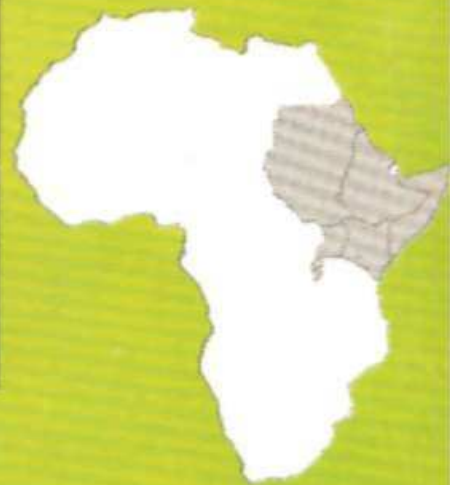




# Pigeonpea in Eastern and Southern Africa



International Crops Research Institute for the Semi-Arid Tropics

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Two meetings took place in March 1992 to launch an African Development Bank-funded collaborative pigeonpea project for eastern and southern Africa. This resulting publication was specifically prepared by ICRISAT for submission to the African Development Bank. It is divided into three sections. The first consists of introductory and background information, the second deals with the Nairobi meeting, and the third the Lilongwe meeting. Summaries of the 19 papers presented at the meetings are included. These cover Country Papers that are statements of the status of pigeonpea research in each country, and Special Topic Papers that provide additional information on various aspects of the crop. The full texts of the opening and closing speeches and the participating countries' lists of national program requirements are also included. Of particular importance are the recommendations and suggested work plans for initiating collaborative pigeonpea research in the two regions.

## Résumé

*Le pois d'Angole en Afrique orientale et australe: comptes rendus des réunions organisées pour lancer le projet conjoint Banque africaine de développement/ICRISAT de pois d'Angole en Afrique orientale et australe, 17-18 mars 1992, Nairobi, Kenya, et 30-31 mars 1992, Lilongwe, Malawi.* Deux réunions ont eu lieu en mars 1992 en vue de lancer un projet conjoint de pois d'Angole en Afrique orientale et australe financé par la Banque africaine de développement. Cet ouvrage, issu de ces réunions, a été essentiellement conçu pour être soumis à la Banque africaine de développement. Il comporte trois parties. La première partie porte sur l'historique et l'information de base, la deuxième partie est consacrée à la réunion de Nairobi, et la troisième à la réunion de Lilongwe. Les synthèses des 19 communications présentées lors de ces réunions sont incluses. Les communications de pays font le point sur la situation de la recherche sur le pois d'Angole dans chaque pays et les communications de thème spécial comprennent des connaissances supplémentaires sur divers aspects de la culture. Sont aussi inclus les textes intégraux de discours d'inauguration et de clôture ainsi que les listes dressées par les pays participants sur les besoins des programmes nationaux. Les recommandations et les plans d'action proposés pour démarrer la recherche collaborative sur le pois d'Angole dans les deux régions sont particulièrement importants.

## Resumo

*Sumario da reunião de lançamento do projecto conjunto de guando (Feijão boer), pelo banco Africano de desenvolvimento BAD/ICRISAT para o oeste e o sul de Africa, de 17 a 18 de março de 1992 Nairobi-Quenia e de 30 a 31 de março de 1992 em Lilongwe-Malawi.* Duas reuniões tiveram lugar em março de 1992, para o lançamento do projecto conjunto de guando (Feijão boer), para o oeste e o sul de Africa pelo banco Africano de desenvolvimento-BAD/ICRISAT. A presente publicação, foi especialmente preparada pelo ICRISAT para submetê-la ao BAD. Está dividido em tres secções: A primeira secção é introdutória e de informação básica; A segunda relaciona-se com a reunião de Nairobi; A terceira relaciona-se com a de Lilongwe. Esta inserido o sumário dos dezanove relatórios apresentados na reunião. Estes, cobrem o balanço do estado da investigação do guando em cada país, e um relatório especial que suministra informações adicionais em vários aspectos da cultura. Também, está incluso o texto completo do discurso da abertura e encerramento e dos países participantes assim como, a lista das necessidades dos programas nacionais de investigação. De particular importância, são as recomendações e sugestões de planos de trabalho de investigação conjunta do guando nas duas regiões.

# **Pigeonpea in Eastern and Southern Africa**

**Summary Proceedings of the Launching  
Meetings for the African Development  
Bank/ICRISAT Collaborative  
Pigeonpea Project for Eastern  
and Southern Africa**

**Nairobi, Kenya, 17-18 March 1992  
and  
Lilongwe, Malawi, 30-31 March 1992**

*Edited by*  
**S. L. Silim, S. Tuwafe, and E. M. McGaw**



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**Sponsored by**



**African Development Bank**

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The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of ICRISAT concerning the legal status of any country, territory, city, or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries. Where trade names are used this does not constitute endorsement of or discrimination against any product by the Institute.

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# **Section I**

## **Introduction and Background**





## Welcome from ICRISAT

On behalf of ICRISAT's Director General, Dr James G. Ryan, and the Management Committee, I congratulate all participants of the Launching Meetings for the African Development Bank/ICRISAT Pigeonpea Collaborative Project for Eastern and Southern-Africa for their enthusiasm and hard work. The first of these meetings was held 17-18 March 1992 at Nairobi, Kenya. The second was held 30-31 March 1992 at Lilongwe, Malawi. Our hope is that, through the efforts of all participants at both meetings, we will succeed in establishing a viable pigeonpea improvement project to serve the farmers of these two important regions.

ICRISAT's headquarters are near Hyderabad, India. The Institute, which celebrates its twentieth birthday this year, was the first Center created under the aegis of the Consultative Group on International Agricultural Research (CGIAR). ICRISAT has always concentrated on the special problems of the semi-arid tropics, especially the problems of rainfed agriculture. Because part of our mission is to alleviate poverty in this difficult region, ICRISAT has a mandate to work on six food crops important to the diets of the people who live there: sorghum, pearl and finger millets, chickpea, pigeonpea, and groundnut. In addition, the Institute was entrusted with the task of undertaking research on the management of the region's scarce resources. To accomplish this, we exchange technologies with the national agricultural research systems (NARSs) of the 49 countries within our regional mandate.

At the time of the establishment of ICRISAT, it was clear that pigeonpea was grown mainly in the Indian subcontinent. The crop was nonetheless included in the international mandate because pigeonpea is a source of protein for over 350 million poor people and because of its potential for extension to nontraditional areas.

ICRISAT posts scientists at several locations around the world to conduct research. ICRISAT Center in India has an overall world mandate, but its main geographical research focus is on Asia. In West Africa, research on pearl millet, groundnut, and resource management is conducted at the ICRISAT Sahelian Center in Niger, while in Nigeria and Mali the research focus is on sorghum. In the southern African region, the SADCC/ICRISAT Sorghum and Millets Improvement Program is located in Zimbabwe, and the SADCC/ICRISAT Groundnut Improvement Project is based here in Malawi. Our Eastern Africa Regional Cereals and Legumes (EARCAL) Program is located in Kenya, and we have a small sorghum research program in Mexico. Finally, we cooperate with the International Center for Agricultural Research in the Dry Areas (ICARDA) in Syria in chickpea breeding, and on Vertisol technology through a project based at International Livestock Centre for Africa (ILCA) in Ethiopia.

ICRISAT has only recently formulated its Strategic Plan for the year 2000 and beyond. The Plan, that was prepared in full consultation with the national programs, has been approved by the CGIAR. We are now in the process of develop-

ing our Medium-Term Plan (1993-98), again in consultation with the NARSs. We take this exercise seriously, identifying those areas of research likely to have a quick impact on food production. This has now become urgent due to reduced funding for international agricultural research.

To date, pigeonpea research has been conducted in only a few countries in Asia, Africa, and Latin America. The crop is still far from being fully domesticated. Even so, there have been two major research breakthroughs: one in geographical adaptation and the other in stress tolerance, particularly disease tolerance. Pigeonpea is now grown in at least 37 countries in Africa. However, significant research has only been carried out in Kenya, Malawi, Tanzania, and Uganda.

These meetings are not the first occasion when ICRISAT has sought to enlist the support of both eastern and southern African scientists in a common cause. The First Eastern and Southern African Regional Legumes (Pigeonpea) Workshop, held at Nairobi in June 1990, successfully united scientific efforts in these two regions. And now the African Development Bank has generously agreed to fund a project for research and development of pigeonpea in eastern and southern Africa. The Bank extended its financial support because:

- ICRISAT has established good linkages with the region's national programs;
- the Institute has considerable experience with research on pigeonpea;
- ICRISAT has developed meaningful training programs; and
- pigeonpea has high nutritional value and remarkable tolerance to drought.

The Governments of Kenya and Malawi have kindly permitted ICRISAT to post pigeonpea scientists in their countries, and for this we are very grateful. ICRISAT initiated pigeonpea research in Africa only after its scientists had gained sufficient experience and confidence by working in collaboration with other national programs.

ICRISAT clearly believes in partnership with the national programs through regional collaboration. ICRISAT views its role as that of a catalyst in assisting these collaborative efforts to function effectively.

Having worked for over 25 years on pigeonpea, I firmly believe that the crop's future in international agriculture is secure. Its importance will increase as human food, animal and poultry feed, fodder, and fuelwood. The role of pigeonpea in maintaining the productivity of fragile soils will be increasingly appreciated.

In conclusion, I would like to once again congratulate all those who took part in these important meetings.

**Y.L. Nene**  
Deputy Director General  
ICRISAT

## Remarks from the African Development Bank

It is indeed an honor for the African Development Bank to be invited to the Launching Meetings of the African Development Bank/ICRISAT Collaborative Pigeonpea Project in Eastern and Southern Africa. These meetings will launch what we at the Bank view as very significant projects for these two important regions. We as an institution take pride in sponsoring the project and we look forward to its successful implementation.

Since its establishment in the early 1960s, two guiding principles have determined the Bank's strategy of interventions in Africa.

- Ensure that agriculture is the sector that benefits most from the Bank's operational commitments.
- Give priority to those projects that are likely to benefit more than one country in a particular subregion.

The underlying reasons behind this strategy are (a) that agriculture is Africa's most important resource base; and (b) that economic necessity warrants regional cooperation in areas such as research, trade, and communications.

Another reason the Bank has agreed to support ICRISAT's work with pigeonpea is that the Institute has already established an excellent track record of research activities on drought-resistant crops in Africa. This record may be summarized as follows.

1. Training of scientists in various aspects of agriculture in western Africa under the auspices of the ICRISAT Sahelian Center.
2. Research on sorghum and millets in Burkina Faso.
3. Sorghum and millet breeding in Sudan.
4. Millets research in the SADCC countries.
5. Establishment of a regional groundnut program for the SADCC countries in Malawi.
6. Establishment of a regional sorghum and millets network in eastern Africa.
7. Establishment of the Eastern Africa Regional Cereals and Legumes Program.

The African Development Bank is particularly interested in the special characteristics of pigeonpea and its potential benefits to African countries. The improvement of nutritional standards through higher consumption of the protein-rich pigeonpea is of paramount importance. And the possibility of intercropping pigeonpea with other crops without expanding the size of the farm plot is a particularly valuable feature of the crop in countries with limited arable land. ICRISAT's proven success in developing disease-resistant pigeonpea varieties ensures that the national programs in the region will have access to the best germplasm.

The Bank's ultimate objective in supporting ICRISAT through this project is that its collaborative research efforts with the national programs will result in breakthroughs in productivity and disease control that might eventually lead to the evolution of pigeonpea as both an important subsistence crop and as a cash crop in the region.

There is a growing realization in the Bank that research spearheads development and that the best investment projects and programs are those identified through proper and conclusive research. You may therefore rest assured that we will not be lacking in encouragement and support to your efforts.

