FIFTH MEETING
HELD
AT THE PRESIDENT HOTEL,
GABORONE, BOTSWANA
ON 3-4 NOVEMBER, 1988
MINUTES OF THE FIFTH MEETING OF THE STEERING COMMITTEE OF THE SADCC/CIAT REGIONAL PROGRAMME ON BEANS IN SOUTHERN AFRICA, HELD AT THE PRESIDENT HOTEL, GABORONE, BOTSWANA ON 3-4 NOVEMBER, 1988

Those present

Miss Olivia Venge, Department of Research & Specialist Services, P O Box 81009, Causeway, Harare, Zimbabwe, (Lady Chairman)
Miss Mmasera Manthe, Sebele Research Station, Private Bag 033, Gaborone, Botswana
Ms Betty Gondwe, Acting National Coordinator, TARO-Lyumungu, P O Box 3004, Moshi, Tanzania
Mr Kennedy Kanenga, Acting for Dr Joyce Mulila-Mitili, Nsukera Research Station, P O Box 510089, Chipata, Zambia
Mr Castro Canarada, Facultade de Ciencias Agrarias, CP 236, Huambo, Angola
Mr Simon Molma, Maseru Research Station, P O Box 829, Maseru 100, Lesotho
Dr Garry Massey, Maseru Research Station, P O Box 829, Maseru 100, Lesotho
Dr Dennis Wanchinga, SACCAR, Private Bag 00108, Gaborone, Botswana
Mr Chris George, CIDA, Ottawa, Canada
Dr Roger Kirkby, CIAT, P O Box 67, Debre Zeit, Ethiopia
Dr David Allen, SADCC/CIAT Regional Bean Programme, P O Box 2704, Arusha, Tanzania

Absent

Dr Wilson Msuku, Bunda College of Agriculture, P O Box 219, Lilongwe, Malawi, (with apologies)
Mr Manuel Amane, INIA, C P 3658, Mavalane, Maputo, Mozambique
Mr John Pali-Shikhu, Malkerns Research Station, P O Box 4, Malkerns, Swaziland

1 Introduction

Miss Olivia Venge, the Lady Chairman, opened the meeting at 0815 hrs on 3rd November and asked Miss Mmasera Manthe to offer a welcome to the participants to Botswana

2 Agenda

After introduction of the new participants on the Steering Committee (SC), the Lady Chairman drew attention to the proposed Agenda (Appendix 1), asking if there were amendments. Chris George asked if the budget was to be discussed, and David Allen, the Regional Coordinator, replied that a revised budget had been drafted and was subject to discussion at CIAT
headquarters in December when it was presumably to be submitted to CIDA for approval. The Agenda was ADOPTED.

I Minutes of the 4th SC, held in Harare on 12-13 May, 1988 were read, and the following corrections were made:

p 5 (111) K Kanenga (not Kamenga)

p 8 b(i) Amend final sentence to read at present OFR in Angola was effectively impossible in some bean production areas

p 9 (v) The Committee (not committe)

It was PROPOSED by Manthe that the Minutes be adopted as a true and accurate record of the 4th Meeting, and this was SECONDED by Gondwe.

4 Matters arising from those Minutes

P 8c(1) The Regional Coordinator NOTED that no nominations had been received for the weed management course. Kirkby ANNOUNCED that, in fact, this course had been postponed, it was now to be held from 17-28 April, 1989 in Kampala. 3-4 graduate participants from SADCC could be accommodated, if firm nominations are received by Allen before the end of January.

P 10 e Allen asked Chris George about the status of the post-doctoral fellowship (PDF). After reminding the committee of the background to the establishment of the PDF, George said that he would be following up on this position when he next visits CIAT headquarters, after a rethinking of the RP budget. Some members of the COMMITTEE suggested that there might be greater need for using the PDF money instead to establish additional academic scholarships at the MSc (or perhaps even the BSc) level, but no firm recommendation was made.

