Crop Improvement in Eastern and Southern Africa

Research Objectives and On-Farm Testing

A regional workshop held in Nairobi, Kenya, 20-22 July 1983
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Crop Improvement in Eastern and Southern Africa: Research Objectives and On-Farm Testing

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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 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.
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IMPROVEMENT AND DEVELOPMENT OF PRODUCTION PRACTICES AND PREPARATION AND PRESERVATION METHODS OF INDIGENOUS VEGETABLES IN MALAWI

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In the quest for food and the struggle for human survival, indigenous vegetables and fruits have historically played an important role in developing countries. Daily consumption of these vegetables and fruits has provided the bulk of vitamins, essential minerals, protein, and some carbohydrates needed for normal human body growth and development. Unfortunately for decades, it has been accepted that the indigenous vegetables and fruits are poor-man's crops and their high nutritional value has been virtually ignored and they are not included as important crops in agricultural statistics in many developing countries, including Malawi.

In Malawi, where over 90% of the population lives in rural areas (Anonymous 1977), indigenous vegetables (Table 1) form the main relish taken with "nsima" (cooked maize flour) and provide most of the vitamins, essential minerals, and some protein in the diet of the people (Thomo 1983, unpublished data; Butao 1981; Pereira and Bergum 1976; Platt 1940). The nutritional value of indigenous vegetables is comparable to and in most cases surpasses that of most exotic vegetables (Okigbo 1981; Butao 1981; Grubben 1977; Schmidt 1971), but their economic potential has not been explored and, hence, is regarded as inferior to that of exotic vegetables (Grubben 1977; Epenhuijsen 1974). Limited survey reports show that a large number of different species of indigenous vegetables are consumed by the rural population (Thomo 1983, unpublished data; Williamson 1956; Platt 1940).

In spite of the dietary importance and economic potential, no recommended production practice packages are available. Most of the indigenous vegetables grow unattended either in farmers' fields, in association with other crops, or on resting land or forest. For some, they could be found growing as volunteer crops around farmers' compounds, with minimum or no care at all (Thomo 1983, unpublished data). As a result of the nature of their production, fresh indigenous vegetables are available mainly during the wet season, with very few fresh vegetables being available during the dry season, except for those preserved in the dry form. The situation is worse when it is realized that even researchers, extension workers, and nutritionists have virtually ignored these vegetables. Little research has been done to improve their yield and quality, or even to collect and document the available species and cultivars of indigenous
Table 1. Some common indigenous vegetables consumed in Malawi.

<table>
<thead>
<tr>
<th>Amaranthus sp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adenia gummifera</td>
</tr>
<tr>
<td>Gynandropsis gynandra</td>
</tr>
<tr>
<td>Crotalaria anthyllopsis</td>
</tr>
<tr>
<td>Bidens pilosa</td>
</tr>
<tr>
<td>Cocciria adoensis</td>
</tr>
<tr>
<td>Cerabotheca sesamoides</td>
</tr>
<tr>
<td>Cleome monophylla</td>
</tr>
<tr>
<td>Hibiscus acetasella</td>
</tr>
<tr>
<td>Hibiscus sabdariffa</td>
</tr>
</tbody>
</table>

vegetables found throughout the country, not to mention documentation of their agronomic characteristics, cultivation methods, nutritional value, and methods of preparation and preservation for use during the period of scarcity, which lasts for about 7 months.

In recent years, the need to improve the yield and quality of indigenous vegetables has become apparent. Most of the indigenous vegetables are on the verge of extinction as a result of deforestation, intensive cultivation of other crops, massive land clearing, and construction of roads, houses, and urban centres. Due to the unavailability of indigenous vegetables and coupled with rising costs of meat, fish, milk, eggs, and production inputs for exotic vegetables, the majority of the people cannot meet their daily dietary requirements. Hence, any coordinated research effort aimed at improving the yield and quality of indigenous vegetables will go a long way toward helping the majority of the people meet their dietary requirements. This undertaking would contribute significantly to the government's efforts to combat the problem of malnutrition, thereby improving the health of the people and enhancing their ability to work, which contribute to the economic development of the country.