**B.A. Gardaad**  
Senior Programme Officer  
African Development Bank

# Pigeonpea in a Global Context

The pigeonpea (*Cajanus cajan* [L] Millsp.) is believed to have originated in South Asia and to have spread to Africa some 4000 years ago. It probably spread from Africa to the Caribbean region about 500 years ago, and is now found in most parts of the American tropics. The crop is also grown in Southeast Asia, and to a limited extent in East Asia, Australia, and Oceania. Nene and Sheila (1990)<sup>1</sup> list 109 countries in which pigeonpeas are grown. It is difficult, however, to obtain accurate data on crop area or production from the many countries where pigeonpea is cultivated only as a 'backyard' or hedgerow crop.

Almost 90% of the world's pigeonpeas are grown on the Indian subcontinent, the bulk of this production in India itself, where about 2 million tonnes are produced from nearly 3 million hectares. The dominant role of India in pigeonpea production has to some extent masked the importance of the crop elsewhere. However, it should be noted that India is a net importer of pigeonpea, and the Indian Government is most concerned that production should be augmented to meet the demands of an increasing population. Finding effective solutions to the various problems causing low yields of pigeonpea in India will take time. This means that in the foreseeable future India will remain a good market for pigeonpeas produced in other countries of Asia, Australia, and Africa.

I understand that there is already a significant export of dried pigeonpea to India from Kenya, Malawi, and Tanzania. In a recent visit to Myanmar I learned that there was an important export trade, generating considerable foreign exchange, of pigeonpeas to Bangladesh and India. There is also a growing market for pigeonpeas in Europe and North America, possibly influenced by the increasing numbers of people in these areas adopting vegetarian diets. A growing agroprocessing industrial base in Kenya is presently exporting *dhal* to the European and North American markets. For a considerable time there has been export of pigeonpeas from the Caribbean to North America, mostly as canned green peas, but also as dry and dehulled split seeds, or *dhal*. There is interest in expanding this trade, and an example is the initiative taken by the Government of Trinidad and Tobago to diversify from sugarcane to commercial pigeonpea production on a large scale. This should be a feasible proposition given the availability of short-duration, short-statured varieties of pigeonpea which lend themselves to fully mechanized production systems. If successful, the introduction of pigeonpea into an agro-industrial system dominated by sugarcane could also provide benefits by improving soil fertility and enhancing sustainability of farming systems. If the pigeonpea production and processing industries in the Caribbean are successful, there could be increasing exports to the North American and European markets, thus providing competition to eastern and southern African

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1. Pigeonpea: geography and importance. Pages 1-14 in *The Pigeonpea*, Nene, Y.L., Hall, Susan D., and Sheila, V.K. (eds.) 1990. Wallingford, Oxon, UK: CAB International. 490 pp.

countries wishing to maintain or establish trading links with these markets. Productivity and efficiency of production and processing must be addressed. The potential for exporting canned or frozen green pigeonpeas from eastern Africa should be seriously examined.

Interest in pigeonpea in many countries is growing. Some wish to expand the production of traditional long-duration varieties; in others there is a wish to try the recently developed short-duration and extra-short-duration materials in existing cropping systems, or to exploit them in developing new and innovative cropping systems.

In some countries where pigeonpea cultivation has decreased, or where the crop had never really taken hold, economic factors have led to efforts being made to develop the crop and to take advantage of new varieties and improved production technologies. Let me cite examples from two countries in Asia.

In Sri Lanka, where pigeonpea production had fallen to a very low level, the Government was very concerned about the increasingly large sums in foreign exchange required to pay for importation of lentils for making *dhal*, a staple food in the country. In a pilot project between the Ministry of Agriculture of Sri Lanka and ICRISAT, pigeonpea *dhal* was found quite acceptable to the population as a substitute for lentil *dhal*. A research and development project was funded by the Asian Development Bank, and all aspects of production, marketing, and processing were researched to establish a structure for a pigeonpea *dhal* industry. The crop, presently grown on several hundred hectares, should soon cover thousands of hectares and lead to a very significant decrease in expensive importation of lentils.

In Indonesia, pigeonpea is also being pushed as a substitution crop for soybean in the production of a fermented food product called *tempeh*. *Tempeh* of acceptable quality has now been produced from pigeonpea and agronomic studies have been undertaken to develop the crop. Although it has been grown successfully in the humid areas of Java, it has even better potential for production in the drier eastern islands.

The current situation of pigeonpea production in eastern and southern Africa and its potential for the future have been summarized in the Proceedings of the First Eastern and Southern African Regional Legumes (Pigeonpea) Workshop held in Nairobi in June 1990. During these meetings, we shall hear more about the potential for improvement of pigeonpea production in the region. The prospects look favorable, and I was very pleased to see in Malawi last week that some short-duration varieties had produced good pod yields under the very severe drought conditions prevailing during the 1991/92 cropping season.

In western Africa, as in many areas of eastern Africa, pigeonpea is consumed as a green vegetable. Some 30 years ago, I worked in a research station in the Guinean Zone of Nigeria where we used pigeonpea as a land recovery crop after 5 or 6 years intensive cropping to groundnuts, sorghum, and cotton. At that time we were unable to sell the dried pigeonpeas harvested from this crop. But the

situation is now changing and there is more interest in pigeonpea production for both human food and for animal feed in Nigeria, Mali, and Burkina Faso.

Interest in pigeonpea production for export should not obscure the fact that the basic importance of the crop is that it provides a high protein input to the diets of many of the poorest people of the developing countries, particularly to those living in the harsh environments of the semi-arid tropics. Although it ranks only sixth among grain legumes of the tropics in terms of area sown and production, its very diverse usages ensure an important place for pigeonpea in the farming systems adopted by smallholder farmers. In addition to its major use as *dhal*, the fresh green peas and in some cases the young pods are eaten as vegetables. Crushed dried seed and the residues from processing of *dhal* are used in animal feeds, and the foliage is used as fodder. Stems are used in construction of huts, fencing, and baskets, and (particularly in the more arid regions) are used as fuelwood, thus conserving animal manure for soil improvement.

Growing pigeonpea either as a sole crop in rotation with cereals or as an intercrop component with cereals improves soil fertility both through symbiotic nitrogen fixation and through the plant's ability to access scarce nutrients from the deeper soil zones with its long roots and to transfer them to the soil surface through leaf drop. Pigeopeas are also used to reduce soil erosion by sowing them along contours or on bunds in hilly areas (e.g., in the Dominican Republic and Nepal). They can also be used as windbreaks to reduce soil erosion on the light sandy soils of arid regions such as the West African Sahel. Their use in agroforestry is currently being examined.

Because I am convinced of the present usefulness and great future potential of the crop for improving the lot of the rural and urban poor of the semi-arid tropics and contributing to the financial well-being of producing countries, I have concentrated on the positive side of pigeonpea. However, I am fully aware of the many and varied production constraints and economic problems that have to be overcome if we are to obtain full benefits from this unique and valuable crop. ICRISAT's Legumes and Resource Management Programs are committed to finding solutions to those problems that have global occurrence and importance. The regional programs such as the ones under discussion in the eastern and southern African countries will focus more on local problems. Hopefully, there will be considerable spin-offs in information, genetic materials, and technologies from the various research and development programs. The strong farming systems focus of the work should contribute greatly to the goal of developing sustainable and ecologically sound agriculture in the developing countries of the semi-arid tropics.

**D. McDonald**  
Legumes Program Director  
ICRISAT Center





# **Section II**

## **The Nairobi Meeting**



## Introductory Remarks

Let me add my word of welcome on behalf of ICRISAT and its Eastern Africa Regional Cereals and Legumes Program (EARCAL) based here in Nairobi. We are indeed very pleased that all of you have been able to come to this important workshop to launch this Pigeonpea Project for Eastern Africa. We are happy that representatives of the national programs of Burundi, Kenya, Sudan, and Uganda are here. A representative from Ethiopia is not expected to attend the meeting because pigeonpea is not currently one of their priority research areas. We did not receive responses to our repeated telexes inviting Rwanda and Somalia to participate in this meeting. However, we assume that this is due to communication problems and we intend to continue to try to contact them.

I also want to take this opportunity to sincerely thank the African Development Bank for providing funds for the project, and for the confidence that the Bank has placed in ICRISAT to manage this project for eastern Africa as well as the other part of the project that will serve southern Africa, for which a similar launching meeting is scheduled later this month in Lilongwe, Malawi. I would also like to acknowledge the support of Semi-Arid Food Grains Research and Development Project (SAFGRAD) of the Organization for African Unity (OAU) for funding the Eastern Africa Regional Sorghum and Millets Network (EARSAM) and for providing the umbrella under which ICRISAT has been operating in eastern Africa for a long time.

As most of you know, ICRISAT, whose headquarters are located near Hyderabad, India, is a world center for improvement of its mandate crops and associated farming systems in the semi-arid tropics. The Institute has a role to play in helping the farmers of this region increase their productivity, thus ensuring food security. In addition to research, other key elements in ICRISAT's role are human resource development, especially within the national agricultural research systems, and transfer of technology to the farming community through national and regional agricultural agencies.

EARCAL is the arm of ICRISAT that focuses on crop improvement in eastern Africa. Three of the five EARCAL scientist positions are core funded. A fourth position (Pigeonpea Agronomist) is funded by this ADB Pigeonpea Project, and the fifth position, Coordinator for the EARSAM Network, is funded by the OAU/SAFGRAD.

Once again, welcome to this meeting. I hope that all of us find it useful and enjoyable.

**S.B. King**  
Team Leader  
ICRISAT / EARCAL

## Program Objectives

In a meeting in 1986, scientists from eastern and southern Africa involved in grain legume improvement research, recommended that ICRISAT should become actively involved in pigeonpea improvement in the region. As a result, a pigeonpea improvement project for eastern and southern Africa was prepared by ICRISAT that same year, and in 1988 a request was submitted to the African Development Bank to finance the project. ICRISAT recognizes the importance of pigeonpea in eastern and southern Africa and is committed to improving yield and productivity there. As a first step, in 1989, an ICRISAT pigeonpea scientist was stationed in Kenya to initiate pigeonpea work. In 1991, after the African Development Bank approved the funding for a pigeonpea improvement project in eastern and southern Africa, two additional scientists were recruited: a Breeder stationed in Malawi and an Agronomist in Kenya.

ICRISAT, as you all know, responds to individual national requests for germplasm, training, information, and scientific assistance. ICRISAT has previously held numerous workshops and meetings on legumes, including pigeonpea. In the past, national program scientists were invited to these meetings as representatives of individual countries. Today's gathering, on the other hand, has for the first time brought together administrators and scientists from both eastern Africa and ICRISAT to develop a broad regional framework for collaborative research on pigeonpea improvement and its cropping systems. Also present at this meeting are other specialists whose presentations we believe will help us to formulate our research strategies.

Through the presentation of papers and discussions, each country's representatives should address the following important topics in order to successfully launch this project.

1. Identify your country's particular constraints to improved pigeonpea production as well as your resources and needs for research. The project has a limited provision for supplies to support pigeonpea research.
2. Identify your needs. The project has provision for training scientists and technicians,
3. Identify your priorities to determine which research problems the project should tackle and how they should be tackled.
4. Draft a general work plan. Details of this work plan may require attention at a later date.
5. Assess the capability and commitment of your network program to undertake collaborative research.

In all our deliberations we should remember that our improved technology must reach the farmers. In drafting a work plan, therefore, a technology exchange component should be included.

A diverse range of maturity groups of pigeonpea is available and many cropping systems and usages for the crop exist. These considerations should also be considered when drafting a general work plan.

We hope to conduct travelling workshops and to hold meetings every 2 years to discuss our results.

**S.N. Silim**  
Associate Principal Agronomist  
ICRISAT / EARCAL

## Opening Address

Mr Chairman, Ladies and Gentlemen.

I would like to join others who have welcomed you all to this first Launching Meeting of the African Development Bank/ICRISAT Collaborative Pigeonpea Project for Eastern Africa. I am glad to see so many eminent scientists participating in the meeting.