P 11 g(i) Kirkby drew attention to the summary of the proceedings of the Soil Fertility (= Agronomy) Workshop (Appendix 2) which makes recommendations of potential consequence to Steering Committees, including the establishment of certain working groups. This was NOTED by the COMMITTEE.

P 14 9 Allen reported that nominations for the African Bean Research Prize from the three RP's on beans in Africa had been submitted to CIAT-HQ where the winner would be chosen. Kirkby added that, since the Prize was to be awarded annually, the SC should be considering new nominations while news of the 1988 winner was awaited.

5 Regional Coordinators Report on 1988, and Workplan for 1988/89

The Lady Chairman asked the Regional Coordinator to present his report for the year since Nov. 1987, when the last RC report was presented at the 3rd SC. Allen began by stating that this year, his report would not cover the technical progress made by
national programmes because no reports had been received from National Coordinators. Abstracts from reports (later received for Angola, Tanzania, Zambia and Zimbabwe) would be included in a revised edition. It was noted that the report from Lesotho would be made available to the RC in January 1989. The Report and Workplan were ACCEPTED by the COMMITTEE, subject to incorporation of NP reports, and subject to revisions made to the Workplan. Amended editions of each are attached as Appendix 3, and the suggested amendments and other discussions are summarized below.

(1) Discussion on RC's Report

It was mentioned that applications for the Training Officer position were invited. Copies of the Announcement (Appendix 4) were distributed to National Coordinators and SACCAR, and others will be distributed shortly by post to Directors of Research, Deans and the local press.

With regard to breeding materials distributed for CIAT to NP s, Massey mentioned that of the materials listed (p 5 of RC's Rep), only the Sugar Bean Nursery had been received. AFBYAN II had also been received. Lesotho requests also a Drought Nursery. Allen agreed to follow-up on this with the Regional Breeder, Dr. Smithson. It was further noted that the Drought Nursery should be sent direct to recipients, not via Kampala, Kirky, who is distributing the nursery, was asked to note this.

Allen emphasized that it was vital that National Coordinators did now comment on the Workplan, which should meet the needs of NP s, and Chris George echoed this, remarking too that the RC's report was a very thorough one.

With regard to CIAT's Economist (Dr. W. Grisley), now stationed at Kavanda, Uganda, Kirky asked what uses are foreseen for this position in the SADCC region, to which one third of his time will be appointed. Allen suggested that there were perhaps three areas of potential use, their importance varying with the country. These areas are: the gathering of production statistics for bean mapping, the design and use of socioeconomic surveys at the diagnostic stage of on-farm research, and impact studies on recently released cultivars. In response from a question from Wanchinga about support of the position, Kirky confirmed that the Economist was entirely funded by the Eastern Africa project, only costs of his travel to Southern Africa would be charged to the SADCC programme. Specific requests for input from the Economist are summarized as follows:

Angola Economics not yet relevant. An FAO Statistics Unit is working on crop production data.

Lesotho Macro-economic input is critical. And guidance on market opportunities (e.g., in Europe) useful.

Tanzania Priorities are to gather secondary production
data nationally, and to initiate microeconomic surveys at the diagnostic level of on-farm research in target areas (Lushoto and Kagera).

Zambia: A visit to Mbala (late March/April 89) would be useful, to establish links with ARTP.

Zimbabwe: A stop-over (e.g. en route to Maseru) would be welcome, to consider a programme.

With regard to other proposed travel by the regional scientists, Camarada stressed that as the Angolan programme was young, input from the Breeder would be useful to supplement the planned visit of the Regional Coordinator in November 1988. The second season (March 1989) might be suitable. Massey requested that regional scientists visit Lesotho as often as possible, particularly around the Breeder's Workshop to allow sufficient time in the field.

6 National Coordinators Reports (see also Appendix 3)

(1) ANGOLA

The main points reported by Camarada were that progress had been made in acquiring scientific literature from CIAT headquarters, collection of local germplasm had been made and these had been evaluated and early maturing lines had been identified among 94 entries at Chianga. Through the national seed programme, trials were also run at Malanje where mean seed yields of some entries exceeded 1100 kg/ha relative to the local check, Ervilha (700 kg). It was noted that progress had also been made in training and staff development.

