THE ROLE, ORGANIZATION AND MANAGEMENT OF CIAT'S ACTIVITIES IN SURPORT OF NATIONAL BEAN IMPROVEMENT PPOGRAMS IN EASTERN AFRICA[1]

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Bean Production and Research Opportunities

Beans (Phaseolus vulgaris L) were introduced into Africa from the Latin America gene center by West European traders over the last centuries Currently Africa is the second most important common bean-producing region of the tropics, following Latin America The total average annual African production, according to FAO production statistics, amounts to 1 4 million t per year over the last decade Production estimates vary greatly, as was documented in a workshop in Malawi on the Potential for Field Beans in Eastern Africa (CIAT , 1981) A large part of the total bean production is consumed locally and is thus not captured in the FAO estimates shown in Table 1 For example, Kenya and Uganda report production of 467,000 t and 300,000 t, respectively vs FAO estimates of 161,000 t and 175,000 t respectively

Total bean production in Africa has increased over the last decade However, this has been achieved through area increases, while productivity has been stagnant and is currently at around 500 Kg/ha Production increases have not kept up with population growth rates Per capita consumption is therefore falling, and price increases have been above normal inflation rates in most countries

Beans play a critical role in the human nutrition of Eastern Africa, providing up to 45% of total protein consumption in Burundi and Rwanda (the highest in the world) and over 10% of protein consumed in Kenya and Uganda Beans contribute nearly as much protein to average national diets as all animal products combined in Malawi and Uganda and far more in Burundi and Rwanda Moreover, because beans are cheaper than animal products, they are of even greater significance in the diet of the poor, who are obviously most vulnerable to malnutrition This applies especially to those countries where based diets on cassava and banana are associated with serious protein deficiencies, such as Uganda

Small farmers are the principal producers of beans in most of Africa The vast majority of beans are cultivated in associated cropping systems with maize, sorghum or bananas In Kenya for example, only 6% of total production is estimated to be in monoculture Most bean production is for subsistence, with less than a third of the output being marketed Use of fertilizers, pesticides and fungicides in bean production is rare (CIAT, 1981) However large differences in management applied by farmers can be found within relatively short distances In Ethiopia, for example, small-seeded white beans are grown as a primary cash crop in the rift valley, under a rainfall regime of 600 to 800mm, in a minimal input monocropping system - a single ploughing to incorporate broadcast seed, with no subsequent weeding In a higher rainfall area of the nearby Sidamo region, by

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Table 1 African bean production in the last decade

Country	Annual production ('000 tons) 1966-68	1977-79	Annual area and yield increase 1962-1979 (%) Area	Yield	Apparent annual per capita grain legume consumption (kg/capita) 1977-79
Principal Producers					
Uganda	175	175	6 7	-2 3	29 3
Burundi	133	162	3 6	-0 9	44 0
Kenya	133	161	-	-	21 0
Rwanda	126	174	3 7	0 3	50 6
Tanzania	108	150	2 7	0 9	12 0
Other Producers					
Ethiopia	68	13	-8 8	-0 2	21 2
Somalia	2	8	-	-	1 7
Angola	64	64	2 7	-2 1	10 5
South Africa	50	75	-1 6	4 7	3 1
Madagascar	49	47	0 1	0 4	5 6
Cameroun	24	82	6 7	0 4	13 1
Zimbabwe	23	25	0 4	1 7	5 2
Togo	20	16	1 4	-0 6	10 1
Others	52	198	-	-	8 0
Total	1,027	1,350	3 8	-0 1	11 7

Source FAO Production Yearbook, various years

contrast, large-seeded red beans are grown twice per year for subsistence purposes, often intercropped in maize, and sown in rows behind the ox plough and are weeded by hand subsequently In this example, recommendations for raising yields from the low-input monocropping system have been developed but, except for change in variety, most appear to be unacceptable to farmers because their implementation would require diversion of labor from other crops or activities at peak periods in the crop calendar (Tilahun Mulatu, 1986) Very little research, on the other hand, has been conducted on the improvement of the subsistence intercropping system, although results available from other countries in the region indicate some promising directions On-farm research is needed to identify local priorities

