Crop Improvement in Eastern and Southern Africa

Research Objectives and On-Farm Testing

A regional workshop held in Nairobi, Kenya, 20-22 July 1983
The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support research designed to adapt science and technology to the needs of developing countries. The Centre's activity is concentrated in five sectors: agriculture, food and nutrition sciences; health sciences; information sciences; social sciences; and communications. IDRC is financed solely by the Parliament of Canada; its policies, however, are set by an international Board of Governors. The Centre's headquarters are in Ottawa, Canada. Regional offices are located in Africa, Asia, Latin America, and the Middle East.
Crop Improvement in Eastern and Southern Africa:
Research Objectives and On-Farm Testing

A regional workshop held in Nairobi, Kenya
20-22 July 1983

Editor: Roger A. Kirkby
Un atelier a réuni un petit groupe représentatif de scientifiques travaillant à des programmes d'amélioration des cultures alimentaires en Afrique orientale et australe, pour discuter de la planification, de la conduite et de l'élaboration de ces programmes. Le débat a porté surtout sur les aspects méthodologiques, communs à la majorité des cultures réalisées par les petits fermiers et les plus susceptibles de permettre l'utilisation des résultats de la recherche.

On s'intéresse donc ici aux cultures locales et aux pratiques culturales, à l'organisation de l'aide institutionnelle pour améliorer les cultures, aux objectifs particuliers des programmes et au mode d'établissement de ces objectifs, enfin aux méthodes d'évaluation employées pour formuler une nouvelle recommandation sur les travaux de vulgarisation. On résume aussi la séance de discussion qui a porté sur l'organisation des programmes d'amélioration des cultures, l'établissement des objectifs techniques, l'application des critères de sélection, la méthodologie pour les essais tels que les fermes, et enfin, l'orientation de la recherche.

RESUMEN

Este seminario reunió un pequeño grupo representativo de científicos que trabajan en programas de mejoramiento de cultivos alimenticios en Africa oriental y meridional con el ánimo de discutir la planificación, la ejecución y el desarrollo de tales programas. El énfasis de la discusión recayó en aquellos aspectos metodológicos, comunes a la mayoría de los cultivos sembrados por los pequeños agricultores, que tienen la probabilidad de influir más en que los resultados de la investigación sean utilizados por el agricultor.

Entre estos trabajos se encuentran breves recuentos de las variedades locales y las prácticas de cultivo empleadas actualmente, la organización institucional para el fitomejoramiento, los objetivos específicos de los programas y su sistema de establecimiento, así como los procedimientos de evaluación empleados para llegar a las nuevas recomendaciones para los trabajos de extensión. También se incluye en este volumen un resumen de la sesión de discusión sobre la organización de los programas de fitomejoramiento, la fijación de los objetivos técnicos y la aplicación de los criterios de selección y la metodología para las pruebas tanto en fincas como en localización múltiple. Varios temas de política fueron identificados.
CONTENTS

FOREWORD 5

INTRODUCTION 6

Methodological issues related to food-crop improvement in eastern and southern Africa Roger A. Kirkby 6

CEREALS 14

Sorghum research at Serere, Uganda J.P.E. Esele 14
Sorghum improvement in Zimbabwe Joseph N. Mushonga 19
Sorghum improvement in Somalia M. Hashi 25
Toward a maize program responsive to Burundi farmers Robert Zeigler and Kayibigi Manassé 30

GRAIN LEGUMES AND OILSEEDS 36

Reviving groundnut production in Mozambique A.D. Malithano, K.V. Ramanaiah, and S.B. Chilenguin 36
Pulse and groundnut improvement in Tanzania A.L. Doto and C.L. Keswani 47
On-farm testing of improved pigeon pea (Cajanus cajan (L) Millsp.) cultivars in Kenya J.F. Moses Onia 53

ROOTS AND TUBERS 60

Root-crops program, Zanzibar Mwinyi Haji Makame and Caroline Begg 60
Sweet potato cultivation and research in Rwanda G. Ndamage 64
Strategies for root-crop improvement in Uganda G.W. Otim-Nape 78

