Pasture Improvement Research in Eastern and Southern Africa

Proceedings of a workshop held in Harare, Zimbabwe, 17–21 September 1984
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Pasture Improvement Research in Eastern and Southern Africa

Proceedings of a workshop held in Harare, Zimbabwe, 17–21 September 1984

Editor: Jackson A. Kategile

Cosponsored by the
Southern African Development Coordination Committee, Gaborone, Botswana,
and the
International Development Research Centre, Ottawa, Canada
Abstract: The proceedings contains reviews by national scientists on pasture research done primarily in Eastern and Southern Africa (Ethiopia, Kenya, Tanzania, Burundi, Zambia, Zimbabwe, Lesotho, Botswana, Mozambique, and Madagascar). The application of the results obtained and lessons learned are highlighted and used in setting of national priorities for research areas for the future. Critical reviews on current pasture research methodologies are included in the proceedings. The research methods discussed are germ-plasm collection, storage, and dissemination; and germ-plasm introduction and evaluation, nutritive evaluation of pastures, grazing experiments, and range monitoring. Specific guidelines on methodologies are outlined and these are useful to pasture agronomists, animal nutritionists, and range-management scientists.

Two case studies of pasture-research regional networks in Asia and Latin America were presented and discussed. A strategy for future pasture research coordinated through a regional Pastures Network for Eastern and Southern Africa (PANESA) was discussed and agreed upon.


Deux études de cas ont fait l'objet d'une présentation suivie d'une discussion : il s'agit des réseaux régionaux de recherche sur les pâturages en Asie et en Amérique latine. Après discussion, on a convenu d'une stratégie de la recherche sur les pâturages, dans les années à venir; la coordination de cette stratégie sera assurée par une section régionale du Pastures Network for Eastern and Southern Africa (PANESA).

Resumen: En las actas se recogen ponencias presentadas por científicos de diferentes países sobre las investigaciones en pastos que se han realizado principalmente en el África oriental y meridional (Etiopía, Kenia, Tanzania, Burundi, Zambie, Zimbabwe, Suazilandia, Lesotho, Botswana, Mozambique y Madagascar). Se destaca la aplicación de los resultados y experiencias obtenidos, muy útiles para determinar las prioridades de las investigaciones futuras en las diferentes naciones. En las actas se recogen también ponencias críticas sobre las metodologías empleadas actualmente en las investigaciones sobre pastos. Se analizan los siguientes métodos de investigación: recogida, almacenamiento, diseminación, introducción y evaluación de germoplasma; evaluación del valor nutricional de los pastos; experimentos de pastoreo; y control de dehesas. Se resumen directrices y metodologías específicas de gran utilidad para agrónomos especializados en pastos, expertos en nutrición animal y científicos especializados en gestión de dehesas.

Se presentan y analizan dos estudios de casos de las redes regionales de investigación en Asia y Latinoamérica. Se discutió y aprobó una estrategia para realizar investigaciones sobre pastos en el futuro que serán coordinadas por la Red de Investigaciones sobre Pastos para África Oriental y Meridional (RIPADM).
CONTENTS

Foreword 7

Participants 9

Keynote Address 15

Session I State of Research Work in Eastern and Southern Africa 23

Pasture Research in Zimbabwe: 1964-84
J.N. Clatworthy 25

Highlights of Pasture Research in Malawi: 1975-84
B.H. Dzowela 59

Pasture Research and Development in Ethiopia
Lulseged Gebrehiwot and Alemu Tadesse 77

Pasture Research in Burundi
Gaboryaheze Astère 92

Survey of Pasture Research in Madagascar
J.H. Rasambainarivo, R. Razafindratsita, and M. Rabehanitrihiony 102

Review of Range and Pasture Research in Botswana
D.R. Chandler 115

Review of the Use of Improved Pasture Species in Mozambique
Jonathan Timberlake and António Catalão Dionisio 143
Pastures in Lesotho
C.J. Goebel, B. Motsamai, and V. Ramakhula