(11) LESOTHO

Dr Massey reported a very successful year, with much rain in Spring (Oct/Nov 87), followed by a January drought then heavy rain again. Pinto types continue to be very promising, and the programme is occupied with seed multiplication (in the absence of a national seed industry). Common bacterial blight (CBB) is the chief disease problem, and pollen beetle is considered the worst pest. Dual 960 has proved a highly effective herbicide in beans. It was noted that Mr Seth Nkobole, on secondment by the Regional Programme to Lesotho where LAPIS pays his salary, is highly regarded; we couldn't ask for anyone better was the sentiment expressed. The complete Annual Report of the Lesotho programme will be available by the end of Jan 1989.

After this presentation, Allen noted the need for CBB resistance in Lesotho and suggested to Massey that a positive screening of the International Common Bacterial Blight Nursery be run next season.

(111) TANZANIA

The Acting National Coordinator, Ms Betty Gondwe, reported
that 1987/88 had been a very active year with 5 major activities
- genetic improvement,
- agronomic practices appropriate to improved cultivars, and weed control.

The superior performance of Lyamungu 85 had been confirmed on-station and on-farm, and extensive seed multiplication was underway. Other promising materials include G05oZ1, BAC (=XAN) 60, Carioca, EMP 86 and Selection 6.

It was noted that on-farm research had been expanded and work in Lushoto District, a new area, had been particularly successful.

On-farm yields were approximately half those obtained on-station, attributable in Gondwe's view to an important extent to weed competition. On-station research on weeds had identified Dual as an effective herbicide, the critical weeding time was shown to be during the first 5 weeks.

Work in Arusha had shown that endosulfan is effective against pod borers. Recent studies on halo blight had identified partial resistance in local landraces. Both races 2 and 3 of the halo blight pathogen had been identified in Tanzania, where a brown pigmented variant of race 2 had also been found.

Ms Gondwe concluded with a description of the structure of bean research in Tanzania, stating that collaboration between the 3 separate national institutions (TARO, UAC and SUA) had been further strengthened with the assistance of the regional programme. National varietal trials were to continue, stratified by ecological zone for each of which a separate institution would assume responsibility.

Discussion following Ms Gondwe's report was led by Massey, who suggested that work on weed competition was site-specific. There was often an interaction with drought stress. Allen commented that the practical use of herbicides was liable to depend on the degree of commercialization of bean production, it was possible that the seed bean industry in northern Tanzania might adopt results from Gondwe's work more readily than food bean producers whose farms were usually smaller scale and less commercially orientated.

Kirkby remarked that the efficacy of endosulfan in controlling insect pests of beans was not new, nor was it very safe. This emphasizes the need to find safer insecticides. Massey added that simple practices are sometimes very effective in controlling pests. In Lesotho, cutworms are very important in maize, winter ploughing gives excellent control.

(iv) ZAMBIA

Mr Kanenga reported good progress during the year. The recently released cultivar Carioca was outyielded two-fold by DOR 335 and BAC (=XAN) 76, however noting that DOR 335 was small-seeded like Carioca. In the AFBYAN, A 197 and BAC 76 excelled,
out-performing the check IPV 292 by 80/ A 197 will be promoted to National trials next year

Waterlogging at Msekerena had damaged the Sugar bean Nursery and the VEF (in which 16 entries were superior to Carioca). In the ABFRN, A 74 showed resistance to bean fly and was the heaviest yielder.

Allen added that a Technical Assistant has been recruited under the Regional Programme to help Zambia's Grain Legume Research Team in Mbaia, particularly to help bridge the gap between the commodity team and the Adaptive Research Planning Team who are responsible for on-farm trials. Kirkby remarked that national structures can sometimes militate against full coordination of research on a commodity and that such bridges could help to counteract perceived gaps.

