using *Mucuna* to farmers and agro-pastoralists.

From 1994 to 1996, the Chadian Project on Improved Fodder Systems tried to solve the problem of hungry gap fodder shortages by introducing fodder crops (BR1 cowpea and four varieties of *Dolichos*) to previously sensitised agro-pastoralists. The results were poor yields because of the lack of rain and especially because of the farmers' socio-economic problems.

In Cameroon, research workers and various departments of the Ministry responsible for livestock have worked extensively on fodder crops, identifying: grasses (*Panicum*, *Brachiaria*, *Chloris*, *Pennisetum*), herbaceous legumes (*Stylosanthes guyanensis*, *Calopogonium mucunoides*, *Macroptilium atropurpureum*) and leguminous shrub species (various *Acacias*, *Cajanus*, *Prosopis*, *Leucaena*, *Gliricidia*), adapted to the different ecological regions of Cameroon.

In Tunisia, more than 75 % of the fodder systems are based on a vetch/oats mixture, which is harvested in the spring and then stored as hay or silage. It has been part of the fodder system in Tunisia since the 1940s and developed after independence in response to the urgent needs of livestock production. The crops have undergone no genetic improvement, although varietal improvement in the 1980s led to the production of oat varieties adapted to the Tunisian environment. Other fodder crops, such as Italian ray-grass, maize and sorghum, are now in extension.

The productivity of annual fodder crops, particularly vetch/oats, is thus still low, achieving only between 40 and 60 % of the production potential of the soil, climate and farmers' technical capacities. The Tunisian authorities' choice is clear: the strategy to increase livestock production must include fodder production systems, so as to reduce the amount of concentrate used. New crops, such as oil-seed rape and soybean are to be worked on in the future.

Overall, there have been many attempts to introduce fodder crops into the rotation systems in most countries, especially in the Sahel. However, until recently, the results have not lived up to expectations. In areas where there is strong pressure on natural resources, fodder crops (such as fodder cowpea in southern Mali) are increasingly being adopted by the agro-pastoralists. There are, however, still climatic, socio-economic and technical constraints, particularly the problem of seed supply.

2- Seed Production

Some of the fodder crop seeds available in sub-Saharan Africa are produced locally, others are imported. It should be noted that, apart from a few national projects, there is no seed marketing body.

The problems of producing tropical fodder crop seed prevent them being grown on a larger scale. There are some, but limited, possibilities for seed production at national level.

Research is underway in several countries (Côte d'Ivoire, Kenya, Nigeria, Mali, Senegal, Burkina Faso) to solve the problem. In Senegal, the CRZ in Bambey introduced several grass and legume species into the River Senegal valley. In Mali too, the Babougou seed project has been producing *Dolichos* and *Macroptilium lathyroides* since 1981. In Chad (report, 1997), selected species have been introduced and grown in upland or irrigated plots for seed production. These are: soybean, *Cenchrus setigerus*, *Moringa oleifera*, *Lablab purpureus* and *Macroptilium atropurpureus*.

If seed production is to yield well, specific cropping techniques must be learnt. There are other constraints too: production costs, quality maintenance, poor estimation of needs and poorly defined channels of distribution, genetic problems and choice of species.

B- PROBLEMS IDENTIFIED

The main factors restricting the development of fodder crops in Africa are:

Climatic, particularly insufficient rain, and the problems of finding enough time and labour during the rainy season;
 Socio-economic factors related to changes in habits (recent innovations), development costs which are often beyond the possibilities of the agro-pastoralists, land tenure problems, and bush fires;
 Many different technical factors, concerning constant seed availability, familiarity with cropping techniques and choice of species. For the latter, work needs to be done to identify perennial plants that can be grown either on dry or irrigated land in order to establish permanent productive grasslands, annual plants which can be introduced into rotation systems with food or cash crops, grasses for irrigated systems, so as to save on water use, and grass-legume intercrops should be tested in order to save on fertiliser and provide balanced rations;
 The low yield and high cost of seed production;
 The lack of any network for the exchange and dissemination of results (institutional problems);
 The lack of reliable data concerning the specific needs (both quantitative and qualitative) of each country.