Pasture Research and Development in Zambia
J. Kulich and E.M. Kaluba

Past and Current Trends of Pasture Research in Kenya
Abdullah N. Said

Pasture Research in Tanzania
A.B. Lwoga, M.M.S. Lugena, and A.R. Kajuni

Forage Legumes in Agropastoral Production Systems within the Subhumid Zone of Nigeria
M.A. Mohamed Saleem

Session II Pasture Research Methodologies and Regional Networks

Collection and Preliminary Forage Evaluation of Some Ethiopian Trifolium Species
J. Kahurananga, L. Akundabweni, and S. Jutzi

Theory and Practice in Forage Germ-Plasm Collection
J.R. Lazier

Germ-Plasm Storage and Dissemination
Adolf Krauss

Tropical Pasture Germ-Plasm Evaluation: Strategy and Experimental Designs
A.B. Lwoga

Introduction and Evaluation of Large Germ-Plasm Collections
D.G. Cameron

Methods of Pasture Establishment
P.J. Grant and J.N. Clatworthy
Animal Experiments as a Measurement of Pasture Productivity
   P.T. Spear 368

Commercial Seed Increase of New Pasture Cultivars: Organization and Practice
   D.S. Loch 392

Evaluation of the Nutritive Value of Forages
   Kassu Yilala and Abdullah N. Said 425

Range Monitoring Methodologies
   Moses O. Olang 452

Australian-Southeast Asian and Pacific Forage Research Network
   T.R. Evans 465

Network Approach in Pasture Research: Tropical American Experience
   J.M. Toledo, H.H. Li Pun, and E.A. Pizarro 475

Discussion Summary and Recommendations 499

Research Priorities and Future Strategies on Germ-Plasm Collection (Multiplication, Storage, and Dissemination) 499

Selection and Evaluation Methodologies 502

Establishment and Management 504

Research for Small-Scale/Small Producers Pasture Improvements 506

Organizational Aspects 507
AUSTRALIAN-SOUTHEAST ASIAN AND PACIFIC FORAGE RESEARCH NETWORK

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Abstract Pasture research workers in Southeast Asia and the Pacific face many constraints in the development of effective research programs. Opportunities for discussion of problems of mutual interest are few both between scientists in the different countries and experienced scientists elsewhere. Access to scientific and technological information is limited. The paper discusses these and other constraints and the opportunities for overcoming them, through the function of a Network established to link pasture/forage scientists in the region. The major objective of the Network is to improve the effectiveness of research and forge strong interactive links between scientists and extension workers in the countries involved for the benefit of improving livestock production and income of primary producers in the region.

The objectives of agricultural research in most, if not all, developing countries are primarily to solve problems concerned with improving the nutritional levels and reliability of food supplies for their populations. Staple food crops are given the highest priority in research, but the improvement of ruminant livestock production is also considered important. The reasons are varied; in the more affluent developing nations as Gross National Product (GNP) increases and more money becomes available to their people, the demand for meat increases; in the poorer nations, there is a demand for increase in meat and milk not only to provide improved
nutrition for the existing population but to meet the demands from an increasing population. In many cultures, large ruminants are a source of draft power for crop productivity and manure for fertilizing such crops. There are also socioeconomic reasons for being able to maintain or improve livestock populations, for example, they are a source of capital for use in times of hardship.

Although food-crop production receives a greater emphasis in improving food supplies, a combination of crop and livestock in farming systems can have a major impact in improving overall productivity. Ruminants make a particular contribution to improving the efficient use of land resources, through their ability to utilize crop residues and by-products not suitable for human consumption and to use pastures or forages on land not suitable for crop production.

These resources cannot be fully utilized or improved in productive capacity without appropriate research involving a range of scientific disciplines. Interactions between climate, soil, plant, and animal and the effect of human interference in this dynamic biological system are highly complex. For research to be fully effective, there is "conceptually" a requirement for a "critical mass" of scientists from different disciplines that is necessary to sustain any serious research effort. This concept is applicable in both developed and developing nations, but is more difficult to put into operation in the latter. Limited financial resources and shortage of scientists and technical personnel are a serious constraint to achievement in research. Isolation of scientists either geographically or through lack of contact with their peers in their own or other interactive disciplines and inadequate support services are also important constraints.