Africa is presently undergoing great changes with many challenges to be faced. One of the greatest of these is for the continent to become self-sufficient in food. This challenge becomes greater as the population of the continent grows nearly 3% per annum. Improved plant and animal production is of critical importance.

The Organization of African Unity, through its technical department, and in conjunction with national governments, international organizations, and donor agencies, is trying to alleviate this problem. This is being done by developing improved farming methods, superior crop varieties, and better animal health care and nutrition.

Because much of Africa is semi-arid and subjected to frequent droughts, I am glad that the project will develop new drought-resistant crops such as pigeonpea, while improving traditional ones.

The catastrophic drought in Africa during the 1970s led the African governments, in 1977, to create a multidonor organization, the Semi-Arid Food Grains Research and Development (SAFGRAD), to oversee the development of drought-resistant crops. The organization was established to promote and utilize scientific research for sustainable production of the staple food crops of semi-arid Africa.

It was through SAFGRAD that ICRISAT established its Eastern Africa Regional Cereals and Legumes (EARCAL) Program, with its headquarters in Kenya. EARCAL began its work with sorghum and millets improvement in 1982, adding pigeonpea in 1989. I am glad to note that the African Development Bank realizes the importance and potential of pigeonpea in semi-arid Africa, and provides ICRISAT with the necessary financial support to expand its research and development for pigeonpea. This regional research program brings together national scientists from eastern Africa to develop improved varieties and cultivation methods of pigeonpea and to transfer this technology to the farmers. It also provides an opportunity for these scientists to share their experiences, findings, and ideas. Finally, the regional program provides training and exchange of materials to build applied research capability.

Pigeonpea is a unique crop in many ways. It is a perennial legume and a woody shrub. Because it is a perennial, pigeonpea gives multiple harvests. Because it is a legume, it is a good soil conditioner. The plant is drought-tolerant because of its deep root system which extracts iron-bound phosphorus. Grown as an annual crop, pigeonpea has a maturity period ranging from 90 to 270 days. It is used in many ways in human diets. It is also an excellent protein base for animal and poultry feed.

Pigeonpea is grown in 37 African countries as a multipurpose legume crop. In eastern Africa, it is grown on a large scale in Kenya, Tanzania, and Uganda, with smaller areas of the crop found in Ethiopia, Burundi, and Sudan. The grain is exported to Asia, Europe, and America.

Pigeonpea production, however, has remained low, only 300-700 kg ha<sup>-1</sup>. I am glad to say that recent research conducted by ICRISAT and other organizations has improved the productivity of new pigeonpea cultivars which have potential yields of more than 2000 kg ha<sup>-1</sup>. This increase of over 200% is excellent. Furthermore, these new varieties mature in about half the time. I appeal to you, the scientists and academicians of eastern Africa, to transfer these new varieties and cultivation methods to the farmers as soon as possible. In this regard it is pleasing to note that the Kenya Agricultural Research Institute (KARI), the Ministry of Agriculture of Kenya, and ICRISAT are presently collaborating in the testing of the new varieties of pigeonpea in the field in Eastern Province. They are also developing suitable methods of pest management. When the new techniques have been tested they will be transferred to other semi-arid regions of Africa.

The program of this meeting is packed full with technical subjects which you have come here to discuss. I will therefore take no more of your time.

It now gives me great pleasure to declare this meeting officially open.

**W.N. Masiga**  
OAU / IBAR  
Nairobi





# Country Report Summaries

## Pigeonpea Production and Research in Burundi

*W. Godderis*

Information on pigeonpea production in Burundi is largely based on two surveys, one in the Moso region and the other in the Kirimiro region. Pigeonpea is grown extensively, with little or no improved cropping techniques, as an intercrop in rural areas.

Most farmers cultivate pigeonpea as an annual crop; a few prefer ratooning. The major abiotic constraints identified by farmers are drought at the end of the dry season and heavy rainfall during the rainy season. Seedling wilt and borers are considered the major biotic constraints, whereas ants, birds, and moles may cause minor losses. Lack of seed distribution and lack of help from agricultural projects are recognized as important socioeconomic constraints.

The farmers cultivate two long-duration varieties, Isega and Itenda. In the Moso region, 1 kg seed reportedly yields 8-10 kg. Because pigeonpea is grown for local consumption, its marketing potential is still very limited. In the 1990/91 season, the Institut des sciences agronomiques du Burundi (ISABU) initiated research on pigeonpea. Variety trials were conducted at its research stations in the Imbo and Moso regions. At both locations, two introductions from ICRISAT, ICPL 87W and ICPL 87B, gave the highest yields among the trial entries. In 1991/92, in collaboration with the Faculty of Agronomic Sciences of the University of Burundi, ISABU focused on five objectives. More funding is needed to support further collaborative research.

## Status and Needs of the National Pigeonpea Research Program in Kenya

*M. Siambi, P.G.A. Omanga, and W. Songa*

Pigeonpea is the most important grain legume in the semi-arid region of eastern Kenya. Annual production is estimated at 176 000 t from an area of over 200 000 ha, mainly in Machakos, Kitui, Embu, and Meru districts. Productivity is highly variable, depending on the cropping system and may range from 500 to 800 kg

ha<sup>-1</sup>. It is mainly consumed as whole dry grain in a number of dishes, but a large amount is also consumed in the form of green peas.

Farmers grow landraces that take 8-11 months to mature. These landraces are sown at very low plant densities, which is uneconomical on spatial and temporal scales. Pigeonpea is grown as an intercrop in diverse spatial arrangements, depending on what the farmer perceives as the main component in the intercrop complex. Research work on this crop has centered on finding solutions to the various constraints identified by several surveys of the major growing districts. Breeding selections concentrating on short-duration genotypes and basic characteristics such as bold, cream-colored seeds have led to the release of varieties that mature in 4-5 months. A large amount of germplasm, both local and exotic, has been evaluated. Diseases and pests remain the major challenge. Fusarium wilt and cercospora leaf spot are known to cause yield losses that may be as high as 75-85%, depending on the location and season.

Increased production can be achieved by improving the production practices, since the full potential of the present area under pigeonpea is yet to be realized. Introduction of short-duration genotypes in rice- and wheat-based cropping systems offers ample scope for expansion. More coordinated marketing of the crop is necessary to protect the farmers from exploitation by merchants. Potential exists for the export of whole grain as well as processed products. Diversification in utilization through the popularization of new products should stimulate production through increased demand.

Linkage with the extension services and national programs in the region is emphasized. ICRISAT, through its role in making germplasm available and in its participation in specific collaborative projects, will serve as a catalyst in helping Kenya's pigeonpea program to achieve its goals.

## **Status and Needs of Pigeonpea Research in Sudan**

*H. A. O. El Awad*

Pigeonpea cultivation in Sudan is not a high priority within the national program at present. Although it is probably well suited to the harsh drought-stressed conditions prevailing over much of the country, it is a nontraditional crop that has yet to prove itself.

The most favorable agroecological region of Sudan for pigeonpea cultivation is in the South. Unfortunately, however, civil unrest there prohibits agricultural research. Sudanese scientists will therefore work out a plan for mechanized farming in eastern Sudan, and after this work is initiated research on the crop will be

extended to western Sudan. Agronomic experiments in the country's various isohyets are proposed with sole cropping, intercropping, and alley cropping.

## **Pigeonpea Production and Research in Uganda**

*M. S. Musaana, D. S. O. Osiru, and N. M. Silim*

Pigeonpea is important in Uganda as both human food and animal feed. It is also a source of high-quality protein. Currently the yield at farm level is low but the potential is very high. Constraints to production presently include lack of improved varieties, the narrow genetic base of present cultivars, damage by pests and diseases, inefficient plant types, and the lack of a seed multiplication and distribution program. Storage and postharvest processing require immediate research attention. In the past our breeding research concentrated on developing high-yielding, short-duration cultivars; searching for male sterility; examining disease resistance; and developing composites.

Other studies investigated a diallel crossing system from which good combining parents were identified. Looking toward future application in selection programs, we also noted the gene action for yield and yield components. Using path-coefficient analysis to measure direct effects on yield, we found that the component with the greatest effect was pod clusters per plant. Seed size had the least effect, and the pods-per-plant component was somewhere in the middle. Also examined were population, spacing, and intercropping.

Current and future research strategies are discussed in light of the increasing emphasis on pigeonpea as a supplement to protein-deficient diets and as a possible nontraditional export crop in Uganda.



## **Special Topic Summaries**

### **Past, Present, and Future for Research on Pigeonpea in Eastern Africa**

*J. F. M. Onim*

The paper reviews pigeonpea research in eastern Africa from the mid-1950s to the present. Five thousand accessions of pigeonpea were received by Makerere University in the early 1970s from an Asian collection comprising accessions from India, Pakistan, and Bangladesh. Some of this germplasm was transferred to the Kenyan national program in 1974 and used to initiate Kenya's pigeonpea improvement program. Some of the Makerere germplasm was sent to the International Institute of Tropical Agriculture (IITA) in Nigeria in mid-1970, from where it eventually reached ICRISAT Center.

The current pigeonpea research jointly undertaken by Kenyan scientists and the ICRISAT / EARCAL team is summarized. Looking ahead toward the future, it is emphasized that pigeonpea research programs should not only develop high-yielding, short-duration cultivars, they should also evaluate the potential of the locally adapted medium- and long-duration and perennial landraces. A strong case is made for the formation of an eastern African pigeonpea network.

### **Pigeonpea Germplasm Resources in Eastern Africa**

*P. G. A. Omanga*

Africa, with about 500 000 ha, is second only to the Indian subcontinent in pigeonpea hectareage. The crop has been cultivated in Africa for more than 4000 years. Although its center of origin remains a subject of dispute, most authorities agree that the presence of many close relatives and the diversity of the germplasm in India indicate that that country was the birthplace of pigeonpea. Eastern Africa, however, if not the center of origin of pigeonpea, is certainly the second most significant center of diversity. Eastern Africa produces about 10% of the total world production, and Kenya, with over 200 000 ha, is Africa's largest producer. Other eastern African countries produce lesser amounts. Uganda produces

50 000-90 000 ha, and while exact figures are presently unavailable, pigeonpea is an important crop in areas of Burundi, Ethiopia, and Sudan.

While ICRISAT has collected 11 171 pigeonpea accessions from 52 countries, India, with 9136, has contributed over 90%. Only 900 accessions have thus far been collected from eastern and central Africa. Pigeonpea breeding in eastern Africa is a recent undertaking. Although a few new cultivars have been developed and released for general cultivation, most of the cultivated area is still sown to landraces. This paper identifies efforts made by national programs in the region to collect local pigeonpea landraces for use in breeding programs. The collection, conservation, and evaluation of pigeonpea are delineated.

## **New Pigeonpea Production Systems in Eastern Africa**

*Laxman Singh, S.N. Silim, and P.G.A Omanga*

Pigeonpea is widely distributed throughout Africa. The principal producers of pigeonpea in eastern Africa are Kenya and Uganda, with small production areas in Burundi, Ethiopia, and Sudan. The most prevalent pigeonpea production system in the region is based on photoperiod-sensitive, long-duration cultivars intercropped with cereals (maize, sorghum, or pearl millet) and short-duration legumes. In this system the productivity of pigeonpea is low; mainly due to low population, drought stress, and insect pests and diseases. Improving production systems involving long-duration pigeonpea requires:

- developing varieties that are higher-yielding, less susceptible to pests and diseases, and white- and bold-seeded;
- determining optimal population and sowing patterns in relation to major intercrops;
- developing integrated plant protection systems; and
- developing postharvest handling and marketing components.

New pigeonpea plant types of short or extra-short duration have been developed for sole cropping and are suitable for three agronomic practices.