C- PROSPECTS FOR THE DEVELOPMENT OF FODDER CROPS

Four main activities must be included in the strategy for the development of fodder crops:

Seed multiplication and the promotion of intensification within a national and regional programme:

If fodder crops are to be developed, good quality seed must be made available to the farmers. Hence, seed multiplication needs to be built up, not only at the farmers' level, but also as regards State structures. Seed production requires a knowledge of national needs (qualitative and quantitative), and training and guidance for farmers in the production of fodder crop seed. In this context, the structures involved should conduct:

- A proper analysis of the specific potentials of different biotopes and the constraints;
- The development of simple rural techniques for seed production, harvesting, storage, conservation and quality control prior to planting;
- Regular monitoring and a periodic review of achievements.

The farmers' fodder seed production plots could belong to specialists who would then market the produce, or could be integrated into the system of each farmer, who would devote part of his/her cultivated land to this purpose.

Inclusion of fodder production in development activities:

If this is done more frequently, the different farming situations and the changes which drive farming systems will be taken into account.

Strengthening of land tenure rights:

The decline in land available for pasture means that the farmers' guarantees on land must be strengthened.

Organisation of farmers:

This will give the farmers greater responsibility in managing their fodder crops and train them in seed multiplication and cropping techniques.

V – PROSPECTS FOR IMPROVEMENT – NETWORK – RECOMMENDATIONS

As we have seen, the degradation of already fragile ecosystems over recent decades has led to an imbalance between animal populations and pastoral resources, particularly in the Sahel. Because of this, various

measures and actions have been taken to rehabilitate the ecosystems and promote the development of environmental conservation, the implementation of methods of combatting desertification, and the management of pastoral resources, including through the organisation of agro-pastoralists.

In spite of the various constraints and blockages encountered (lack of an integrated approach, lack of coordination between the structures involved, socio-economic aspects), the following have been noted:

- The establishment of infrastructure for the development of livestock production;
- Attempts to improve animal productivity;
- Attempts to ensure the rational use of pastoral land;
- The use of by-products in animal feeds.

For the countries of Africa, livestock production is an economic, social and cultural activity. It is still primarily an extensive system, even though there are increasing numbers of peri-urban dairy herds. The major constraints are related to disease, animal production techniques, socio-economic factors, and especially feed supplies (use of rangeland, by-products, and fodder crops). The catastrophic effects of the drought, together with growing human and animal pressure, all contribute to the extension of desertification. A continuation of this situation could prove disastrous, if corrective measures are not taken in an urgent and coherent manner. Intended as a guide to planners, developers, decision-makers, technicians and users, this is a summary of strategies which could be recommended in order to achieve the sustainable use of rangelands in Africa, in the context of the CCD.

THE DIAGNOSIS

An analysis of the situation produces the following diagnosis:

- In terms of fodder resources, animal production and income for pastoralists in the pastoral regions, the present situation is of increasing concern, because of the drought and the increase in human and animal pressure;
- The rapid transformation of types of land use is leading to increased sedentarisation, and an extension of farming activities to the detriment of pastures, giving rise to changes in the traditional livestock production systems;
- These changes have not been followed by appropriate developments in the land tenure and pastoral codes;
- Many of the projects and activities undertaken in various pastoral and agro-pastoral regions have not achieved the expected results because of inadequate strategies and inadequate account being taken of environmental constraints and the specific needs of pastoralists;
- Pastoralist participation in identifying and designing projects has often been ineffective, due to the over-technocratic approach to problems and the means used to solve them;
- Despite efforts directed at the development of pastoral regions, livestock productivity is still low and directly subject to climatic and other constraints;
- Significant efforts have been put into training staff specialised in livestock production and pastoral development, but this is still far from satisfying the quantitative and qualitative needs that exist;
- Despite an increasingly clear awareness of the importance of livestock production to the economies of the countries of the Sahel, the means made available have not yet been sufficient to meet the objectives set.

POTENTIAL

The problems encountered by livestock production in the pastoral and agro-pastoral environment of the Sahel should not obscure the great potential of the sector:

- Pastoralists and agro-pastoralists have extensive knowledge and know-how concerning the ecological environment and the animals they breed;

Pastoralists in the Sahel have acquired a great capacity for adapting to the effects of the climate, which, until very recently, has enabled them to ensure balanced ecological systems;
 The herds of the Sahel and the Sudan savanna represent a huge genetic potential which has not yet been exploited because of the constraints of the physical environment and some shortcomings in terms of health protection;
 Some significant fodder resources are not yet exploited because of the lack of water sources in particular regions, whereas others are over-used. Moreover, the possibility of improving pastoral and fodder production has not yet been explored on any large scale;
 The significant achievements of research represent a serious basis on which to build up coherent strategies for the rational exploitation of natural resources in the pastoral regions;
 There is a potentially important national and regional market, which could guarantee outlets for animal products in the medium and long term.