The establishment of a network of pasture/forage scientists would provide a means of overcoming some of these problems and give support and encouragement to scientists in developing countries. Expertise from within the network could aid in identifying priorities in research and provide a sound basis for requests for resources to undertake research in high-priority areas. It should be recognized that agricultural scientists not only have a responsibility to provide information to
farmers, which is used to plan and implement improved production of crops and livestock, but also to provide reliable information to governments for future planning of development policies. It is important, therefore, to develop a cadre of competent scientists capable of problem solving and of interpreting national and international scientific advances for the benefit of national development.

**PASTURE/FORAGE NETWORK IN SOUTHEAST ASIA AND THE PACIFIC**

The Australian Centre for International Agricultural Research (ACIAR) and the Australian Development Assistance Bureau (ADAB) are jointly supporting the establishment of a Network of Pasture/Forage Scientists in Southeast Asia and the Western Pacific. The background to this project is as follows.

Australia has had a substantial effort on tropical pasture research for some 30 years and is in a strong position to assist pasture research in the Asia-Pacific region. For more than 10 years, Australian scientists have been involved in pasture research in collaboration with local scientists in the Asia-Pacific region, especially in the Southeast Asian countries of Indonesia, Malaysia, and Thailand. During this period, there has been substantial growth in interest in pasture investigations by national institutions and universities within the region. The development of improved pastures and other aspects of livestock production has also been encouraged through bilateral and multilateral aid programs in which Australia has taken a leading part.

The growing interest in pasture and forage production and its utilization by ruminant animals has been reflected in a considerable increase in the number of scientists and research centres active in these fields. However, much of this research is at an early stage of development and local experience in planning and conduct of research programs, interpretation of results, and in experimental techniques is limited. Pasture workers in these Asia-Pacific countries are handicapped by lack of regular access to information on relevant developments. Opportunities for discussion of problems of mutual interest are few, both between scientists in
the different developing countries and between them and experienced tropical pasture scientists in Australia. There has been an increasing desire by scientists in the region for better communication and contact both between themselves and with Australian scientists; the establishment of a network is perceived as a means of meeting this need.

Countries working in pasture/forage research in Southeast Asia include the Philippines, Thailand, Malaysia, and Indonesia and Fiji in the western Pacific; selected statistics are shown in Table 1. The land area of \(297 \times 10^6\) ha carries a human population of some \(269 \times 10^6\) people of whom approximately 58% are involved in agriculture. Ruminant populations are approximately \(13.6 \times 10^6\) cattle, \(11.8 \times 10^6\) buffalo, \(4.3 \times 10^6\) sheep, and \(10.3 \times 10^6\) goats. Small ruminants are kept for meat production, but both cattle and buffalo are primarily used for draft purposes and ultimately for meat, when they are too old to work.

The region has climatic diversity, even within countries, due to monsoon influences and marked topographic effects. Similarities exist between eastern Indonesia, northeast Thailand, and the western parts of Luzon and Visayas in the Philippines where there are distinct wet and dry seasons. In contrast, west Indonesia, southwest Thailand, Malaysia, the eastern Philippines, and Fiji have a short (2-3 months) dry season or no period without rain. There are also transitional zones with generally higher rainfall variability than either of the above. The range of annual rainfall reported from within the region is from 570 to more than 7,000 mm.

The problems of increasing forage/pasture production to meet ruminant requirements are intensified in some areas through the combination of intensive land use for cropping with high human and ruminant populations. The most extreme case is in Java and Madura in Indonesia. These islands carry 64% of the human population of Indonesia together with 60% of the cattle, 43% of the buffalo, 80% of the goat, and 94% of the sheep. In this highly fertile and intensively cropped area, large ruminants are being replaced with small ones because of first, the diminishing crop area per family and uneconomical animal use of cattle/buffalo for
Table 1. Selected statistics for countries participating in the Forage Network.