- 1. Short-season sole cropping.** The new crop is sown in areas with bimodal rainfall but where the annual precipitation is below 600 mm (e.g., eastern Kenya). To transfer the technology of short- and extra-short-duration pigeonpea in this area would require the identification of optimal plant density, optimal pest protection measures, and the cultivars best suited to the region.
- 2. Multiple harvest.** Suitable areas require high rainfall and cultivars with good ratoonability (e.g., ICPL 87 and KAT 60/8).

**3. Rotation and double cropping.** In areas with high rainfall, short- or extra-short-duration pigeonpea can be grown before or after a cereal or a short-duration legume crop. Potential areas are:

- Burundi: the Imbo and Moso regions;
- Kenya: where Mwea and Ahero rice-based cropping schemes are used and in the Rift Valley after wheat;
- Sudan: after sorghum in mechanized farming in the central region; and
- Uganda: after millet or groundnuts in the North.

## **Processing the Pigeonpea: the Kenya Experience**

*A. O. Makhoha*

In Kenya, pigeonpea is processed into *dhal* by several millers. The basic *dhal* processing steps include loosening and removing the pigeonpea husks. *Dhal* yield is comparatively low because of the low quality of raw material grains and because of high milling losses. Protein is lost during *dhal* processing, but this is compensated by an improvement in digestibility and net protein utilization.

The main constraint in the pigeonpea milling industry is the insufficient supply of raw material. However, the anticipated regional cooperation in eastern Africa as well as the liberalization of pigeonpea marketing in the region may increase the production and supply of pigeonpea. It appears likely that in future pigeonpea will be processed into an array of products in Kenya.

## **Pigeonpea Marketing in Kenya**

*O. L. E. Mbatia and P. M. Kimani*

Pigeonpea is one of the most important legumes in Kenya because it is drought-tolerant and is a multi-purpose crop. The major growing areas are semi-arid with less than 800 mm annual rainfall. The principal producing districts are Machakos, Kitui, Meru, and Embu, all in Eastern Province. The area under pigeonpea in Kenya is estimated to be 115 000 ha. Kenya is the world's second largest producer

of pigeonpea after India. The purpose of this paper is to evaluate the production, marketing, and pricing of pigeonpeas.

Five hundred farmers were randomly sampled from the three principal producing districts. The sample comprises 200 farmers from Machakos, 150 from Embu, and 150 from Kitui. In addition, marketing surveys were conducted in shops selling cereals and legumes, and in open markets in Nairobi District. It was found that most farmers intercropped pigeonpea mainly with maize, beans, cotton, and sorghum. Factors contributing to low yield include lack of superior varieties, diseases and pests, drought stress, poor soil fertility, poor crop husbandry practices, poor prices, and poor marketing systems and infrastructure.

The farmers in the survey harvested an average of 4 bags of which they sold an average of 2.4 bags. Almost all the farmers in the study area reported that they eat pigeonpea at least once a week. The marketing of pigeonpea is poorly structured. Market outlets for pigeonpea for farmers include neighbors, nearby shops, and local markets. About 5% of the farmers considered the prices they received as very good, 23% as good, 19% as fair, 32% as poor, and 22% as very poor. Problems mentioned by farmers concerning the marketing of pigeonpea were transporting their produce to the market and selling it.

The study concluded that the future of pigeonpea in Kenya is determined by the 'four Ps': production, promotion, price, and product. As production improves with the availability of improved varieties and better management of diseases and pests, the need to improve the formal marketing of pigeonpea will become urgent. Policymakers need to promote local and export market schemes while seeking an appropriate pricing policy.

Finally, the improvement of access roads to production areas and storage facilities should be assigned a high priority.

## **The Nile Valley Regional Program: a Successful Model for Technology Transfer**

*M. B. Solh*

The International Center for Agricultural Research in the Dry Areas (ICARDA) is one of 17 centers coordinated by the Consultative Group on International Agricultural Research (CGIAR). The Center, located near Aleppo, Syria, has a regional responsibility for agriculture in West Asia and North Africa (WANA). One of ICARDA's primary activities is its extensive outreach program through which it tries to transfer improved technologies to the region's national agricultural research systems.



ICARDA's first outreach program was the Nile Valley Regional Program (NVRP), which was established in 1979. This program sought to link scientists both within countries and within the region by addressing the various research and training needs, thereby strengthening the national programs. Outreach programs like the NVRP provide feedback from the region to ICARDA so that the Center can best orient its research agenda. The programs also promote leadership at both national and regional levels, facilitate cooperation among countries, optimize the use of scarce resources, and encourage self-reliance. ICARDA believes that strong national programs are prerequisite to the establishment of effective regional networks.

The paper outlines the history of the NVRP, the various crops grown within the scheme (principally faba bean), the countries involved, and the program's donors. The NVRP methodology and activities are discussed in detail, and the parameters for measuring the program's impact are explained.



# National Program Requirements

## Burundi

### National Objectives

Government technicians presently spend only 5-10% of their time on pigeonpea. The balance of their time is mostly spent on beans, the staple food crop. The main objective is to divert more research attention toward pigeonpea.

### Proposed Execution of Priorities

1. Conduct surveys on constraints and marketing potential
2. Collaborate with the Institut de recherche agronomique et zoologique (IRAZ) in collection of landraces
3. Conduct trials at research stations and farms on:
  - short-duration cultivars
  - pest and disease resistance
  - screening for large and white seeds
4. Test husbandry technology adopted by neighboring countries or recommended by ICRISAT
5. Initiate agroforestry research in collaboration with ICRAF and IRAZ

### Present Commitment

The Government operates a research station, and the national system's Institut des sciences agronomiques du Burundi (ISABU) has a defined research priority for legumes.

### Present Human Resources and Future Needs

At present an expatriate scientist has been recruited by ISABU to coordinate the country's research on legumes. This scientist is backed up by one national scientist and one technician.

Needed:

- 1 technician
- 1 MSc in Agronomy
- 1 station-based Agronomist

### Requirements for Efficient Program Operations

1. Equipment
  - 1 motorcycle (for technician)
  - small equipment (later)
  - supplies

2. Germplasm
3. Literature (books, journals, etc.)
4. ISABU needs to identify a donor to initiate a new crop
5. Funding for workshops, seminars, visits
6. Allocation of funds for small equipment by a Steering Committee

### **Overall Budget**

Burundi seeks an arrangement with ICRISAT similar to the one it has with the Centro internacional de agricultura tropical (CIAT) for beans research.

## **Kenya**

### **National Objectives**

1. To improve seed production
  - basic seed
  - cost of multiplication
  - packaging, etc.
2. To transfer technology to farmers
  - on-farm trials
  - field days
  - workshops
3. To improve crop protection
  - breeding for resistance
  - postharvest technology
4. To address the lack of diversity in utilization
  - new food products
5. To identify appropriate production systems
  - investigation of existing systems
  - synthesis of appropriate old and new systems = best systems
6. To develop suitable varieties
  - breeding
  - germplasm evaluation and rejuvenation
7. To investigate marketing (socioeconomic analysis)

### **Proposed Execution of Priorities**

1. Merge two programs (Kenya Agricultural Research Institute (KARI) and Nairobi University) into one national program
2. Draw up proposals and develop a work plan
3. Designate resource allocation

## **Present Commitment**

1. Government assigns high priority to agricultural research.
  - KARI is a well-developed NARS.
  - The National Dryland Farming Research Centre (NDFRC) at Katumani conducts specialized crop research for dryland agriculture.
  - Coordination in the country will be handled by NDFRC-Katumani.
2. Farming systems research is supported by Government.
3. Government has established and presently maintains a seed genebank.
4. Laboratory equipment designated for use in agricultural research has been purchased by Government.
5. Funding is available for workshops, seminars, and visits (KSh 200 000 annually budgeted).

## **Present Human Resources and Future Needs**

<b>Category</b>	<b>Present</b>	<b>Future</b>
Breeder	4	<b>1</b>
Agronomist	1	<b>2</b>
Postharvest Entomologist	0	<b>2</b>
Food Science Technologist	0	<b>1</b>

## **Requirements for Efficient Program Operations**

1. Equipment
  - 2 microcomputers
  - 1 vehicle
2. US\$ 400 000 to initiate work on seed production

# **Sudan**

## **National Objectives**

To initiate pigeonpea research, mostly in Western Sudan. Sudanese scientists will work out a plan for the mechanized farming in Eastern Sudan. Southern Sudan has the highest potential for pigeonpea but political unrest has prevented work on the crop.

## **Proposed Execution of Priorities**

1. Test pigeonpea in the 300-400 mm isohyte in sandy soils.
  - a. Sole cropping. Objective: by identifying short- and extra-short-duration cultivars for cultivation as a sole crop during fallow years, to:

- improve soil fertility
  - shorten fallow period
  - provide food, feed, and fuel
- b. Intercropping
    - millet/pigeonpea
    - sorghum/pigeonpea
    - sesame/pigeonpea
  - c. Alley cropping (agroforestry)
    - with gum (*Eucalyptus*) trees
2. Test pigeonpea in the 500-600 mm isohyete in heavy soils.
    - a. Sole cropping. Objective: to identify medium-duration cultivars to be grown as sole crops in rotation with sorghum
    - b. Intercropping
      - sorghum/pigeonpea
      - cowpea/pigeonpea
    - c. Identify perennial pigeonpea for cultivation undersupplemental irrigation for:
      - grain
      - ability to regenerate (fodder)
      - capacity to branch

### **Present Commitment**

The Eastern Africa Pigeonpea Project needs to make a start without expecting an initial contribution from the Government of Sudan. At present the Government is not funding pigeonpea research. It is necessary first to prove that the crop can grow in Sudan. A case in point is cowpea, which, after being successfully cultivated in Sudan, was allocated funding for research.

### **Present Human Resources and Future Needs**

Sudan's human resources are at present very meager (one Agronomist/Breeder, one technician), and its immediate requirements are not great.

Immediate needs:

- 1 MSc in Agronomy/Breeding
- 3-4 technicians

### **Requirements for Efficient Program Operations**

1. Germplasm introduction
  - extra-short-duration
  - short-duration
  - medium-duration
  - long-duration
2. Operational funds for day-wage laborers and fuel

# Uganda

## National Objectives

(The objectives are listed in order of priority. There was a 'tie' for third priority, hence no fourth priority is listed)

1. To gain a clear understanding of the existing farming systems through rapid rural appraisal.
2. To acquire new varieties through collection, introduction, evaluation, and diagnostic surveys on constraints.
3. To develop appropriate postharvest systems.
3. To improve production systems through agronomic studies.
5. To encourage technology transfer of the new production systems through both on-farm and adaptive research.
6. To undertake socioeconomic studies to obtain detailed information on local and export markets.

## Proposed Execution of Priorities

Objec- tives	1st year	2nd year	3rd year	4th year	5th year
1	Rapid rural appraisal (6-9 months)	-	-	Re-appraisal (6-9 months)	-
2	Acquire and evaluate germplasm	Acquire and evaluate	Evaluate	Evaluate and release	Evaluate and release
3	Postharvest systems (start after rapid rural appraisal)	Postharvest systems	Postharvest handling	Processing and postharvest storage	Processing and postharvest storage
4	-	Assemble knowledge from collaborating countries and test	Test	Test and develop in-country	Test in-country
5	-	-	Technology transfer on-farm	Adaptive and on-farm	Adaptive and on-farm
6	-	-	-	Socio-economic studies	Diagnostic evaluation

Common grounds of operation for formulation of regional subprojects:

- integrated pest management
- postharvest handling
- socioeconomic studies

### **Present Country Commitment**

Government is presently funding the following:

- provision of manpower
- ex-situ maintenance of germplasm
- maintenance of research facilities at Makerere and Kawanda
- well-established infrastructure (including land and buildings)
- research is among the six top priorities in the country.