THE CONSTRAINTS

The above potential is affected by many constraints linked to the characteristics of the pastoral and agricultural environment:

Climatic irregularities and the brevity of the rainy season, causing periodic under-nourishment in animals, which affects their productivity and, in the case of "prolonged droughts", seriously decreases their numbers;
 Current agricultural production systems include no provision for fodder production;
 The availability of agro-industrial by-products which can be used as animal feed is limited by the priority set on exports and the pricing policy which does not encourage the use of these by-products in local livestock production;
 The lack or inadequacy of pastoral codes and land tenure regimes is a significant hindrance to the rational management of pastures and water resources;
 The inadequacy of the funds set aside for livestock in national budgets makes it impossible to ensure that the necessary investment is made and that the departments and agencies responsible for promoting the sector do their work correctly.

Given the complex nature of the problems and the delays in implementing solutions, a short-term policy cannot ensure the necessary conditions for the development of livestock production.

THE OBJECTIVES

On the basis of all the aforementioned, the following objectives may be identified:

To ensure the survival of pastoral and agro-pastoral populations through the implementation of policies of social and economic promotion;
 To halt environmental degradation and ensure restoration of the environment through national and regional programmes to combat desertification;
 To recognise the full value of the natural resources available: pasture, water, and genetic potential;
 To increase animal production to cover the needs of local consumption and produce an exportable surplus;
 To ensure the health of livestock herds through a regional policy of health monitoring and protection;
 To halt the deterioration of pastoralists' incomes through the establishment of national and regional marketing policies.

ELEMENTS OF THE STRATEGY

With the objectives so defined, the following elements of a strategy could be envisaged. They could constitute programmes of work:

To improve the living conditions of pastoral populations by working on the following areas:
 pastoral and village water supplies (conflict-free water sources),
 food production,
 primary health care,
 education, training and promotion of activities;

To promote the organisation of pastoral associations which could take responsibility for their own development;

To solve land tenure problems through the adoption and application of appropriate pastoral and land tenure codes;

To intensify animal production and farming systems, particularly by increasing the means and actions of research and development, and promoting the integration of agriculture and livestock production;

To develop pastoral resources through:
 the diversification of animal species raised,
 the establishment of a balance between resources and herd sizes,
 the establishment of a system of spatial and temporal monitoring, and national and regional alarm systems concerning the state of pastures and watering places,
 the introduction of fodder crops (especially dual-purpose crops) and the extension of the appropriate harvesting, drying and storage techniques;

To adopt and implement community regulations concerning, in particular:
 the transhumance ,
 the marketing of livestock products,
 animal health;

To adapt types of training and modes of funding to the specific nature of the pastoral environment;

To encourage the use of industrial by-products by local livestock producers, in particular by restricting imports;

To design and/or develop training modules on the management of rangelands and the development of fodder crops in Africa.

SPECIFIC PROPOSALS FOR ACTION - RECOMMENDATIONS

The workshop to be held in Addis Ababa represents a first step.

The workshop should do the following:

Decide on specific programmes of work, of those proposed in this document, on which to concentrate future activities;

Identify more clearly the resource persons and institutions to constitute the network for the management of rangelands and the development of fodder crops, in the context of the CCD;

Establish a committee to monitor the decisions taken during the workshop, so as to avoid it becoming just another meeting, given the problems to be identified, which are already known;

Request the permanent secretariat of the CCD to provide the financial, material and human resources for the network to implement the programmes agreed and decided upon;

Request the monitoring committee to establish and, according to the funding available or to be sought, to draw up project documents, taking account of the programmes of work agreed upon, with precise time schedules.

All this will allow us to go beyond INTENTIONS, the pious wishes which characterise most meetings of this type.

Some of the more sceptical "beneficiaries" of the numerous recommendations do not, so they say, believe that even a start will be made on solving the many serious problems of the rural world.

THE END