Diseases and insects, low soil fertility, and periodic water deficits form the principal natural constraints associated with the low average yields The Regional Bean Workshop in Malawi and the 1983 Workshop of African bean researchers held at CIAT identified anthracnose (Colletotrichum lindemuthianum), bacterial blight (Xanthomonas phaseoli), angular leaf spot (Isariopsis griseola), bean common mosaic virus, and rust (Uromyces phaseoli) as the most important diseases

across countries The beanfly (Ophiomya spp) is the principal insect problem Although sources of resistance to the above problems have been identified, they often occur in materials with grain types lacking consumer acceptance, or are in poorly adapted materials and are, therefore, not approprate for farmers' circumstances For example, the most important cultivar in Ethiopia, Mexican-142, is susceptible to most of the above pathogens To reduce disease pressure farmers in many countries plant at suboptimal densities and accept a lower potential yield by planting beans dangerously close to the next dry season

Beans in Africa are mostly consumed as mature beans, either dried or before the seed drying process has started Green pods are also important, and young tender leaves are sometimes consumed as a vegetable Large red, red-and brown-mottled or speckled seed types are preferred in many areas but seed color preferences seem less stringent than in Latin America Short cooking time, however is very important where, as in Rwanda, the firewood problem is acute Beans, being slower to cook than most other common foodstuffs in the diet, largely determine the amount of firewood used (CIAT, 1986b) Taste is also important in helping to determine acceptance of a new variety, although, here too, generalization is difficult a commercially non-preferred, small grained variety was found to be popular with the poorest sector of the rural population of Kirinyaga in Kenya, because seed for planting was less expensive (Franzel, 1982)

There are many similarities between the bean production systems and production problems in Africa and Latin America In both regions, beans are produced primarily on small farms in association with maize, and with little use of chemical inputs In both Africa and Latin America, drought is an important limiting factor in production, and many of the most important diseases constitute severe problems anthracnose, angular leaf spot, bean common mosaic virus (BCMV), rust and bacterial blight Prospects therefore appear promising that important bean technology components may be transferable from Latin America to Africa Of course, there are also differences between the Africa and Latin America bean situations Halo blight and necrotic strains of BCMV are relatively more important in Africa than Latin America, neither the beanfly nor bean scab is found in Latin America Socioeconomic production conditions also differ between the continents For example, in Africa, a higher percentage of bean production is used for home consumption and the taste and cooking qualities of local varieties need to be maintained in new material Consequently, transfer of finished technology to Africa can be, at best, a short-term expedience and no substitute for the permanent strengthening of local research capability

National Bean Research Programs

Bean research has a long history in Africa and has continued to increase in importance over the past few years Many national programs are backed by a reasonable infrastructure, although seed storage, transport for on-farm research, and field equipment not available for purchase in local currencies are generally inadequate for efficient deployment of the available research manpower

The adequacy of human resources available to these national research programs varies greatly Uganda, with an estimated 450,000 hectares of beans grown in several distinct agroecological zones, has twelve graduate staff of the Ministry of Agriculture devoting on average 70% of their research time to the bean crop Not all countries are so well endowed In recent years agronomy in general appears to have received less attention than breeding and crop protection All countries, however, place priority on improving the training of their research staff, both graduates and technical assistants These two principal categories of staff require different types of training, and it is becoming apparent that a concentration of training opportunities upon those at the graduate level does not necassarily lead to a

concommitant improvement in the practical skills of their assistants

Exchange of research methodogies, literature and other results among the various national and international programs has been largely lacking, until recently A questionnaire survey of all known bean researchers in Africa, conducted in 1985, identified the critical need for improved information and documentation access in the region For example, none of the national scientists who responded was able to subscribe to a scientific journal, for reasons of costs and foreign exchange restrictions, and most libraries in the region are deficient and deteriorating