<table>
<thead>
<tr>
<th></th>
<th>Philippines 4°N-21°N</th>
<th>Thailand 3°N-22°N</th>
<th>Malaysia 10°N-6°N</th>
<th>Indonesia 11°S-6°N</th>
<th>Fiji 16°S-19°S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land area (ha x 10^6)</td>
<td>29.8</td>
<td>51.3</td>
<td>32.8</td>
<td>181.1</td>
<td>1.83</td>
</tr>
<tr>
<td>Human population (x 10^6)</td>
<td>51.9</td>
<td>49.2</td>
<td>14.8</td>
<td>153.0</td>
<td>0.65</td>
</tr>
<tr>
<td>% in agriculture</td>
<td>44.6</td>
<td>74.4</td>
<td>46.2</td>
<td>57.8</td>
<td>38.70</td>
</tr>
<tr>
<td>Ruminant population (x 10^6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cattle</td>
<td>1.95</td>
<td>4.50</td>
<td>0.55</td>
<td>6.4</td>
<td>0.16</td>
</tr>
<tr>
<td>Buffalo</td>
<td>2.80</td>
<td>6.20</td>
<td>0.29</td>
<td>2.5</td>
<td>na^a</td>
</tr>
<tr>
<td>Sheep</td>
<td>0.03</td>
<td>0.02</td>
<td>0.07</td>
<td>4.2</td>
<td>na</td>
</tr>
<tr>
<td>Goats</td>
<td>1.60</td>
<td>0.32</td>
<td>0.38</td>
<td>8.0</td>
<td></td>
</tr>
</tbody>
</table>

^a na = not available

cultivation and, second, the greater flexibility in feed and financial management offered by sheep/goats. The average number of cattle per family is 1.8 and food supply for them is dependant on crop residues, cut forage from waste areas, back gardens, roadsides, or plantation crop areas. In contrast, Indonesia also has an estimated 19 x 10^6 ha of Imperata grasslands that could be improved for animal production and are currently almost unused.

There are three broad areas that require research for improving pasture/forage production:

(a) Backyard or smallholder farms. Although 90% of the ruminant population in the region is owned by smallholders, most are confined to the family farm area. This may vary from 1-5 ha. Improvement in forage production is being undertaken by use of forage tree legumes, e.g., leucaena, and the more vigorously growing grasses such as Napier grass.

(b) Extensive native pasture lands, often on soils of low fertility and with a pronounced dry season. Some of these are common grazing lands that present special problems in species establishment and management.

(c) Use of forages in intercropping systems. An obvious target area is use of pastures/forages under plantation crops, e.g., rubber, oil palm, coconuts, and reafforestation areas. Another is intercropping with forage species in a cropping system. For example, undersowing a legume in the later growing stage of rice production, or as an alternate crop after rice; both techniques are being researched in Thailand and the Philippines.

**CONSTRAINTS IN RESEARCH**

The introductory statement in this paper mentioned some constraints that apply in the Southeast Asia/Pacific region as well as to developing countries in other regions. Other than financial constraints in research funding, the most serious one is probably inexperience by scientists in research planning. Research in soil-plant-animal-systems requires interaction between scientists of different disciplines.
team should ideally comprise scientists with expertise in the fields of pasture agronomy, plant nutrition, legume bacteriology, soil science, animal nutrition, and biometrics. A range of such expertise within individual countries may exist but there are often no integrated research programs involving such disciplines. In other instances there may be no experienced scientists available in some disciplines.

The lack of interaction between plant and animal scientists is cause for concern. This dichotomy of interest is partly historical and was a considerable problem in some developed countries for many years. Animal scientists, many with a veterinary background, tend to place a higher priority on animal health and genetics than on improving the nutritional status of animal feed supplies. Both health and genetics require research, but it is well documented that a well fed animal is more resistant to (or tolerant of) pests and diseases and that the genetic potential for growth and production cannot be fully expressed on poor-quality feeds.

COMMUNICATION CONSTRAINTS

Communication is an integral part of research and this includes obtaining scientific and technological information from existing world agricultural knowledge. Adequate library services play an essential part in this information flow, but in many instances their capacity to provide these services is limited. Journals from both international and in-country sources are just not available. Although a literature review is a standard requirement for planning experiments, available resources often preclude this.