### **Present Human Resources and Future Needs**

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<b>Name</b>	<b>Qualification</b>	<b>Profession</b>	<b>Training needs</b>
M.S. Musaana	MSc	Plant Breeder	
RR. Rubaihayo	PhD	Plant Breeder	
D.S. Osiru	PhD	Agronomist	
Areke	BSc	Breeder	MSc
N.M. Silim	MSc	Postharvest Entomologist	PhD
M. Ugen	MSc	Technology Transfer Officer	MSc
Nanyenya Ntege	BSc	Socioeconomist	MSc
Deficit		Pathology	PhD

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### **Requirements for Efficient Program Operation**

#### **1. Transport**

To conduct multilocational and on-farm research transport is needed to aid the program as follows:

- 2 4-wheel-drive double cabin pickups (diesel)
- 4 motorcycles
- 10 bicycles for technical staff and contact people in the field for on-farm and adaptive research

#### **2. Operational funds**

- vehicle maintenance and fuel
- land preparation, sowing, weeding, and harvesting (including overtime payment)
- materials (e.g., tags, labels, paper bags, gunny sacks)

#### **3. Field and laboratory equipment**

- leaf area meter



- incubator, autoclave, computer, printer, photocopier
- laboratory chemicals and glassware
- balances (scales)
- one compound and one dissecting microscope
- lab coats and stationery
- greenhouses

#### 4. Allowances

- safari day allowances
- night allowances
- incentive allowances for staff at all levels (present Government salaries are very low: successful projects have included this parameter for better research output)

#### 5. Training

- workshops
- seminars
- short courses
- higher degrees
- books
- journals

#### Overall Budget (in U.S. \$)

1st year	2nd year	3rd year	4th year	5th year
\$0.3 m	\$0.2 m	\$0.18 m	\$0.16 m	\$0.16 m
Training	Training	Training	Training	Training
Transport	Equipment	Chemicals	Chemicals	Chemicals
Equipment	Operational	Operational	Operational	Operational
Operational allowances	allowances	allowances	allowances	allowances

## Recommendations

Participants were requested to divide their priorities into three categories:

- Technical
- Training
- Other needs

These priorities are dynamic and not rigid. They are given as guidelines with the understanding that periodic adjustment will be necessary.

### Technical Priorities

**Table 1. Prioritization of technical requirements, by country.**

Country	Priority						
	1	2	3	4	5	6	7
Burundi	RRA <sup>1</sup>	V	A	TT	SE		
Kenya	SP	TT	CP	PH	A	V	SE
Sudan	A	V	PH	TT	SE		
Uganda	RRA	V	PH/A/CP		IT	SE	

1. RRA = Rapid rural appraisal. CP = Crop protection.  
 V = Variety development. TT = Technology transfer.  
 PH = Postharvest technology. A = Agronomy.  
 SP = Seed production. SE = Socioeconomics.

### Regional Activities

**Crop protection.** Although crop protection was not shown as important, it was agreed that it was an important aspect which is properly covered under variety development. Crop protection should be conducted as integrated pest/disease management programs. It was agreed that it should be a regional activity.

**Postharvest technology.** Two aspects of postharvest technology were identified:

- processing
- postharvest losses

It was agreed that postharvest technology should be a regional activity with processing being undertaken by Kenya and postharvest losses by Uganda. ICRI-SAT has not done much work on storage pests. It was agreed that the Legumes Program Director would convey a message to ICRISAT administrators that storage pests are a major regional constraint.

**Socioeconomic studies.** This is another area that should be a regional activity. Surveys need to be conducted (e.g., in crop marketing).

**Germpasm exchange.** Strong national programs such as Kenya's could initiate germplasm exchange by sending some of their promising cultivars to cooperating countries for evaluation. Later, a regional nursery could be developed where cooperating countries could contribute their promising lines. This may involve both eastern and southern Africa.

### Training Priorities

**Table 2. Prioritization of training requirements, by country**

Country	Requirement	Level of training		
		Technician	MSc	PhD
Burundi	Agronomy	<b>3<sup>1</sup></b>	<b>1<sup>2</sup></b>	<b>1</b>
	Breeding	-	<b>1</b>	-
Kenya	Agronomy	-	-	<b>2</b>
	Breeding	-	-	<b>1</b>
	Entomology	-	<b>2</b>	-
	Food Science Technology	-	<b>1</b>	-
Sudan	Agronomy	<b>4</b>	-	<b>1</b>
	Breeding	-	<b>1</b>	-
Uganda	Entomology	-	-	<b>1</b>
	Breeding	-	<b>1</b>	-
	Pathology	-	-	<b>1</b>
	Economics	-	<b>1</b>	-
	Food Science Technology	-	<b>1</b>	-

1. Bold face = most urgent.

2. 1 = BSc level.

The principle behind the project is to be sustainable in the long term and not to disintegrate once donor funding ends. Training should be focused on the pigeonpea crop in areas relevant to the research priorities of each country. The research training location should therefore be within the region, or if necessary at ICRISAT Center. Students seeking higher degrees can register either within the region or at external locations.

### Other Needs

Table 3 lists the priorities for items needed for successful implementation of the project.

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**Table 3. Prioritization of other needs.**

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Country	Priority level <sup>1</sup>		
	1	2	3
Burundi	OF	V	E
Kenya	OF	V	E
Sudan	OF	E	
Uganda	OF	V	E

---

1. 1 = highest, 3 = lowest.

2. OF = Operational funds (labor, fuel, supplies, allowances, incentives, etc.)

E = Equipment.

V = Vehicles.

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The importance of incentives was clearly expressed during the meeting. Incentives should, however, be allowed by national policy, and should be earned through merit and not through seniority alone.

## **Plan of Action**

### **Nomination of National Coordinators**

National coordinators for Burundi, Kenya, and Sudan are yet to be nominated; Uganda nominated M. Musaana.

### **Development of Work Plan**

ICRISAT pigeonpea scientists based in Nairobi will travel to each of the participating countries to draw up detailed work plans.

### **Release of Funds**

ICRISAT will draw up proposals based on agreed priorities for submission to Bank officials for approval. The provision of funds to the national program will be within what the Bank has provided. While developing a methodology to assist national programs in the eastern Africa region, both the area under pigeonpea, and the actual potential for improving productivity will be taken into consideration.

## Closing Remarks

I would like to take this opportunity to thank you for the hard work you have all done in preparing your country reports and work plans prior to coming to Nairobi, and for the effort you have made to make this important meeting a success. You have the distinction of having been selected by your national programs to represent them at this historic occasion to lay the groundwork for a regional project that will serve the farmers of eastern Africa.

Of the seven countries in the region invited to attend, three: Ethiopia, Rwanda, and Somalia, unfortunately did not attend. Ethiopia responded to our invitation by informing us that pigeonpea is not a crop of high national priority at this time. Somalia, as we all know, is presently undergoing civil unrest. We had no response from Rwanda. It is possible that Rwanda did not respond due to reasons beyond their control. ICRISAT hopes that, in time, each of these countries will find it useful to participate in the regional pigeonpea project.

The pigeonpea project for which we are breaking ground is a regional cooperative venture supported by the African Development Bank. Due to time constraints, it was not possible to arrange full consultations between national programs and ICRISAT representatives prior to this meeting. It is now our mutual responsibility to work together to develop work plans for each NARS represented.

The Bank has allocated sufficient funds to support Phase I of the project. Continuation of the project beyond Phase I will depend on the project's success. It is therefore critical that Phase I shows impact. Each country should therefore remain committed and accountable to the project. Right now, at the beginning of the project, we need to predict what we are likely to accomplish so that we can later measure our achievement. Rapid rural appraisal is a key tool for planning. We need to put money where there is going to be impact. Before conducting any trial, the possibility of success must be determined. Kenya has a wealth of socio-economic data, but this still needs to be assembled and published. When this is done, other national programs will be able to use Kenya's model to accumulate essential data in their own countries. For the project to succeed, we must evaluate the chances of success.

In its initial stages, the project's emphasis will be on research and training. It is therefore important to form linkages with development agencies so that our products reach the farmer. Both research and development require diagnostic study. Since information may already be available on improved production technology, diagnostic study can be used to determine whether available superior technologies can be put to use to improve productivity.

We must lay a solid foundation for our project to sustain it after external funding has ended. Because donors prefer projects that receive support from the national programs, NARS commitment is key to the sustainability and success of

the projects. Specifically, donors want to see the impact of their investment in farmers' fields.

Programs on pigeonpea research are relatively better developed in Kenya and Uganda, while in Burundi and Sudan research is likely to be of an exploratory nature. We need to determine agroecological zones in Kenya and Uganda so that when technology is developed we may extend to areas with similar agroecological zones in Burundi and Sudan. We need to delineate production domains, after which we can exchange material and information.

Human resources are our most important resources. Developing them must therefore receive attention. Education and training, particularly for higher degrees, should receive high priority, but should whenever possible remain within the region. Education in the developed world is becoming costlier every year. Regional training will stretch the money, thus preparing a larger number of scientists and technicians than would be possible if the training were undertaken in developed countries.

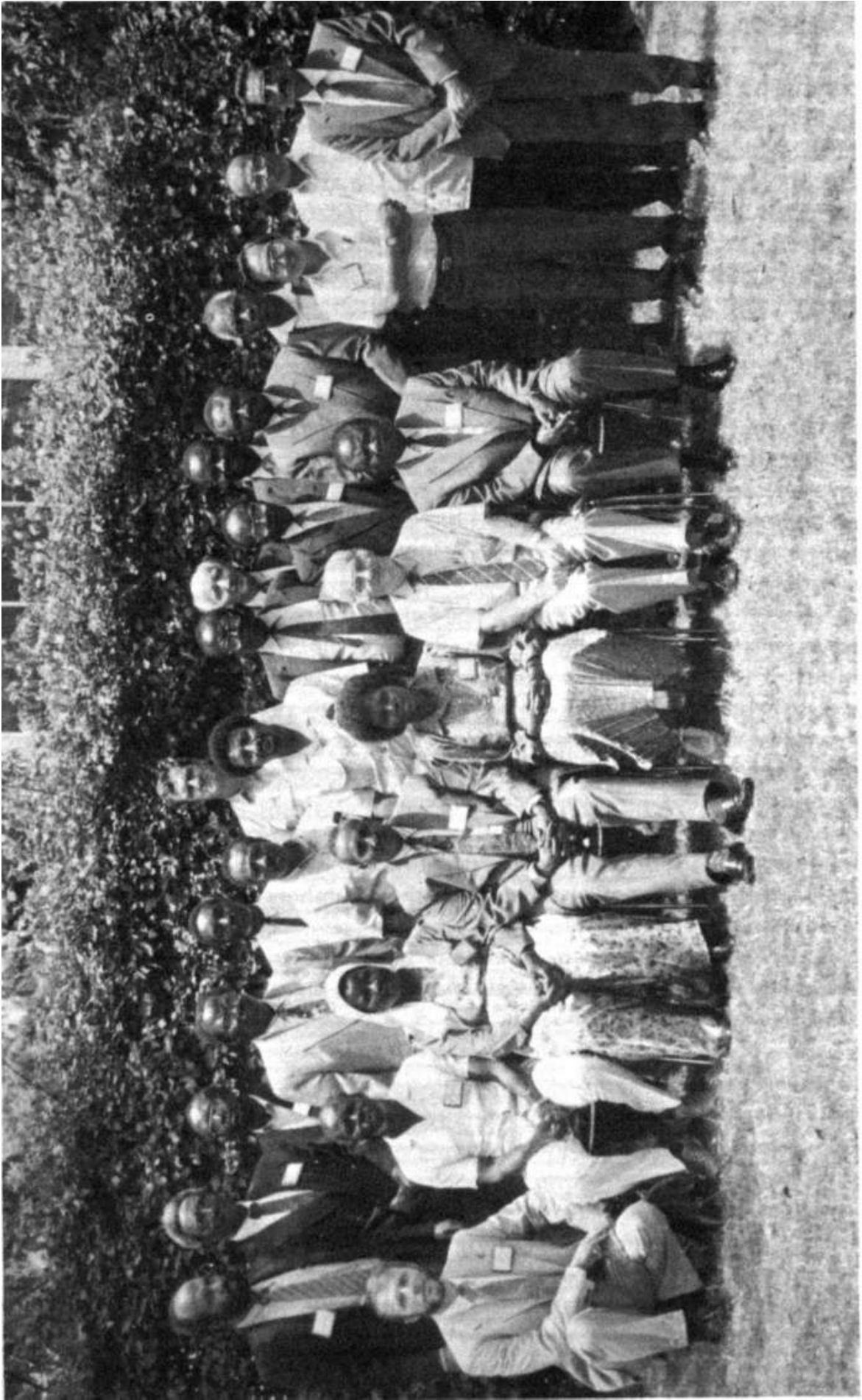
I have one last appeal. A great deal of research has been done in the eastern African region. This knowledge should be published for others to know what has been done, thereby avoiding duplication of effort while sharing valuable information.