One bright spot was the emergence three years ago of the Phaseolus Beans Newsletter for East Africa, complied and published by Kenya's national program at Thika This newsletter is attracting contributions from throughout the region and is already received by one third of the region's researchers, according to a recent survey

There was little exchange of bean germplasm within the region until recently, and the present range of varieties appears quite limited Ethiopia, for example, has the widest altitudinal range of agricultural environments in Africa but does not produce beans above approximately 2000 masl, whereas Latin American countries at a similar latitude grow beans up to about 3200 masl.

Objectives of the CIAT Bean Program in Africa

CIAT's activities in support of national efforts in bean research have the following three broad objectives

1 To increase the productivity and production of food beans by breeding and selecting higher yielding genotypes identified from among a more diverse germplasm base, both from introduction and from locally adapted landraces Such cultivars are likely to be selected for yield stability, relying on resistance to biotic and abiotic stresses, and for consumer acceptability

2 To develop more productive systems of cropping, utilizing promising new cultivars and varietal mixtures when appropriate, while ensuring that such innovations of cropping system and cultivar remain acceptable to producers and consumers and do not disrupt existing farming systems adversely

3 To assist strengthening of national research programs, to a degree that is both appropriate and sustainable nationally, through giving substantial emphasis to training Training is offered to postgraduate scientists at universities within or outside the region, either with or without periods of research with CIAT programs Short-time training is encouraged, within Africa or outside the region On-the-job training in Objective 1 and 2 is important

Organization of CIAT Bean Activities in Africa

In a first meeting of bean researchers in Africa, held in Lilongwe in March, 1980, CIAT was asked by delegates from the chief bean-producing countries of Eastern Africa to mount a regional program in order to support national bean research in Africa (CIAT, 1981) After some years of negotiation, it became apparent that no single donor was prepared to support the entire region of Eastern and Southern Africa CIAT therefore sought to establish projects in geographical subregions, identifiable on agroecological and/or economic grounds, for which funding could be found

By 1983 CIAT was in a position to set up a regional program for the Great Lakes countries of Burundi, Rwanda and Zaire with Swiss (SDC) support, and a full regional team is now in operation from a coordinating center in Rwanda Towards the end of

1984, CIDA and USAID funds (through CDA) became available for establishing operations in the rest of Eastern Africa, including Kenya, Uganda, Ethiopia and Somalia. CIAT placed one bean scientist at Thika, Kenya in September 1984 to start up operations. The regional coordination center for these countries is now established in Ethiopia. Further funding from CIDA has enabled CIAT to start establishing a third regional base in Arusha, Tanzania to serve the SADCC countries, and a regional coordinator was posted there in July, 1986. Each of the three regional programs is located, by agreement with the respective national research institution, with a national bean improvement program. The Southern Africa program is a joint program of CIAT with the Southern African Center for Cooperation in Agricultural Research (SACCAR). The probable pattern of staffing is indicated in Table 2.

Table 2. Staffing and Location of CIAT Regional Bean Programs

Region	Position	Location
Great Lakes	Breeder/Coordinator	ISAR-Rubona, Rwanda
	Cropping Systems Specialist/ Anthropologist	" " "
	Pathologist	" " "
	Cropping Systems Agronomist	" " "
	Nutritionist	" " "
Eastern Africa	Cropping Systems Agronomist/ Coordinator	IAR-Nazret/Debre Zeit, Ethiopia
	Breeder, Pathologist (1)	MAF-Kawanda, Uganda
	Agronomist/Breeder (1)	" " "
	Economist (1)	(2)
Southern Africa	Pathologist/Coordinator	TARO-Arusha, Tanzania
	Breeder	" " "
	Cropping Systems Agronomist(1)	" " "
	Entomologist (1)	" " "
	Breeder (1)	Bunda, Malawi