(v) ZIMBABWE

Ms Venge reported that 28 new crosses had been made, and segregating populations of previous crosses were advanced. Yield data from Preliminary Variety Trials revealed that 71 entries outyielded the control, Natal Sugar. In the Intermediate Cultivar Trials, all entries had out-performed the check, producing mean yields in the range of 2 1-3 t/ha. Carioca will be tested in on-farm trials next season. A 86, B 80-37, PAN 10 and Puebla 152 Cafe have entered pre-release testing.

The presence of necrotic strains of BCMV in Zimbabwe was confirmed. PAD 10 exhibited neither mosaic nor black root. Preliminary results from a virus survey conducted by Dr H J Vetten, as part of a CIAT/Braunschweig special project, has also identified cucumber mosaic virus infections in beans in Zimbabwe.

Bean fly infestation at two sites (Kadoma and Panmure) wiped out trials. No significant differences between chemical treatments for the control of bean fly were detected at Panmure. There was little agronomic research conducted.

7 Regional Collaborative Research Sub-projects

(1) Revised proposals

The Lady Chairman asked Ms Gondwe to present the revised proposal from Tanzania (Dr Margaret Mmbaga) on rust. From the new proposal (Appendix 4) the COMMITTEE NOTED that the title, format and budget now confirmed to the recommendations made at the 4th SC. However, it was also NOTED that Dr Mmbaga was likely to accept a research fellowship offered her at the University of Nebraska. The COMMITTEE ACCEPTED the Proposal, CONDITIONAL upon Dr Mmbaga's being in situ (in Dar es Salaam), in which case the full $10,500 for the first year would be awarded. Further awards would depend on satisfactory progress being reported at the 7th SC (approx Oct 89).

(11) New proposals
Ms. Gongwe went on to present a new proposal from Tanzania, on behalf of Prof. Femi Lana of Sokone University of Agriculture, on BCMV (Appendix 5). Substantial discussion ensued. Noting that there was a related subproject in Uganda (Dr. Samson Owera, Makerere Univ), the COMMITTEE RECOMMENDED that the two proposals be merged, with a view to sharing both facilities and (high) costs. It was AGREED that a visit of Lana to Makerere (or Owera to SUA) be supported, in order to develop a single proposal and single budget. The budget should be split two-ways, with equipment being chargeable to CIAT’s RP for Eastern Africa and operational costs covered by the SADCC RP. The revised proposal should be submitted at the next SC (March for E Africa, April for SADCC), and Allen/Kirkby to write a letter to inform Lana/Owera accordingly.

Mr. Kanenga asked Allen to present a new proposal from Zambia, on behalf of Dr. Sithanantham of Msekeria, because he had received it directly from Dr. Mulil-Mitti. The proposal, on aphids (Appendix 6), it was NOTED by the COMMITTEE, was in need of revision. It should follow the required format, should give details of the intended cooperators and the nature of linkages, possibly including those with experience of aphids outside the SADCC region (e.g., Dr. Autrique, Burundi, Dr. Khaemba, Kenya). Reference to relevant work elsewhere should be made (e.g., Susan Halbert’s work on aphids of soybeans in Illinois, published in Ann. appl. Biol.). Trapping methods should be included.

A second new proposal from Zambia was presented, on behalf of Dr. Joyce Mulila-Mitti (Appendix 7), on the genetic improvement of Carioca. Various queries were raised, centering on the need to give details of the parents with which Carioca is crossed. To what extent are these seed types widely acceptable? Are back crosses planned? Will seed quantities in the F3 be sufficient for distribution to 3 countries from 1990? Information is also required on the choice of sites as BCMV black root spot. Questions over the budget focused on the lab supplies item. The COMMITTEE CONCLUDED that the proposal be SUPPORTED now, principally so as to avoid losing a year, on CONDITION that satisfactory changes are made (by 6th SC) in answering the above queries, with careful review of the budget.

(iii) Sub-project Agreements

The COMMITTEE ASKED Dr. Wanchinga to present a proposal on behalf of SACCAR at the 6th SC.

The session ended with a plea from Kirkby, as Regional Coordinator for Eastern Africa, that sub-project leaders liaise adequately with counterpart subproject leaders in other regions.