The Director General of ICRISAT has asked me to bring several copies of a recently published book on pigeonpea to this meeting. Appropriately entitled **The Pigeonpea**, it is an exhaustive examination of the crop that has brought us together. On behalf of ICRISAT, it is my pleasure to present copies of **The Pigeonpea** to the Directors of Research from the four national agricultural research systems represented here, as well as to the representatives of the Universities of Nairobi and Makerere.

Finally, I would like to thank Dr King, Team Leader of EARCAL, ICRISAT's research team in Nairobi, and particularly Dr Silim, whose responsibility it was to organize the meeting, for all they and the other members of their team have done to make this meeting successful.

Because of your enthusiasm and hard work, the pigeonpea project has an excellent chance for success in eastern Africa. Let me once again thank you for participating in this meeting.

**L. K. Mughogho**  
Cereals Program Director (Acting)  
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**Section III**  
**The Lilongwe Meeting**



## Introductory Remarks

It is a great pleasure to welcome you, the representatives of southern African countries, to this important meeting in Lilongwe. We have come together to discuss the importance of pigeonpea in the southern African countries where it is presently grown and its potential elsewhere. Our hope is that together we can lay the foundation of a dynamic collaborative project.

Delegates are here from Angola, Malawi, Tanzania, and Zambia. Other countries and international agencies in the region have indicated their interest in the project, and we hope they will participate in the future.

Although the number of participating countries is lower than expected, three of the four countries in the region where pigeonpea production is currently important are present. Of these four (Malawi, Mozambique, Tanzania, and Zambia), only Mozambique was unable to attend. And we are delighted that Angola has decided to join us as well. Countries like Angola that are not growing pigeonpeas now will soon be able to take advantage of the research results of our collaborative work.

Pigeonpea has many qualities and uses. As human food it is an excellent source of protein. Pigeonpea stems are important as fuelwood. The crop has a unique ability to fix nitrogen and mobilize nutrients in the soil. It is a hardy crop that prospers where others fail. Its modest moisture requirement makes it as a reliable yielder even in dry seasons. It is an excellent intercrop component because it does not compete with associated crops. For all these reasons pigeonpea is an ideal crop for sustainable agriculture in small-scale farming. At the same time, however, it is also a high-yielding commercial crop on medium-sized and large farms.

The creation of a collaborative pigeonpea project for eastern and southern Africa will promote this versatile and valuable crop, thus helping regional farmers in many ways. The specific objective of the project is to develop and distribute cultivars for various agroecological zones and purposes. Although the challenge of identifying appropriate varieties for the many types of potential uses of pigeonpea is great, ICRISAT is ready. Our colleagues in Nairobi have already been working with pigeonpea in eastern Africa for several years. And Dr Tuwafe has just joined our team here in Malawi as Associate Principal Pigeonpea Breeder, the first time since our establishment in this country that we have been asked to conduct research on a crop other than groundnut. I feel that the future of pigeonpea cultivation in southern Africa is in the best of hands.

We are profoundly grateful to the African Development Bank for agreeing to finance our new collaborative project.

**G. Schmidt**

Team Leader, SADD/ICRISAT Groundnut Project

## **Program Objectives**

This launching meeting is the second in an inter-regional collaborative pigeonpea project for both eastern and southern Africa. Although the participants gathered here in Lilongwe represent only the southern African region, we have much in common with our neighbors in eastern Africa. I was fortunate to attend the first meeting in Nairobi 2 weeks ago, and to have the opportunity to meet the eastern African delegates. Because both regions are characterized by great agroecological and agronomic diversity, much can be gained through collaborative work and the flow of information. And avoiding duplication of effort will save both regions a considerable amount of work.

This meeting will take place over 2 days, during which two sets of papers will be given. The first set of papers, the Country Reports, will give us a general idea as to the status of pigeonpea production in each country represented. This will provide an opportunity to determine the similarities and differences, as well as the strengths and weaknesses, of pigeonpea cultivation in the various countries. The second set of papers, the Special Topics, will provide additional information about pigeonpeas.

During this meeting, you will be asked to draw up a list of constraints to pigeonpea production in your countries and the requirements you expect will be necessary to address them. Once the list is complete, arrange the items by priority. You should also identify, as specifically as possible, your training needs for both scientific and technical personnel.

If your national program has resources that can be utilized to further the aims of the project, these should be mentioned.

The African Development Bank, which has agreed to fund the project, is particularly interested in the level of NARS commitment in undertaking collaborative research.

As part of its work plan, each country should nominate a National Coordinator to liaise with the African Development Bank, with ICRISAT, and with each other. Various names for our new project have been suggested. A final decision will be taken later at a Steering Committee meeting. If you have suggestions, please give them to your National Coordinators once they have been nominated.

As you may know, I have already been designated as the ICRISAT scientist responsible for pigeonpea in southern Africa, as have my colleagues Dr Laxman Singh and Dr Said Silim for the eastern African region. All of us hope to maintain open lines of communication with the National Coordinators, and to organize biannual meetings to share the results of our research.

**S. Tuwafe**

Associate Principal Pigeonpea Breeder



## Opening Address

Distinguished Guests, Ladies and Gentlemen.

On behalf of the Government of the Republic of Malawi, I welcome all the distinguished guests and delegates who have gathered here to discuss the future of pigeonpea in the region.

First of all, I would like to express my gratitude to His Excellency the Life President, Ngwazi Dr H. Kamuzu Banda, for directing me to open this launching meeting of the Eastern and Southern Africa Pigeonpea Project (ESAPP). As you know, His Excellency takes agriculture seriously. He is in fact his own Minister of Agriculture. I am therefore greatly honored and privileged to be given the opportunity to officiate at this opening ceremony.

It is pleasing to note that this workshop is being attended by delegates from Angola, Tanzania, Zambia, and of course the host country, Malawi. Observer delegates have also come from Kenya. I am delighted to note that ICRISAT is represented by the Institute's Deputy Director General, Dr Y.L. Nene, who has journeyed all the way from ICRISAT Center in India to join us today. His presence is a clear indication of the high priority ICRISAT has assigned to this meeting.

Pigeonpea is one of the most important food legumes in Malawi and other countries of southern Africa. Pigeonpea is an important pulse crop in Malawi, particularly in the southern region. It can be grown in almost all types of soils as either a sole crop or in mixed cultivation with cereal crops such as maize. Pigeonpea is a valuable source of protein and farmers grow it both for food and as a cash crop. Pigeonpeas improve soil fertility through nitrogen fixation and can be grown either as annual or perennial crops. Present average yields obtained by farmers in Malawi range from 0.4 to 0.8 t ha<sup>-1</sup>. Potential yields of up to 1.7 t ha<sup>-1</sup> can be attained in pure stands.

The policy of the Malawi Government is to increase yields of pigeonpeas per unit area of land. This can be achieved by sowing improved varieties and by applying improved cultural practices. My Government is therefore intensifying both research and extension efforts.

Realizing the importance of pigeonpea in Malawi and other southern African countries, the Government of Malawi last year invited ICRISAT to establish a regional pigeonpea project based at Chitedze Agricultural Research Station, where ICRISAT had already installed a research infrastructure to work on groundnut. Earlier this month, Malawi hosted the Fifth Regional Groundnut Workshop for Southern Africa, another indication of the constructive collaboration between ICRISAT and the Government of Malawi. Through these projects and others, I believe that Malawi is contributing positively to the ideals of SADCC.

The objectives of this meeting are:

- to bring together scientists and directors of agricultural research to exchange information and ideas on pigeonpea research and development in the region;
- to identify priorities related to the problems limiting pigeonpea production in the region;
- to identify areas of cooperation and collaborative efforts among researchers; and
- to establish links of cooperative work throughout the southern African region.

I am told that the pigeonpea research in southern Africa will be funded by the African Development Bank and managed by ICRISAT. In Malawi we also have a pigeonpea research project funded by the United Nations Development Programme (UNDP) and managed by FAO. The Government of Malawi is grateful to the African Development Bank for agreeing to provide funding for pigeonpea research for southern Africa and for sponsoring this workshop, and to UNDP and FAO for their support of the Malawi Pigeonpea National Research Programme. Finally, ICRISAT deserves our sincere thanks for accepting the responsibility of coordinating the project.

This meeting has been called to facilitate exchange of scientific information between regional scientists and those from elsewhere. Together you share the important task of charting the direction of the pigeonpea research in southern Africa in the 1990s. I wish you every success.

Mr Chairman, ladies and gentlemen, I declare the meeting open. Thank you.

**Hon. F.M. Kangaude, M.P.**  
Deputy Minister of Agriculture,  
Government of Malawi

## **Country Report Summaries**

### **Pigeonpea in Angola**

*A. C. Chicapa-Dovala*

Although some pigeonpea is grown in isolated maize fields, the crop is not well known in Angola. However, there is some scope for conducting collaborative trials with ICRISAT in the country.

Angola is a largely semi-arid country. Moreover, like its neighbors, it has suffered from the drought which has affected the region for several years. Because pigeonpea is resistant to drought, research on this crop for cultivation in Angola is recommended as an urgent priority.

In this regard therefore I invite ICRISAT to take up this challenge and contact the Director of the National Agronomic Research Institute, Mr Joachim Caesar, on this matter.

### **Pigeonpea Research and Development in Malawi**

*H. N. Soko*

Pigeonpeas in Malawi are very important as a source of high-quality protein for both human and livestock nutrition. The crop is widely grown in most agroecological zones of the country, especially by smallholder farmers. It is usually grown as an intercrop with staple food crops such as maize, sorghum, pearl millet, or cassava. Most farmers grow long-duration landraces that are susceptible to fusarium wilt, a major production constraint.

Recent research efforts have resulted in the release of ICP 9145, a wilt-resistant, long-duration variety developed by ICRISAT. A few short-duration varieties introduced by ICRISAT have shown a good deal of promise and these should shortly be released for cultivation. Present research efforts are directed toward the development of high-yielding varieties of both short- and long-duration with resistance to wilt and other diseases as well as to insect pests. Another important research thrust is the investigation of suitable agronomic practices, particularly intercropping systems, that would fit into smallholder farming systems. A smallholder seed multiplication scheme for the released varieties is also being developed.

# **Pigeonpea Improvement and Cropping Systems in Tanzania**

*R. V. Ndoni*

In Tanzania, pigeonpea is grown by smallholder farmers using mainly tall perennial landraces of long duration. These are intercropped with cereals, cassava, and other legumes. The area and production figures of pigeonpea are difficult to quantify because the crop is intercropped in small fields or grown as a backyard crop, and because much of the harvest is consumed by the household.

Production constraints include lack of improved high-yielding varieties, lack of variety of agronomic practices, pests and diseases, and unavailability of seed. Pigeonpea research objectives are to address these production constraints. Constraints to research include lack of transport and insufficient funds.

Major sources of germplasm in Tanzania's pigeonpea improvement program have been the Kenyan and Indian national programs, as well as ICRISAT. Anticipated research output includes two short-duration varieties to be released soon, improved agronomic practices, farmer awareness of new varieties and technologies, and, finally, an increase in pigeonpea production.