(1) Position to be filled during 1987

(2) Location not yet fixed

One member of each regional program acts also as coordinator, and all staff report to the coordinator of CIAT's Bean Program in Colombia. The distribution of regional staff is intended to combine elements of centralization (conferring advantages of easy interdisciplary teamwork and a critical mass) with the advantages of decentralization (daily contact with a large number of national programs and agroecological zones, and smaller groups of expatriates less likely to dominate national program decisions). The decentralized model is felt to be particularly appropriate to Eastern Africa, where national programs are generally more developed than in the other two regions.

Philosophy of Regional Program Operations

CIAT's philosophy in operating these programs is that their principal objective is to strengthen national programs in such a way that they become fully effective, practically oriented interdisciplinary research teams that remain effective after

the withdrawal of external support The key to this lies, we believe, in working alongside national bean teams as colleagues within the research sites where they work Care is taken that regional staff guide, encourage and supplement (but do not replace) the activities of national scientists CIAT's regional programs usually do not run separate field trials Instead, they make every effort to give full support to national teams in conceptualization, planning and field execution of the research for which each national team retains responsibility and the credit for its achievements Varietal releases and recommendations of improved cultural practices that emerge from this research collaboration are made by the national program

The foregoing "bilateral" component of a regional program requires careful recruitment of international staff On the one hand, they must be scientists of sufficient calibre to earn the respect of their colleagues in national programs through their work together on a daily or frequent basis On the other hand, they must also be sympathetic to the needs and aspirations of the national programs and scientists, and need to be prepared to assess their own achievements in terms of the performance of national programs Concern with achieving rapid research progress in the short term needs to be balanced by an equal concern for fostering long-term sustainability of research capacity

As similar agroecological zones tend to be found in several neighboring countries, national programs can benefit greatly from regional collaboration Sharing of information and experiences among countries on previous and present research activities is an essential first step Regional trials and technical meetings have a lasting effect in initiating personal contact among scientists working on related problems Problem-specific workshops or monitoring tours provide opportunities both for indepth discussions among these scientists and for injecting relevant external experience through participation of international center staff or other specialists as consultants to the region Purposeful collaboration among national programs in solving one or more common research problems is considered by CIAT to be a further potential of a regional program Not only are limited resources used more efficiently through concentration of effort by different national programs upon complementary aspects of a problem shared by them, but also the planning and analytical abilities of national program scientists are enhanced through collaborative planning sessions and peer group review of research progress

The role of the regional program in these "network" activities is twofold Firstly, the program can catalyze collaboration among countries so that their understanding of shared problems and their rate of progress in exploiting research opportunities are greater than would be likely through national research conducted in isolation Secondly, a regional program should have the technical backup to be able to feed into national programs the new germplasm, research methods and scientific documentation that is required and requested

The full interdisciplinary nature of CIAT's Bean Program worldwide, which includes economists and other social scientists as well as the usual biological disciplines and nutrition, is advantageous is fostering disciplinary intergration in national programs

Management by Regional Steering Committee

Each regional program is monitored by a steering committee that meets at least once per year(intervals of six to nine months have been found useful in the early stages of a program) The committee is composed of the national bean research coordinators or team leaders and the regional coordinator Donor representation in an observer capacity is common

The general functions of the steering committee are to guide CIAT in its implementation of support functions and to set priorities for the region Specific topics that require agreement within the committee include strategies and implementation plans for the following activities

- Selection of research priorities with regional application
- Regional germplasm movements, nurseries, etc
- Regional training program
- Organization of workshops and monitoring tours
- Identification of regional needs for consultancy services from CIAT, from within the region or from elsewhere
- Annual work plan covering all the above (submitted in draft by the regional coordinator)
- Allocation of financial resources where discretion is provided within the budget, e g , for collaborative research subprojects and for capital equipment for national programs