B Status of Research Equipment

(i) Noting the position as summarized in the Regional
Coordinator's Report (Table 8, Appendix 3), the COMMITTEE AUTHORIZED the Regions Coordinator now to PROCEED in ordering altimetre for national programmes (p. 12, 47m SC Minutes), adding also Lesotho

(11) Allen was ASKED by the COMMITTEE to INVESTIGATE the status of repair of the seed stores in Tanzania, at SUA and UAC (Dr O. Mwandemtele should be consulted) For Zambia, the COMMITTEE asked Mr Kanenga to INVESTIGATE and REPORT back on seed storage status at Msekera, including an airconditioner. Meanwhile, Allen is asked to obtain information on storage jars

(111) For Angola, Camarada requests a small, manual and portable typewriter (with Portuguese script AZERTY), and this was APPROVED

(1.v) Ms Gondwe indicated that Tanzania needs two motorized backpack sprayers, for pathogen inoculation. These were APPROVED

(v) Mr Moima on behalf of Lesotho stressed the need for several larger threshers for seed multiplication. Long discussion ended in agreement that such a request was not appropriate, but an order for one other small bundle thresher for research purposes would be placed.

(vi) Moima requested a binocular dissecting microscope for Lesotho. This was APPROVED

9 Consultancies

(1) Noting that Dr S. H. Mugngho had accepted an offer of a consultancy in soils (p. 4, Regional Coordinator's Report) the COMMITTEE asked Allen to contact Dr Msuku to determine the progress made

(11) With regard to independent consultants, Dr Wanchinga confirmed that SACCAR was working on guidelines for their appointment. The Regional Coordinator added that the revised budget of the RP would consider the merit of including a line item for consultancy fees

10 Training and Workshops

(1) New applications for short-term training at CIAT

General discussion led to the conclusion that both structured (courses) and unstructured (personal, discipline-specific) training was required. Kirkby outlined recent proposals for changes in training at CIAT Headquarters, including the conduct of an English language multidisciplinary course in alternate years.

Five nominations were made, as follows
Adolberto Sereno (AN), Soil Fertility (J Lynch)
Dr Alex Mkandawire (MW), Drought (J White)
Kennedy Kanenga (ZA), Agronomy / OFR
Dr A Tesha (TZ), Drought (J White)
Patrick Ndakidemi (TZ), Agronomy

Conclusions drawn by the COMMITTEE were that Sereno was APPROVED, for a 3 month period (March–June, 89), followed by two seasons collaborative research with Dr J Lynch, PROVIDED THAT Sereno drafts a proposal for an appropriate sub-project and that he participates in a soil fertility working group on his return. Mkandawire’s training was also APPROVED by the COMMITTEE who NOTED that the intended period at CIAT followed-up usefully from the Drought Working Group and sub-project.

Conversely, Tesha’s proposed visit to CIAT on the same subject, drought, was NOT ACCEPTED. Instead, it was URGED that Dr Tesha become involved in the Drought sub-project, which had developed from the Working Group meeting (which he had been unable to attend). Noting that there was now no suitable scientist in the Bean Program at CIAT headquarters to give training in agronomy/on-farm research, the COMMITTEE CONCLUDED that in the cases of both Kanenga and Ndakidemi, some kind of training within the region was more appropriate (see below).

Massey proposed that future short-term trainees at CIAT should be required to write reports on their return. This was ACCEPTED.

(iii) Status of short-term training in region

The regional Coordinator reported that plans for the SADCC/GLIP technical training course to be held in Maputo in March for the lusophone countries were progressing satisfactorily. Camarada confirmed that he expected 10 (not 5–7, as previously reported) Angolan nominations to be made. Details were asked to be given to Allen as soon as possible.

It was NOTED that the weed management course to be held in Limpopo had been postponed, to 17-28 April, 1989. Kirkby confirmed 3-4 graduate participants could be accommodated. Nominations direct to Allen (by end Jan 89).