## **Pigeonpea Production and Research in Zambia**

*J. M. Mulila-Mitti*

Pigeonpea is a minor legume crop in Zambia with high potential for increased production. Since present production is insufficient to meet current demand, such increases would be very helpful contributions to the country's agriculture. Most smallholder farmers grow pigeonpea as hedges around their homesteads or fields of annual crops or in their backyards. Several commercial farmers also cultivate this crop in urban areas where there is considerable demand, particularly from the Asian community.

The major constraints to pigeonpea production in Zambia are lack of improved varieties, damage from diseases and insect pests, and the lack of diversification amongst the indigenous population. Multidisciplinary research in pigeonpea was only initiated in 1983 with the establishment of the Grain Legumes Research Team. Major research activities have been varietal screening and intercropping studies. Two introductions, ICP 7035 and 423/50/3, have been released for nationwide testing.

# Special Topic Summaries

## Concepts and Techniques for Breeding Pigeonpea in Southern Africa

*S. Tuwafe*

Pigeonpea is grown on approximately 2.6 million ha in 54 countries for a world production of 2550 t grain. The average yield of 700 kg ha<sup>-1</sup> is rather low. While many reasons for low productivity exist, this paper focuses on just one: the lack of high-yielding, disease- and pest-resistant cultivars in the southern African region. Wilt, caused by *Fusarium udum*, powdery mildew (*Oidiopsis*), and leaf spot (*Cercospora cajani*), are responsible for major losses in the production of pigeonpea. Among the pests, pod borers (*Helicoverpa armigera*) and sucking bugs (*Calavi-gralla* spp and *Nezara viridula*) are important pests in Africa.

There are many parameters to consider when breeding pigeonpeas; outcrossing rate, spreading growth habit, length of duration, availability of socioeconomic data, and the usefulness of local varieties. Because the crop is able to adapt to diverse agroecological conditions, and has therefore been studied in a variety of environments, a wide range of quantitative and qualitative characters has emerged. In spite of this, we have yet to explore and understand fully the genetics of pigeonpea. The existing information is incomplete and at times contradictory.

The broad objective of the pigeonpea project's breeding program is to increase yield, grain quality, and stability of production in southern Africa. Specific objectives are:

- developing medium- and long-duration cultivars resistant to diseases and pests;
- developing short-duration cultivars with high seed yield and consumer acceptability (seed color, seed size); and
- identifying cultivars suitable for intercropping and mixed cropping.

Conventional breeding methods, aimed at achieving these objectives, will include the introduction, hybridization, selection, and testing of elite germplasm and breeding materials.

# **Traditional and Alternative Pigeonpea-Based Cropping Systems**

*S. N. Silim*

Pigeonpea is an important pulse crop for subsistence farmers in the tropics and subtropics. India is the largest producer of the crop, followed by Kenya, Uganda, Tanzania, Malawi, and Mozambique.

The prevailing production systems in eastern and southern Africa are based on intercropping or mixed cropping of long-duration landraces with cereals, short-duration legumes, or with other long-duration annuals. Yields in the region are low, about 0.3-0.7 t ha<sup>-1</sup> mainly because farmers grow unimproved cultivars without inputs. To improve the system there is need to conduct research to:

- identify the best intercropping combination with pigeonpea;
- identify appropriate cultivars;
- identify optimal plant density and spatial arrangement;
- determine the most appropriate times for sowing; and
- determine nutrient requirements

One of the major breakthroughs in pigeonpea is the development of short- and extra-short-duration varieties. Because they are responsive to inputs, these new varieties have been commercially successful as sole crops. They can be grown in areas where rainfall is low (less than 600 mm) and where evaporation is high. Moreover, they can be double-cropped where traditionally only one crop is grown. And they can be ratooned.

The successful introduction of these new crops requires that research be undertaken to:

- determine niches where they can be introduced;
- develop appropriate agronomic systems;
- develop or identify appropriate cultivars; and
- develop appropriate crop protection measures.

## **Diseases of Pigeonpea in Malawi**

*P. Subrahmanyam, M.V. Reddy, A.A. Likoswe, V.W. Saka, and W.A.B. Msuku*

Pigeonpea is an important food and cash crop for smallholder farmers in Malawi. Pigeonpea ranks third to groundnut and phaseolus beans in legumes production in the country. Because diseases are major constraints to pigeonpea production,

disease surveys were conducted in all major pigeonpea-growing areas in 1980 and 1991.

A number of diseases, including fusarium wilt (*Fusarium udum*), cercospora leaf spot (*Cercospora cajani*), powdery mildew (*Oidiopsis*), alternaria leaf spot (*Alternaria* sp), bacterial stem canker (*Xanthomonas campestris*), macrophomina stem canker (*Macrophomina phaseolina*), and root knot caused by the nematodes *Meloidogyne javanica* and *M. incognita* have been reported.

Most of these diseases are widespread, but wilt is the most severe and destructive disease. During the 1980 disease survey, wilt incidence was 36.3%. However, during the 1991 survey, the disease incidence was down to 6.3%. The reduced incidence of wilt observed in 1991 compared with that in 1980 is due to the introduction of a wilt-resistant cultivar, ICP 9145. This cultivar is now grown on 15-20% of the area under pigeonpea in Malawi.

Expanding the area under ICP 9145 and the incorporation of wilt resistance into local landraces should further reduce wilt incidence and increase production in Malawi. Cercospora leaf spots and powdery mildew are widely distributed in Malawi, but serious only on short-duration cultivars. Macrophomina stem canker and root knot are serious in some parts of southern Malawi.

## **Impact Assessment of an ICRISAT Wilt-Resistant Pigeonpea Cultivar in Malawi**

*Suresh C. Babu, G.B. Mthindi, P. Subrahmanyam, H.N. Soko, and V.W. Saka*

The objectives of this paper are to assess yield gains due to a wilt-resistant pigeonpea cultivar in Malawi, to quantify its impact on household food security, and to derive policy implications for priority setting within a commodity at both international and national levels.

In Malawi, the area under pigeonpea increased from 19 904 ha in 1985/86 to 37 309 ha in 1990/91 with an average annual growth rate of 14.6%. The production of pigeonpea increased from 8596 t in 1985/86 to 18 556 t in 1990/91. Both production and area under pigeonpea have shown marked fluctuations during these years. The yields ranged from 0.43 to 0.63 t ha<sup>-1</sup>. Pigeonpea contributes 53% of the total pulse production in Malawi.

Production increases are largely due to the expansion of the area sown to pigeonpea. This points out a need to increase yield levels by investing in the development of crop improvement technologies. The wilt-resistant pigeonpea cultivar ICP 9145 is an outcome of research conducted at ICRISAT Center, India. The cultivar was added to the germplasm collection under the aegis of the De-

partment of Agricultural Research in 1980/81. After adaptive research trails, ICP 9145 was released in 1986/87 for cultivation in farmer's fields. Since then the area under this cultivar has been expanding.

During the 1980 survey, the average wilt incidence was about 36.3%. Using this information and 1985/86 production figures before the release of ICP 9145, the total loss was estimated at 4898 t, about 57% of production that year. During the 1991 survey, wilt incidence was about 6.3%. The area under ICP 9145 was about 20% of the total area. The production loss in 1990/91 was calculated as 5130 t. The value of this loss was about US\$ 0.546 million.

An analysis of the impact of this cultivar on household food security in Malawi showed that smallholder security could be increased by 12 to 94% depending on the area under pigeonpea. Policy implications from the preliminary analysis showed that disease resistance research could have a very high rate of return. Establishing cost-effective ways for adaptive research trials on a country basis should be given due consideration. In order to ensure household food security, the goals should be increasing yield, increasing total value (grain plus fuelwood), and reducing the cost of production.

## **FAO Pigeonpea Research Development Project in Malawi**

*A. A. Likoswe*

Pigeonpea has an important place in the agriculture of Malawi. The main constraints to yield reduction of this important crop are lack of basic information on production, lack of high-yielding varieties, lack of good quality seed, and fusarium wilt disease. Additional research is therefore needed.

Pigeonpea research in Malawi is undertaken under the auspices of the Other Grain Legume Programme of the Department of Agricultural Research. Because of the shortage of resources, however, very little research effort has thus far been possible. The aim of the FAO Pigeonpea Research Development Project is therefore to develop an integrated program of research and development. The project's immediate goal is to establish a research infrastructure, including staff recruitment and construction of adequate facilities. In the long term, we hope to expand the range of germplasm, establish facilities for screening promising material, provide initial multiplication of seed, identify optimal agronomic practices, and publish our results.



The direct beneficiaries of our work are all pigeonpea growers: both smallholders and large estates. Other sectors affected by improved pigeonpea production are merchants and agroprocessors.

A second 5-year phase is planned for the project. During this phase, additional personnel will be recruited and the training of local staff will be a priority. More intensive agronomic experiments, breeding trials, and pathological and entomological studies will be effected. And a more sophisticated seed multiplication program will be developed. In short, the goals which were not achieved during the first phase must be achieved and expanded.



# National Program Requirements

## Angola

### National Objectives

Pigeonpea is grown in Angola but its potential for the country is unknown. The national program's main objectives are, with the help of the regional pigeonpea project, to:

1. Assign pigeonpea experts to Angola to appraise the potential of pigeonpea in the country
2. Initiate a pigeonpea project
3. Collect and evaluate germplasm
4. Train and orient staff towards pigeonpea research and production

### Priorities

1. Rapid rural appraisal
2. Germplasm collection
3. Crop protection
4. Seed production
5. Socioeconomic surveys

## Malawi

### National Objectives

Malawi's national program objectives are to enlist the assistance of the regional pigeonpea project to:

1. Orient and train staff in varietal development and implementation of improved production systems
2. Obtain germplasm
3. Develop publications and communications systems to increase seed production and transfer of new technology
4. Acquire laboratory equipment for conducting postharvest research
5. Provide expertise to help conduct socioeconomic surveys

The national program is willing to designate some of its existing facilities, including laboratories, cold rooms, office space, and transport, to conduct research on pigeonpea. In addition, the NARS can provide the human resources and seed necessary to conduct on-farm trials and increase improved seed production.

### **Priorities**

1. Development of new varieties and improved production systems
2. Germplasm introduction followed by rapid rural appraisal
3. Seed production accompanied by technology transfer
4. Marketing/processing and postharvest technology
5. Germplasm collection
6. Socioeconomic studies

## **Tanzania**

### **National Objectives**

Tanzania's strategy to improve pigeonpea production is to concentrate breeding work at the Agricultural Research Institute in Ilonga and to conduct agronomic trials in various agroecological zones. In the past, lack of transport has limited distribution of seed to research stations and limited the supervision of off-station trials. Lack of funds has also necessitated scaling down pigeonpea research. Therefore Tanzania needs assistance to:

1. Acquire vehicles for supervision of trials and for transporting materials
2. Fund research
3. Train staff to conduct research

### **Priorities**

1. Socioeconomic surveys
2. Improved production systems
3. Development of new varieties
4. Technology transfer
5. Seed production
6. Postharvest technology

# **Zambia**

## **National Objectives**

Zambia's national program needs the assistance of the regional pigeonpea project to:

1. Provide specialized training in collection and analysis of data
2. Train and orient staff in improved production systems
3. Obtain operational funds for labor and leased land
4. Acquire germplasm
5. Acquire small equipment

The Zambian national program proposes to utilize existing facilities and resources to conduct socioeconomic surveys, to locate land for trials, and to provide labor.