In light of the problems associated with the production and use of indigenous vegetables, it is proposed that a multidisciplinary research project be carried out at Bunda College of Agriculture to improve and develop production practices and preparation and preservation methods of the woefully neglected indigenous vegetable species in the country. The research team will be comprised of a horticulturist, farming systems agronomist, human nutritionist, and an extension specialist/rural sociologist. The project will initially be confined to Lilongwe Agricultural Development Division (Central Region) and when fully developed will cover other major ecological zones throughout the country.

PROJECT OBJECTIVES

In general, the project's objectives are to: (1) collect and catalogue indigenous vegetable germ plasm; (2) document the agronomic characteristics and nutritional value of indigenous vegetables; (3) select suitable species and cultivars that can be grown in the different ecological zones of the country; (4) document various uses of indigenous vegetables in different parts of the country; (5) document cultural/sociological and economical barriers associated
with the production and consumption of indigenous vegetables; and
(6) promote the marketing of indigenous vegetables.

The specific objectives of the project are to: (1) document
types of indigenous vegetables; their methods of production,
preparation, and preservation; and their nutritional value;
(2) improve the yield and quality of indigenous vegetables;
(3) improve the nutrition of the people; and (4) improve the economic
value of indigenous vegetables.

**METHODOLOGY**

To accomplish all of these objectives, the research project will
be carried out in six phases over a 5-year period. Project activities
will be coordinated from Bunda College of Agriculture.

**Phase One**

This phase will involve detailed documentation of all types of
indigenous vegetables that are widely consumed in each of the
ecological zones of Malawi and the collection of seed of the
indigenous vegetable species. To accomplish this, several detailed
surveys will be conducted in each of the ecological zones during the
wet and dry seasons of the year. During the survey, information will
be gathered on growth habit, habitat, time of year available,
cultivation practices, uses, portion consumed, preparation and
preservation methods, and cultural/sociological and economical
barriers. Seed collection will also be carried out during the survey.

This phase will require inputs from all members of the research
team to formulate questionnaires pertinent to their respective areas
of expertise. Enumerators will also be employed to work with the
researchers in conducting the survey in each ecological zone. An
accession notebook will be maintained for this purpose.

**Phase Two**

This phase will involve seed multiplication and preliminary field
and laboratory trials to screen for quality (nutritional value, taste,
texture, appearance, and size), yield, and desirable agronomic
characteristics. Field trials will be conducted in many ecological
zones and yield potential and agronomic characteristics of each
indigenous vegetable species will be assessed. Laboratory tests for
quality will be carried out at Bunda College. Samples of the edible
portions of each indigenous vegetable species will be assessed for
quality. Participation of farmers' families from different ethnic
groups and areas will be sought during the assessment of taste,
appearance, and texture of the edible portion mostly using
organoleptic tests.

Preliminary field trials will require inputs from the
horticulturist and farming systems agronomist, whereas the assessment
of quality will require the human nutritionist to work hand-in-hand
with the horticulturist.

At the end of this phase, it is hoped that the results from the
assessment of agronomic characteristics and yield in different
ecological zones and the quality of each indigenous vegetable species
will form the basis for the selection of those species and cultivars
that will be used in phase three.
Phase Three

This phase will involve extensive field trials and quality (nutritional value, taste, texture, and appearance) assessment under various methods of preparation and preservation. Field trials will focus on production practices, such as plant density, time of planting, organic manures (green manure, compost, farmyard manure), fertilizers and water requirements, and pest control, and cropping systems (mixed cropping, monocropping, rotation) in each ecological zone. Quality assessment will focus on the influence of different methods of preparation for eating and preservation for future consumption on the retention of vitamins, essential minerals, and protein, and effects on taste, texture, and appearance.

Field trials will be conducted in all ecological zones at agricultural research stations wherever possible. Assistance will be sought from the research stations to provide land and accommodate project technical assistants who will be looking after the trials. The farming systems agronomist and the horticulturist will be responsible for planning and designing all field experiments and the collection and analysis of data. Whenever necessary, collaboration with the entomologist, pathologist, and nematologist will be sought. Quality assessments will be conducted at Bunda College and when the participation of farmers' families (from different ethnic groups and areas) is required, particularly regarding taste, texture, and appearance, assistance will be sought to conduct such tests in several training centres throughout the country. The human nutritionist will collaborate with the horticulturist in assessing the quality of indigenous vegetables under different methods of preparation and preservation.