There was a need to design individual training in on-farm research within the region (for Kanenga and Ndakidemi, as above). Possibilities were considered to be as follows, Allen to follow-up a total 2-3 months programme perhaps involving visits to areas where active OFR is in progress, including Rwanda, Ethiopia and the Lushoto District of Tanzania.

(iii) Workshops

The Regional Coordinator drew attention to an Intercropping Workshop (Appendix 6) proposed by CIMMYT who had invited CIAT to
take part in its support and planning, it would be held in Lilongwe in late Jan 89. Allen said that this proposal had arisen in Jul., subsequent to the 4th SC, and that it had been made clear to CIMMYT that firm commitment by CIAT's regional programmes was subject to Steering Committee discretion. Substantial discussion led to the COMMITTEE'S ACCEPTANCE that the RP provides support of the CIMMYT/CIAT Workshop, NOTING that the 40-60% share of the costs will be in turn shared between CIAT's three RP's. The COMMITTEE PLACES ON RECORD its regret of non-consultation, implicit in such a short lead-time. The technical importance of the topic was recognized.  

It was NOTED that plans for the Breeders' Workshop were proceeding well. It was further NOTED that Mr Lepheana (in addition to Mrs) should be invited.  

During discussion of the First SADCC Regional Bean Workshop, to which commitment in principle had already been made, it was AGREED that it would be desirable to append the CRSP/Malawi Genetic Resources Workshop, if possible (In the absence of Dr Msuru, it was not possible to pursue this). Dates (sometime in late Sept/Oct) should be fixed with this in mind. An appropriate venue might be Mbabane, in the absence of a representative from Swaziland, this would require clearance.  

The need for further discipline-specific Working Group meetings was discussed. It was CONCLUDED that an Entomology Working Group should be held, preferably in the period 7-8th August 1989 in Nairobi, so that it would be a satellite to an international entomology conference to which presumably some relevant participants are going. From a total of 12-15 scientists, the following entomologists from SADCC should be invited: Dr Giga (ZW), Mrs Pomela (LO), either Dr Sithanantham or Mr Sohati (ZA), Mr Kantiki (MW), Mr Kabungu (TZ/UAC) and Mr Simpa (TZ/TARO). The regional Entomologist should draft a specific programme for presentation at the 6th SC.  

Allen suggested the possibility of a virus working group and it was AGREED that he should draft a first proposal (and contact IITA, with the possibility of a joint coverage of potyvirus diseases of beans and cowpeas in Africa), also for submission at 6th SC.  

(iv) Academic Scholarships  

The COMMITTEE NOTED with satisfaction the progress made toward the recent securing of PhD places for Venge at Cambridge, Maphanyane at Cornell, and Koinange at Univ of California, Davis for where he had already left.  

The Regional Coordinator expressed some concern over the apparent insecurity of PhD places for Mloza-Banda (at Iowa) and Mrs Pomela (at Utah State). After discussion, it was AGREED that Allen should telephone directly to these two universities if he was satisfied that reasonably firm PhD places had been
offered, then the RP should proceed in committing the scholarships.

Wachinga had pointed out that there was always some element of risk that all scholars are subject to obtaining satisfactory grades, so that Allen should not be alarmed unnecessarily.

Noting that the RP had funds until 31 March 92, Chris George was asked about the implications inherent in committing funds for academic scholarships which extended beyond that date. George agreed to confer on this point and to draw up guidelines.

It was AGREED that remaining funds should be devoted to scholarships at the Masters level. Allen raised the suggestion that a revised budget might consider establishing closed scholarships, tied to particular universities, for instance to those in the SADC region, or perhaps to Brazil for the Lusophone countries. Wachinga supported this idea, saying it would be very attractive to SACCAR. George said that he believed this thinking would also appeal to CIDA, so supporting the idea of developing regional centres of excellence.

The COMMITTEE AGREED that since the need for an MSc place for Angola had been noted previously (4th SC), Mr Camarada should proceed with his search for a suitable place. It was further noted that he had applied to Reading for a one year course. Since there would be some saving on the brevity of the course, the SC ACCEPTED that Camarada be permitted to take a 3 month English language course beforehand (approx June 89). Both new and previously received applications for further academic scholarships at the MSc level should be appraised at the 6th SC. Seeking nominations would be the responsibility of National Coordinators.