Chairmanship and venue of the meeting rotates among countries The chairman serves until the following meeting and during that period may be consulted by the regional coordinator on matters pertaining to the regional prograr The regional coordinator provides secretariat services to the steering committee and represents the center

Integration of Independently-Funded Regional Programs

CIAT encourages meetings to be small and informal because this creates an atmosphere that encourages communication among individuals and in time builds the professional trust upon which the establishment of a regional network depends In this respect, three separately funded regional groupings can be useful For example, an annual technical workshop for all bean researchers is held independently within each region Similarly, most training courses accommodate staff from a single country or region

Nevertheless, the intention remains to integrate many of their activities into a single operation Methods already being used include the following

- Interchange of regional scientists although each regional team is multidisciplinary and includes at least one agronomist and one plant breeder, the needs of all the three programs are to be met by a single economist, anthropologist and entomologist, each located in a different program Expenses incurred by each scientist in assisting another regional team are met by the benefitting program

- Attendance of neighboring regional and national coordinators as observers at steering committee meetings regional coordinators have a special role to play in interregional communication, both in research planning and in dissemination of results At the more local level, communication between researchers responsible for agroecological zones dissected by a regional boundary (e g nothern Rwanda and south-western Uganda) is facilitated by the attendance of both national coordinators at their respective steering committee meetings

- Exchange of germplasm The African Bean Yield and Adaptation Nursery (AFBYAN), assembled by the Great Lakes regional breeder from the most promising materials available from each national program, is being used both to give each country wider access to germplasm and to start assessing systematically the agroecological variation in bean-growing areas of Africa Rwandan and Tanzanian breeding materials have been selected by visiting scientists from Uganda for incorporation in their own program

- Exchange visits and monitoring tours Already three Ugandan scientists

have made working visits to the Rwanda national program, accompanied also by Great Lakes regional staff A three-country monitoring tour for scientists from Rwanda, Tanzania and Uganda may facilitate collaboration focussed upon their common interests in the important bean-producing areas located at the junction of the three regions

- Africa-wide Workshops Specialized technical workshops,for assessing the state-of-the-art and for deducing appropriate research strategy,draw upon scientists without regard for their geographical location For example, a bean fly workshop recently drew together breeders and entomologists having relevant experience Similar workshops may be useful in the fields of bean breeding, pathology and agronomy An occasional, broadly-based conference for bean researchers in Africa is also under consideration

Collaborative Regional Research

A regional variety trial of the AFBYAN type is one way in which information can be shared usefully across countries that have similar agroecological zones or cropping systems niches Undoubtedly the purpose and design of these trials will change as understanding of the region improves Collation, interpretation and feedback of results across countries is an important function for the regional programs

There is another approach to improving the efficiency with which national resources are used for overcoming researchable problems that are shared by several countries This approach involves the purposeful division of effort among national programs that choose to collaborate The complex of widespread bean diseases has triggered this form of collaborative research, favored by the opportunity to select for genetic resistance in the best hotspots available in the region

The following collaborative subprojects are currently in progress among the Great Lakes countries

- Screening of germplasm for resistance to ascochyta (ISABU, Burundi)

- Screening of germplasm for resistance to anthracnose (ISAR, Rwanda)

- Screening of this germplasm for resistance to angular leaf spot (Programme National Legumineuse, Zaire)

Eastern Africa has provisinally agreed on the following assignment of priority research topics

- Screening for rust resistance (Ethiopia)

- Screening for drought tolerance (Somalia)

- Screening for bacterial blight and ascochyta resistance (Uganda)

Proposals for collaborative research projects can arise both from the setting of regional priorities by the steering committee and from independent applications submitted through a national coordinator by interested scientists of any research organization in his country A simplified application form is available to facilitate the development and assessment of proposals Regional funds can be allocated for successful proposals in recognition of their regional responsibilities