CROPPING SYSTEMS 88

Farming systems research methodology: The Morogoro experience Z.E. Maingu 88
Banana-based cropping systems in Uganda D.S.O. Osiru and J.K. Mukiibi 94
Improvement and development of production practices and preparation and preservation methods of indigenous vegetables in Malawi M.B. Kwapata and O.T. Edje 100
ORGANIZATION OF CROP IMPROVEMENT 106

Organization of team research for crop improvement in Ethiopia
Gebremariam Shekour 106

Linkages between research and extension in Ethiopia Adugna Haile
109

SUMMARY OF DISCUSSIONS 113

PARTICIPANTS 121
LINKAGES BETWEEN RESEARCH AND EXTENSION IN ETHIOPIA

Adugna Haile

Institute of Agricultural Research, P.O. Box 2003, Addis Ababa, Ethiopia

Ethiopia, with an area of 122 million ha, is predominantly an agricultural economy in which more than 86% of the population is engaged in agriculture. The present agricultural practices of Ethiopian farmers are traditional in nature and the overall production per hectare is low. This low productivity could be improved through extension by introducing modern agricultural technologies that have been developed by research institutes.

In 1974, the Institute of Agricultural Research (IAR)/Extension Project and Implementation Department (EPID) (now the Agricultural Development Department (ADD)) established a joint research and extension program to cover different parts of the country. This program continued until 1976/1977.

A strong resolution was passed by the participants attending the National Crop Improvement Conference (NCIC) meetings held between 1978 and 1980 that IAR and ADD should form a strong link so that the research results of the conference could reach most peasant farmers. In 1980/1981, a joint agreement was reached between IAR and ADD to run adaptive tests in potential areas of crop production. Accordingly, the IAR/ADD joint research and extension program was reactivated with the following objectives: (1) to revive the already discontinued IAR/EPID research program but with better coordination and a better approach, (2) to involve researchers as well as experts in extension work so that constant interaction and dialogue can be maintained, (3) to reach out to more representative locations that are already covered by extension services but receive limited agroecological coverage from IAR, (4) to improve the existing weak and ineffective link between research and extension through a coordinated effort, and (5) to formulate a suitable extension package and provide research innovations to farmers through field demonstrations.

In setting out their strategies to implement the program IAR and ADD have elaborated further on their responsibilities. The program is run by a committee made up of representatives from both IAR and ADD. The committee meets once or twice a year to hear annual reports and make recommendations for the coming season.
ORGANIZATIONAL RESPONSIBILITIES

The responsibilities of IAR are to assign one coordinator to ADD; participate fully in the planning, designing, and evaluation of trials; prepare and supply planting materials and trial guidelines; participate in site visits and supervision; participate in the training of field staff; and submit recommendations based on research findings.

The responsibilities of ADD are to provide facilities, such as offices, materials, and transport, at the field level; ensure that regional staff pay proper attention to the program and any follow-up activities; participate in planning, program establishment, and assessment of trial sites; make trial results available on time to researchers; advance recommendations based on trial results to the appropriate areas; and assign one coordinator to the head office and junior experts to work on-site.

COORDINATION OF THE PROGRAM

The program is run by a committee from IAR and ADD. The committee has a chairman and two coordinators, one from each of the two organizations.

It is the responsibility of the chairman to give advice to the coordinators, call general meetings as needed, and transmit those resolutions made by the committee that can't be solved by the coordinators to IAR and ADD.

It is the responsibility of the coordinators to participate in site selection; collect seeds, fertilizers, and guidelines from researchers and dispatch them to the appropriate sites; purchase materials; follow up land preparation, planting, and cultural practices by collecting data at the sites; collect row data and seeds from the sites and dispatch these to the researchers for analysis, quality tests, and recommendations; collect analysis and recommendation reports from the researchers and compile a progress report each year; and arrange training for field staff.