11 Election of Chairman, venue and time of 6th SC

Miss Mmasera Manthe was unanimously elected the next Lady Chairman. It was agreed to hold the next (6th) SC meeting in Maputo (subject to confirmation from Mozambique), preferably in early April 1989, when it might be run as a satellite to the proposed monitoring tour.

12 Any other Business

(1) Kanenga asked about logistics of seed movements for the drought sub-project. It was agreed that information/requirements should be directed to Kirkby, who was multiplying/distributing seed from Ethiopia.

(11) Kirkby mentioned that there was to be a Directors of Research meeting in Nairobi later in November, to provide guidance for a 10-year planning exercise. He asked that National Coordinators pass their thoughts urgently to their respective Directors.
There being no further business, the Lady Chairman closed the meeting at 12:00 noon on 4th November, 1988

M Manthe
Lady Chairman, SADCC/CIAT Steering Committee

D J Allen
Regional Coordinator
SADCC/CIAT
Arusha
22 November, 1988
APPENDIX 1

APPENDIX 1

TENTATIVE AGENDA AS FOLLOWS (WITH OLIVIA IN CHAIR)

1) INTROD (MS MANTHE)
2) AGENDA
3) MINUTES 4TH SC
4) MATTERS ARISING
5) REG COORD'S REPORT / WORKPLAN
6) NAT COORD'S REPS ON RESEARCH PROGRESS, 1987-83
7) REGIONAL COLLAB RES SUB PROJECTS
   A) REVISED PROPOSALS
   B) NEW PROPOSALS
   C) SUB-PROJECT AGREEMENTS
8) TRAINING
   A) SHORT-TERM AT CIAT NEW APPLICATIONS
   B) SHORT-TERM COURSES IN REGION NEW PROPOSALS
   C) ACADEMIC SCHOOLS STATUS / NEW APPLICANTS
   D) REGIONAL WORKSHOPS PLANS / PROPOSALS
9) CONSULTANCIES
10) EQUIPMENT NEEDS
11) VENUE / ELECTION CHAIRMAN 6TH SC
12) AOB
APPENDIX 2 CIAT WORKSHOP ON SOIL FERTILITY RESEARCH FOR BEAN CROPPING SYSTEMS IN AFRICA
Addis Ababa, 5-9 September 1988

Summary Report

Objectives To bring together a group of agronomists and soil scientists having relevant experience of soil-related constraints to productivity of beans in the cropping systems of Central, Eastern and Southern Africa, for the following purposes

a) To document and assess past research in this area
b) To identify the needs and priorities for future research
c) To review research methods with a view to standardizing the approaches used within the region
d) To devise strategies for regional collaboration in this field

Participants 21 scientists from Ethiopia, Kenya, Uganda (Eastern Africa), Angola, Malawi, Tanzania, Zimbabwe, Zambia (SADCC Region), Burundi, Rwanda, Zaire (Great Lakes Region)

5 CIAT bean agronomists based in Africa and Colombia

1 representative from ICRAF

Programme

Workshop Part A Six formal sessions on Days 1 and 2
Each session was introduced by one or two invited presentations, followed by comments from an invited discussant and then general discussion

1 Traditional systems of soil fertility management
   - description and assessment
2 Diagnosis of soil fertility problems
   - review of past and current research
   - review of research methods
3 Plant nutritional requirements
4 Use of inorganic fertilizers and farmyard manure
   - review of past and current research
   - review of research methods
5 Green manuring and agroforestry in relation to soil fertility
   - review of current and past research
   - review of research methods
6 Management of organic manures, composting, residues and mulch
   - review of past and current research
   - review of research methods

Field trip to IAR Melkassa Research Station and farms in the Rift Valley, on Day 3

Workshop Part B Three working groups discussed the following themes on Days 4 and 5

Group 1 Diagnosis of soil fertility constraints
Findings and Recommendations of Working Groups