## **Priorities**

1. Socioeconomic surveys
2. Improved production systems
3. Development of new varieties
4. Technology transfer
5. Postharvest technology

# Recommendations

Participants were requested to divide their priorities into three categories:

- Technical
- Training
- Other needs

## Technical Priorities

**Table 1. Prioritization of technical requirements, by country**

Country	1	2	3	4	5	6
Angola	RRA <sup>1</sup>	GC	CP	SP	SE	
Malawi	NV	GI	SP	MP	GC	SE
Tanzania	NV	IPS	SE	GC	SP	TT
Zambia	SE	IPS	NV	TT	SP	PHT

1. RRA	= Rapid rural appraisal.	MP	= Marketing/postharvest.
GC	= Germplasm collection.	TT	= Technical transfer.
CP	= Crop protection.	IPS	= Improved production system
SP	= Seed production.	NV	= Development of new variety.
SE	= Socioeconomic survey.	PHT	= Postharvest technology.
GI	= Germplasm introduction.		

## Regional Activities

**Socioeconomic surveys.** Because the need for socioeconomic survey was found common to all participating countries, socioeconomic surveys were viewed as suitable regional projects. Surveys are needed to compile detailed information on local and export market potential and general uses of the crop.

**Seed production.** Limited improved seed is the major constraint to seed production. This problem is common to all countries in the region.

**Germplasm collection.** All the participants felt that inadequate germplasm collection has been undertaken in Africa. In most African countries pigeonpea germplasm has not been collected at all. Therefore germplasm collection in the region should be classified a regional project.

**Development of new varieties.** The need to acquire new varieties was expressed by all participants. Development of new varieties through breeding, selection, and introduction of germplasm and/or breeding materials is necessary to improve the productivity of pigeonpea in the region.

## Training Needs

**Table 2. Prioritization of training requirements, by country**

Country	Discipline	Inservice training			
		Technician	Post-graduate	MSc	PhD
Angola	Agronomy	-	-	1	1
	Breeding	-	-	1	1
	Entomology	-	-	1	1
	Pathology	-	-	1	1
Malawi	Agronomy	5	2	1	-
	Breeding	5	2	-	1
	Entomology	-	-	-	1
	Pathology	-	-	-	1
Tanzania	Agronomy	4	3	1	1
	Breeding	1	2	1	1
	Socioeconomics	1	-	-	-
Zambia	Agronomy	3	-	1	-
	Breeding	2	-	1	-
	Entomology	-	-	1	-
	Pathology	-	-	1	-
	Food science	-	-	-	1

## Other Needs

Table 3 lists the priorities for items needed for successful implementation of the project.

**Table 3. Prioritization of other needs, by country**

Country	Priority level <sup>1</sup>		
	1	2	3
Angola			
Malawi	OF	V	E
Tanzania	OF	V	E
Zambia	OF	V	E

1. 1 = highest, 3 = lowest.

2. OF = Operational funds (labor, fuel, supplies, allowances, incentives, etc.)

V = Vehicles.

E = Equipment.

## **Summary Recommendations**

1. The project should train scientists and technicians from participating countries in all aspects of pigeonpea production and research.
2. The project should designate operational funds to support cooperative research programs and facilitate procurement of small equipment.
3. ICRISAT should assist the project to identify potential donors for national programs to supplement NARS capabilities.
4. The project should facilitate the exchange of germplasm, scientific information, and technology exchange.
5. A Steering Committee composed of members actively involved in pigeonpea production should be established. The Committee should meet once annually.
6. Monitoring tours within the region and brief visits of cooperating scientists to ICRISAT locations should be organized.
7. ICRISAT is requested to send scientists to Angola to appraise the pigeonpea situation there.



# **Plan of Action**

## **Nomination of National Coordinators**

National coordinators for Angola, Tanzania, and Zambia are yet to be nominated; Malawi nominated H.N. Soko.

## **Development of Work Plan**

ICRISAT pigeonpea scientists based in Malawi and Nairobi will travel to each of the participating countries to draw up detailed work plans.

## **Release of Funds**

ICRISAT will draw up proposals based on agreed priorities for submission to Bank officials for approval. The provision of funds to the national program will be within what the African Development Bank has provided. While developing a methodology to assist national programs in the Southern Africa region, both the area under pigeonpea, and the actual potential for improving productivity will be taken into consideration.

## Closing Remarks

When each of you returns to your countries, you and your national program colleagues will have to examine your pigeonpea research priorities. Perhaps the best way to zero in on the problem is to pose basic questions. Is your country's priority a long-term one such as increasing foreign exchange revenue through the exportation of pigeonpeas? Or are your sights set on the more immediate goal of stabilizing cultivation through the adoption of improved agronomic practices?

Regardless of your priorities, a strong breeding program is essential. But it is crucial to rationalize your breeding research. For example, where short-duration pigeonpeas are viewed as undesirable because they have small seeds, the breeding program would naturally tend to focus on improving seed size. But in the meantime long-duration varieties should not be replaced unless there is a solid reason for doing so. And the availability of a short-duration pigeonpea manual for farmers should be considered a fundamental necessity.

Now let me explain something about ICRISAT. We are not donors: we are ourselves recipients of donors' funds. We cannot therefore directly assist you in the financing of your pigeonpea programs. Because of our past experience with the donor community, however, we may be able to help you to identify potential sources of bilateral funds. Both ICRISAT and its donors appreciate the *de facto* nature of the division of labor in agricultural research. Because of their lack of resources, less-developed countries can rarely conduct basic or strategic research. This activity is best assigned to international centers such as ICRISAT. Conversely, the national programs of developing countries are far better placed to undertake applied and adaptive research than are the international centers. If the national programs want the international organizations to help them with their research, we will gladly do so. FAO's highest priority, for example, is strengthening the national programs. ICRISAT's position is to identify and support comparative advantage.

We must not underestimate the value of socioeconomic surveys in understanding the role of pigeonpea as food. I will give you an example. For years I have been puzzled that in Africa pigeonpea remains primarily a food consumed by Asian residents. This phenomenon indicates the need for vigorous food preference and utilization surveys. And joint impact studies of distribution and seed multiplication are especially important.

Another important question to consider is: to what extent is outcrossing possible? Very little work with cross pollination has been done in southern Africa. Cooperative trials with the national programs, for example, could be very effective in maintaining seed purity by identifying isolation distances to reduce cross pollination.

Getting our seeds to the farmers is not a simple task. The seed companies, which are frequently the best conduits for the transfer of improved varieties (particularly hybrids) to farmers, are not interested in essentially self-pollinated

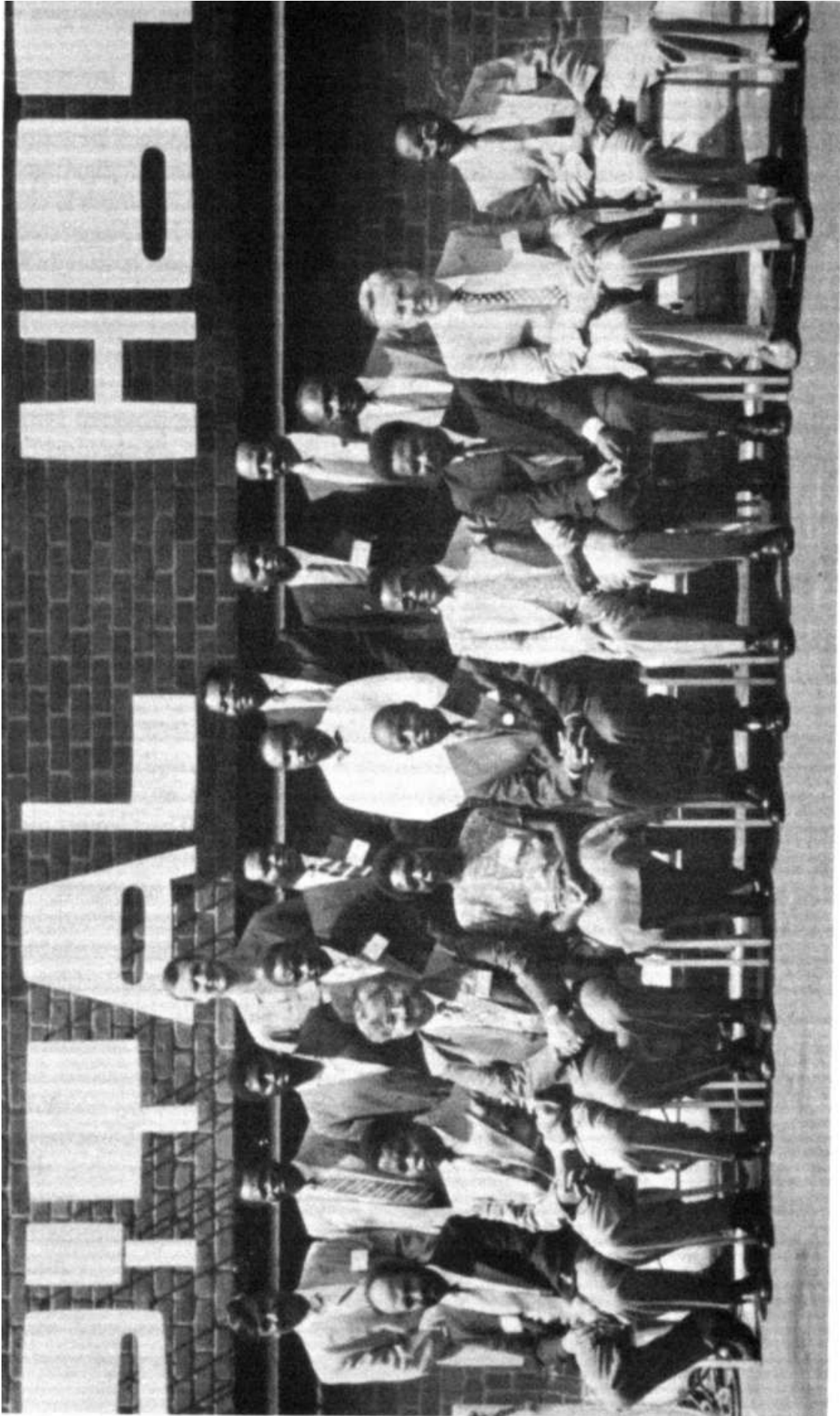
crops like pigeonpea. We have found that the fastest way to get pigeonpea seeds to farmers is to give them small samples.

Let me add a word about agronomic research on pigeonpea. Intercropping practices are a bit like recipes—each farmer has a unique one. Scientists can study existing intercropping systems, but will find it difficult to introduce new ones.

Now I come to a disturbing feature in regard to the future of pigeonpea research. The Technical Advisory Committee (TAC) of the CGIAR, which is charged with mapping the strategy of future agricultural research, has suggested that ICRISAT's work on pigeonpeas be phased out. The justification is that India, by far the world's greatest producer and consumer of pigeonpea, is increasingly capable of taking the lead in pigeonpea research. I am an Indian citizen with the utmost respect and admiration for my country's NARS, but what I said earlier about comparative advantage in research capability is as true in India as it is elsewhere. Moreover, the TAC rationale seems to forget the poverty issue. Although the number of people presently eating pigeonpea as a staple food outside of India (specifically in Africa) is admittedly small in comparison to India, it is nevertheless significant, and it is growing. I therefore take this opportunity to advise you of this development, and to urge you to help ICRISAT retain its pigeonpea research program. If you and your colleagues believe that the pigeonpea research we do is important to your country, please help us to help you. ICRISAT has three sponsors: FAO, UNDP, and the World Bank. The voices they listen to most carefully are yours. One word to them from any one of you carries far more weight than volumes of position papers from us.

Pigeonpea was originally considered for joint study by SADCC, but was subsequently dropped because it was not deemed important enough throughout the whole region. But now the African Development Bank has agreed that a place indeed exists for the crop in eastern and southern Africa. The Governments of Kenya and Malawi are to be commended for their contributions to the establishment of pigeonpea in the region. Although the total number of countries represented at this meeting was not so large as was hoped, the interest shown by those who did attend indicates that our new collaborative project will be a viable one. I am delighted to have been a party to its inception. Good luck to all of you.

**Y.L.Nene**  
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