One of the most productive channels of information from outside a country are networks that link persons in the same lines of research. These contacts may be made through attendance at workshops or conferences, but these opportunities are limited to only a few scientists in the region.

Communication of research information to end-users could be greatly improved. Liaison between research institutions and extension workers is often poor, partly
because there are no formal linkages between departments with these responsibilities.

OBJECTIVES OF THE AUSTRALIAN-SOUTHEAST ASIAN PACIFIC NETWORK

The broad aim of the Network is to improve the effectiveness of research in the participating countries by providing support and encouragement in research and to aid in overcoming communication problems. Specific objectives are:

(a) To help improve the individual countries' capacities to plan research programs that are of high priority in achieving the countries' objectives;

(b) To encourage each country to undertake discrete programs of research that are of mutual interest to participating countries;

(c) To strengthen technological capacity at all levels;

(d) To strengthen each country's information base;

(e) To help provide for the extension of research developments through regional, national, and local channels and their application at the farm level;

(f) To develop a network that will provide a substantial base for long-term future contacts between regional scientists.

Structure and Composition

There are a substantial number of scientists in the Southeast Asia-Pacific region who have some interest and activity in pasture/forage research. In the initial stages of developing the Network, it is considered that the greatest impact would be achieved by establishing a Primary Network of some 10 leading scientists, actively undertaking research, as core members. These scientists would act as focal points for dissemination of the benefits arising from Network activities to other workers in their country or region. Members of the Primary Network would be those institutions actively
engaged in pasture and fodder research on a significant scale whose staff and facilities are of a quality that enable them to derive most benefit from and contribute to core Network activities.

The countries with such a capacity are the Philippines, Thailand, Malaysia, Indonesia, and Fiji. Other countries in the region that have no national institution or scientists working in pasture/forage production are unable at this point to be core members. However, this does not mean exclusion from Network functions that could help in the development and utilization of pastures/forages for ruminant production.

**Network Function**

(a) To provide comment and assistance in planning research and its execution. This function includes assistance with experimental design, choice of appropriate techniques, and advice on the selection and purchase of equipment and consumables for use in experimental programs.

(b) To provide guidelines and advice to scientists on the interpretation and publication of research results.

(c) To identify training requirements at both the scientist and technician levels and to implement training programs.

(d) To assist and encourage pasture/forage seed production and distribution.

(e) To strengthen communication and information bases in the region by: publishing a newsletter 3-4 times a year informing pasture and forage scientists in the region about research activities in the region and their results. It would provide a medium for publication for workers in countries where there are no appropriate local journals. Results of studies of interest to workers in the field, but not acceptable to internationally recognized journals (e.g., results from initial screening of pasture species) would be included, as well as abstracts and comments on developments of particular interest in pasture science. The newsletter would be
widely distributed to all interested pasture scientists in the region.

(f) Arranging annual workshops for members of the Primary Network the venue would rotate between member countries. It is planned to invite other scientists and senior extension persons to attend, but to be effective a workshop should not include more than about 20 persons.

(g) To establish a computerized data base to provide information on (a) scientists in the region and their research and (b) published literature from the region and from conferences and workshops that do not formally publish proceedings.

The Network needs the backing of a research institute with experience in tropical pasture research. The CSIRO Division of Tropical Crops and Pastures has accepted responsibility for the Network and to make available the Scientific Secretary. The Division has research staff with a great deal of accumulated experience in pasture agronomy and ecology and animal production, plus specialists in plant breeding and adaptation, plant nutrition, nitrogen economy of pastures, legume bacteriology, plant physiology, plant biochemistry, animal nutrition, and forage genetic resources. Other scientists in northern Australia with experience in these and other fields would be called on by the Network for information and advice on specific research or extension problems as necessary.

It is hoped that the Network will not only improve the effectiveness of research, but forge strong interactive links between scientists and extension workers in the countries involved and make a substantial impact on improving livestock production and the income of the primary producers in the region.