SITE SELECTION

Each site consists of an area of fenced farmland with a minimum of facilities. The criteria used for selecting sites included the production potential of the area, whether or not the site is representative of the area, and whether or not there was an IAR station or substation in the area (emphasis being given to extending IAR's national coverage). Before beginning any activity in the area, the background of each site was studied.

TYPES OF TRIALS CONDUCTED AT IAR/ADD SITES

Trials were conducted to study adaptation of cereals, pulses, oil crops, and horticultural crops; sowing dates; seeding rates; pests, diseases, and weeds; types and rates of use of fertilizers; and drainage and lime content of the soil.
In 1981/1982, the IAR/ADD joint research and extension program began trials at 11 sites in six administrative regions (Fig.1), each site covering an area of 1 ha. During the 1983/1984 season, trials were carried out on 18 crops and observations on lime application were also made (Table 1). All trials showed good performance and similar yields to those obtained at IAR stations. The trials were evaluated by researchers from IAR, the coordinators, and experts from ADD. After harvest, the coordinators sent all of the data from each site to researchers for analysis and recommendations. Later, after analysis and recommendations, a report was sent back to the coordinators for the preparation of a progress report.

TRIAL MODIFICATIONS

During the 1981/1982 season, most of the trials at the IAR/ADD sites were national variety yield trials, prenational yield trials, observation trials, and variety trials. However, plot sizes and the number of trial replications were not uniform. The technical committee has since suggested that the number of replications be set at four and, where fertilizer is applied as a second factor on a variety trial, it will only be applied to two of the four replications; the length of the plot be limited to 5 m; the number of varieties to be tested be limited to 10 or less; and the varieties to be tested at IAR/ADD sites be either released or those being considered for release within 1 or 2 years.
Table 1. IAR/ADD research program, 1983/1984.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Kohaasion</th>
<th>Bichena</th>
<th>Motta</th>
<th>Bure</th>
<th>Debore Tabar</th>
<th>Moldya</th>
<th>Harbu</th>
<th>Inwari</th>
<th>Tefi</th>
<th>Robe</th>
<th>Shamb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bread wheat</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Durum wheat</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barley</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tef</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Late-set sorghum</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early-set sorghum</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maize</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Pulses                |           |         |       |      |              |        |       |        |      |      |       |
| Haricot bean          | x         |         |       |      |              |        |       |        |      |      |       |
| Cowpea                | X         |         |       |      |              |        |       |        |      |      |       |
| Lentils               | x         | x       | x     | x    | x            | x      | x     | x      | x    |      |       |
| Faba bean             | x         | x       | x     | x    | x            | x      | x     | x      | x    |      |       |
| Field peas            | x         | x       | x     | x    | x            | x      | x     | x      | x    |      |       |
| Soybean               | x         |         |       |      |              |        |       |        |      |      |       |

| Oil crops             |           |         |       |      |              |        |       |        |      |      |       |
| Linseed              | x         | x       | x     | x    | x            | x      | x     | x      | x    |      |       |
| Noug<sup>b</sup>      | x         | x       | x     | x    | x            | x      | x     | x      | x    |      |       |
| Sesame                | x         |         |       |      |              |        |       |        |      |      |       |
| Sunflower             | x         | x       | x     | x    | x            | x      | x     | x      | x    |      |       |
| Rapeseed             | x         | x       | x     | x    | x            | x      | x     | x      | x    |      |       |
| Mustard              | x         | x       | x     | x    | x            | x      | x     | x      | x    |      |       |
| Potato               | x         | x       | x     | x    | x            | x      | x     | x      | x    |      |       |
| Lime application      | x         | x       | x     | x    | x            | x      | x     | x      | x    |      |       |

<sup>a</sup> There will be additional sowings.
<sup>b</sup> Noug = Gezoita abyssinica (Niger seed).

**FUTURE PROGRAMS**

The IAR/ADD joint research and extension programs will be expanded through time as more experience is gained. Any variety that produces a good yield for two seasons will be planted for the third season in a larger plot or on farmers' fields to study its progress and after that it will be released to the farmers.