During this phase, in both the field trials and the study of preparation and preservation methods, consideration will be given to the question of whether or not farmers' families can afford the cost of production, preparation, and preservation of the indigenous vegetables in cases where inputs or other ingredients are used. At the end of this phase, it is hoped that information on appropriate production practices (for each of the selected indigenous vegetable species from phase two) in different ecological zones and the effects of preparation and preservation methods on quality will be gathered. Based on this information, simple and cheap production practices and cropping systems that optimize yield and quality of each indigenous vegetable species or cultivar and land use will be considered appropriate for testing with farm families. Similarly, preparation and preservation methods that best retain high quality and palatability of the consumed vegetable and, at the same time, are relatively easy and cheap will be considered appropriate for experimental introduction to farm families.

Phase Four

This phase will involve on-farm trials and demonstrations of the selected production practices and preparation and preservation methods from phase three. A randomly selected number of farm families in several areas (ecological zones) will be asked to grow the selected indigenous vegetable species or cultivars following the production practices developed in phase three. The yield and quality of each indigenous vegetable species or cultivar obtained by farmers will be compared with research station results and, where necessary, modifica-
tions on production practices will be made. During the growing season, surrounding farmers and extension workers will be invited to field days at both the farmers' and stations' fields. Similarly, farmers' wives will be shown potentially better methods of preparation and preservation of each indigenous vegetable species developed in phase three. The farmers' wives will be allowed to prepare and preserve the vegetables as advised and several samples of prepared and preserved vegetables will be collected over a period of time for quality (nutritional value, taste, texture, and appearance) evaluation. The results will be compared with those obtained at the main stations (Bunda College and training centres) and, where necessary, modifications in preparation and preservation methods will be made to take into account the constraints affecting farm families. In addition to these on-farm trials and demonstrations, local workshops will be conducted for extension/homecraft workers and randomly selected farm families in various training centres where the participants will be trained in production and preparation and preservation methods for each indigenous vegetable species.

In this phase, more inputs will come from the extension specialist/rural sociologist who will collaborate with other researchers in their area of expertise. This phase will require a more coordinated effort on the part of the project team members and the measure of success of the project will depend on how successfully this phase is carried out.

**Phase Five**

Phase five will involve efforts to improve the economic status of the indigenous vegetables and evaluate the success or failure of the research project. Initially, samples of indigenous vegetables will be on display at various markets (rural and urban), with posters and individuals explaining the nutritional value, cooking quality, taste, recipes and preservation methods, and comparisons of these attributes with those of exotic vegetables. Simultaneously, marketing trends will be followed for a period of time through a survey. In the survey, information on the number of customers buying indigenous vegetables, number of producers taking indigenous vegetables to the market, price changes, customer and producer attitudes, and preferences for different types of indigenous vegetables compared with exotic vegetables will be gathered through interviews and questionnaires.

In this phase, inputs from the extension specialist/rural sociologist, in collaboration with the horticulturist and human nutritionist, will be required and, wherever necessary, assistance from an agricultural economist will be sought. Analysis of the data that will be gathered from this phase will indicate whether or not the economic status of the indigenous vegetables has significantly changed for the better.

**Phase Six**

This phase will involve compilation and documentation of all the data gathered from phases one through five. The data will be summarized and recommendations will be made. Bulletins on production practices and preparation and preservation methods of the superior indigenous vegetable species will be prepared for extension/homecraft workers and the use of farm families.
The research project to be developed at Bunda College of Agriculture is intended to achieve improved yield, quality, and economic value of the virtually unknown indigenous vegetables through the improvement and development of better production practices and preparation and preservation methods and the people's awareness of the importance of the indigenous vegetables. Such an achievement would contribute to the improvement of the nutritional status of the people and the economic development of the country. To accomplish the objectives of the project will require a coordinated interdisciplinary research (variety collection and selection, cropping systems, nutrition, and marketing) approach. The involvement of farm families in some of the phases of the project is certainly innovative and will ensure that the final recommendations reflect the need and constraints of the people the project intends to assist.