The steering committee considers each proposal on the basis of (1) relevance of the expected research output to the region as a whole, and (2) progress made by the proposers (in the case of renewals) Progress will be assessed from reports required of the researchers, from presentations at regional workshops, and from visits by one or more members of the steering committee

Bean Information Services in the Region

CIAT operates a Bean Information Center at its headquarters, utilizing core funding and special project funds from IDRC In addition to publishing Abstracts on Field Beans, the center has compiled and distributed three bibliographies on bean research in Africa (Lopez, 1983, CIAT, 1984, CIAT, 1986) The most recent volume includes "fugitive" literature obtained by means of personal visits to bean researcher throughout the region by a consultant

A free monthly service provides researchers and libraries with current contents lists for a wide range of agricultural journals The page charges for photocopies requested by researchers are met by coupons distributed by regional and national coordinators Regional coordinators also assist in updating the distribution lists

Results of research emanating from professional collaboration between regional and national program scientists is not reported by the regional scientist independently In the case of collation or extrapolation of research results across the region by a regional scientist, results are sent to all national bean programs and directors of research

Conclusion

The regional activities outlined above are likely to be successful in meeting all three objectives only if they are undertaken with determination and in partnership The countries of Southern Africa (i e members of the Southern African Development Coordination Conference) have the advantage of a common forum for setting and for implementing their own broad regional priorities in agricultural research However, the steering committee mechanism is proving its value in other regions also, by facilitating collaboration among research institutions and scientists to solve problems that are held to be national priorities by several countries By enabling international organizations to respond more directly to national interests, this mechanism also reduces the risk of paternalism

The judicious provision of technical assistance needs to be accompanied by equal attention to other forms of support to strengthen longterm research capability While strategies being encouraged by CIAT for improvement of bean varieties and cropping systems warrant a separate description elsewhere, the regional approach described here has implications also in these areas For example, a recent African Beanfly Workshop recommended that beanfly resistance screening work be coordinated in the future from within the region rather than from CIAT's headquarters A degree of decentralization of this nature is inherent in the philosophy

Other important components of the program include a strong commitment to training by all regional staff, an imaginative approach to the selection of training modes and locations and the provision of modest funding to national programs for strategic purchase of supplies and equipment

The risk of a surfeit of regional programs and networks, possibly making competing demands or offers, can be reduced by coordination among international centers and similar bodies Active collaboration between CIMMYT and CIAT in the area of training for on-farm research in Rwanda has avoided the risk of confusion and is enabling a wide range of national programs to benefit from a single activity Collaboration with other centers in other areas of training is being planned for 1987

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i am pleased to acknowledge my colleagues' contributions towards the development of this program However, the opinions expressed here are my own, and do not necessarily reflect those of CIAT

References

CIAT 1981 Potential for Field Beans in Eastern Africa Proceedings of a Regional Workshop held in Lilongwe, Malawi, 9-14 March 1980 Centro Internacional de Agricultura Tropical, Cali, 217p

____ 1984 Bibliography on Bean Research in Africa Supplement 1984 Centro Internacional de Agricultura Tropical, Cali, 164p

____ 1986a Bibliography on Bean Research in Africa Supplement 1986 Centro Internacional de Agricultura Tropical, Cali, 190p

____ 1986b CIAT Report 1986 Cali, Colombia 140p

Franzel S 1983 Planning an Adaptive Research Program for Small Farmers A Case Study of Kirinyaga District, Kenya PhD Thesis, Department of Agricultural Economics, Michigan State Univ East Lansing, MI

Lopez S ,J 1983 Bibliography on Bean Research in Africa Centro Internacional de Agricultura Tropical, Cali, 177p

Tilahun Mulatu 1986 Farm survey results and on-farm trials with particular emphasis to haricot beans and cowpea Paper presented to IAR/CIAT Lowland Pulses Research Training Course, Nazret, Ethiopia, 25 August-5 September, 1986 8p