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 terrains et sur 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 África 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. Chilengine 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. Maingi 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
Of a total area of 122 million ha, about 85 million ha (70%) is considered to be suitable for agricultural production in Ethiopia, although only 9 million ha (10%) is currently cultivated. However, agriculture is the mainstay of the economy, providing a livelihood for about 85% of the population, estimated at 32 million people, and contributing to over 50% of the gross domestic product (GDP) and 85% of export earnings.

That Ethiopia offers an unusually wide range of ecological conditions, due to variable altitude and rainfall conditions, has given rise to the cultivation of sundry crops, some of which are of Ethiopian origin. On the whole, cereals occupy about 53%, pulses 13%, and oil crops 4% of the total cultivated land.

Most of the cropland lies in the highlands or river valleys. Cultivation in the mountain zone, including all land over 4000 m above sea level, is largely precluded by cold weather. Grains such as wheat, tef, and barley grow in the cool highland zone, extending from 2500-4000 m.

These crops, as well as corn, sorghum, and millet, do well in the temperate highland zone, which extends from 2000-2500 m. Coffee and ensete (false banana) do well at this altitude in the southwest, where the average rainfall is higher. Cultivation below 2000 m, i.e., in the hot zone of the semidesert, is possible in river valleys or with irrigation and consists of tropical and semitropical produce.

In spite of the inestimable role that agriculture plays in the country's national economy, its productivity has been very low. The national average yield of major cereals has never reached the attainable potential of the crops.

The high productive potential, which paradoxically is tied up with the low productivity of agriculture, can be attributed to many interrelated production constraints and factors. Some of these constraints are institutional, others pertain to natural and environmental factors, while still others relate to the lack of improved technologies prevailing at different times in the country.

Therefore, these technological, natural, and institutional barriers have to be somehow alleviated so that better agricultural
development strategies can be made. The need for and development of an effective research component to cater to the various agroecological zones, the search for and establishment of appropriate research lines, and the coordination of these efforts will go a long way toward solving part of the problem.

**RESEARCH APPROACH**

To accelerate agricultural productivity and promote economic growth for countries heavily dependent upon agriculture, the first and foremost attempt should be directed toward carrying out agricultural research. Even though this may be the case, sustainable results can only be achieved if the preferred research operates in a systematic manner.

The Institute of Agricultural Research (IAR), although presently consisting of 5 departments and 15 interdisciplinary teams working in 7 main stations and 22 substations, has gone through many complex and practical experiences in attempting to build an efficient and sound research effort.

Prior to the strengthening of IAR, some rudimentary research was accomplished by different colleges and institutions. In cognizance of the difficulties encountered in research coordination, IAR has tried to synchronize its efforts and coordinate its station-based research.

Until 1976, research programs were prepared and implemented on a station/location basis, where sections in each discipline were serving only the programs and priorities of the particular station.

This approach was found to be weak in terms of focusing research on the pressing needs of the farmers or on agricultural development in particular. It tended to produce academically oriented research activities and failed to organize the scattered research work outside IAR, which resulted in duplication of effort. The need to coordinate research across stations has since become the immediate alternative, which led to a restructuring of the technical work on a departmental basis during the 1976/1977 crop year. At this time, eight research departments were created.

Although this new approach allowed for better coordination of research activities across stations, through departmental coordinators, it was again found to constrain further development and coordination.

Thus, in 1979, the departmental structure was reformulated to consist of 15 national commodity/crop oriented multidisciplinary research teams, namely: fruits and nuts, roots and tubers, vegetables, spices, wheat, barley, tef, maize, sorghum, lowland oil crops, fibre crops, lowland pulses, highland oil crops, highland pulses, and coffee. Each team is composed of a breeder, an agronomist, crop protection specialists (weed, entomology, pathology), a soil-fertility specialist, and others as required/available. Team members may be drawn not only from IAR but also from Addis Ababa University, according to the availability of relevant expertise. Today, each team is concerned with the improvement of a particular crop and is working under its respective team leader. The team leaders, in turn, are coordinated by the team leaders' coordinator. In addition, five departments (animal science, pasture, and forage crops; crop protection; soil science; agricultural engineering, home science, and food
technology; and socioeconomics), which consist of four, four, two, three, and two sections, respectively, exist in the institute.

Although it is for the crop improvement program that the multidisciplinary research approach was made operational, surveys and studies are in progress to develop the same system for animal resource improvement research, which is now scattered and less coordinated.

In general, the multidisciplinary team approach paved the way for the formulation of an all-inclusive research program. Initially, IAR was facing problems of developing appropriate research programs but now the definition of agricultural research programs, which reflects their needs, is helping to achieve better results due to the active participation of user organizations. This is expressed during the various stages of program development.

In short, the proposed stages of program development or levels of screening, which are viewed in terms of the prevailing stage and researchers' time, are as follows:

(1) National Crop Improvement Conference (NCIC): This is a meeting that involves more than 300 people and is designed to evaluate the performance of previously recommended research results, recommend the release of improved crop varieties and proven cultural practices, and indicate future lines of investigation. NCIC is believed to play an important role in that the users of agricultural research findings are given the opportunity to express their concerns and problems to those persons conducting the research and involved in directing and planning the national agricultural research effort.

(2) Pre-Preview: This is a recently introduced stage at which members and/or researchers meet on a team basis to discuss and check on the practical problems likely to arise in executing proposals and research methodology and scientific interest.

(3) Preview: This stage involves meetings at which acknowledgment of and discussions on the merits of research lines are given attention and where screening of research proposals in light of needs, objectives, and resources for research rather than factors of scientific interest and research methodology take place. It is also the phase during which user organizations are best represented to express their interests.

(4) Review: At this stage, a meeting is held at which programs are rated against some selected priorities. Here also, previously approved projects are discussed. Participants at this meeting include officers in charge, department coordinators, team leaders, invited scientists, and IAR management. After review, the approved research programs are compiled and passed on to higher authorities for financing.

CONCLUSION

The formation of multidisciplinary crop commodity teams in IAR has proven its vitality through the realization of an integrated research program that permits the participation of all other agriculturally involved institutions in an attempt to find solutions to the great variety of agricultural problems existing in the country. Moreover, the research program has benefited greatly from the approach because it is streamlined to focus on priority crops/crop groups, with a joint effort for their improvement.