Group 1  Diagnosis of soil fertility constraints

Five problems were identified

1. The bean growing areas of Africa are not well defined
2. Edaphic Zones in the bean growing areas need to be defined to facilitate collaboration between research organisations and to allow for extrapolation of research results from one area to other areas
3. Adequate information on the principal soils in bean growing areas is not available
4. Resources available for the diagnosis of soil fertility constraints are often inadequate
5. Regional coordination of soil fertility research on beans is lacking

Recommendation I  A bean map for Africa should be developed immediately which delineates bean growing areas for the purpose of evaluating edaphic and climatic constraints to production

Activities

a) CIAT should provide national programmes with guidelines to assist them in supplying the necessary information to the CIAT Agroecological Unit

b) The CIAT Agroecological Unit should evaluate and compile this information, and determine any additional information needs

c) CIAT should take the necessary steps, in collaboration with national programmes, to collect further information needed for the development of the bean map

Recommendation II  Edaphic Zones in the bean growing areas of Africa should be defined

Activities

a) The CIAT Agroecological Unit should define edaphic zones using information obtained pursuant to Recommendation I

Recommendation III  The principal soils in the bean growing areas of Africa should be identified and characterised

Activities

a) The CIAT Agroecological Unit should collate exiting information on the principal soils

b) Benchmark sites should be identified by a soil fertility working group together with the respective national programmes and these should be characterised in collaboration with
c) Regional programmes should encourage one or more students to conduct MSc thesis research on the Fertility Capability Classification System, to determine its utility for African soils and to classify major soils.

**Recommendation IV**
The capacity of national agricultural research organisations to diagnose soil fertility constraints of beans should be improved.

**Activities**

a) Short course training in diagnostic techniques, including the use of soil and plant tissue analysis, nutritional screening trials and use of visual symptoms, should be provided.

b) Soil and plant tissue analytical procedures should be standardised.

c) MSc training should be provided in soil fertility and plant nutrition.

d) The Diagnosis and Recommendation Integrated System (DRIS) for the interpretation of bean plant tissue analysis results should be developed for African soils. This should be the subject of one or more MSc research projects.

e) CIAT should prepare audio-tutorial units, in French and English, on nutritional disorders of beans.

**Recommendation V**
Coordination of soil fertility research on beans should be improved.

**Activities**

a) A soil fertility working group for beans in Africa should be formed. This group would be responsible for coordinating soil fertility research activities, identifying benchmark sites, etc.

**Recommendation VI**
A standard set of genotypes should be assembled and used in soil fertility research.

**Activities**

a) National and regional bean breeders should identify 25 broadly adapted varieties with variable tolerance to soil fertility stress. This might best be done at the CIAT workshop on bean improvement in Africa, to be held in Maseru in January.

b) These varieties should be evaluated and characterised under soil fertility stress conditions.

c) These varieties should be used in future soil fertility and plant nutrition research.
Group 2. Soil fertility improvement

Recommendations for NARS

1. More attention should be given, in planning soil fertility research, to the likelihood of adoption of results by small farmers.

2. Increased efforts are required, by both research and extension agencies, to increase productivity through improvements to the supply, conservation and utilisation of organic materials.

3. Research is needed on the judicious use of inorganic fertilizers to supplement efficiently used organic materials.

4. Long term research on soil fertility is needed to assess a treatment's residual effects, which may be at least as important for sustainability as its immediate effects. This will include assessments of soil physical characteristics and microbiological processes.

5. Teamwork involving soil scientists, microbiologists and agronomists is indispensable in implementing the above strategies.

Recommendations for CIAT

1. For the many situations in Africa where resource-limited small bean producers are not expected to have access to adequate soil amendments, the genetic approach of breeding for tolerance to specific soil constraints is an appropriate new strategy. Initially, CIAT should concentrate upon screening bean germplasm for tolerance to the Al/Mn toxicity problem of acid soils, and make results available in appropriate forms for use by NARS.

Group 3. Methods for improving traditional bean cropping systems

Recommendations

1. An appropriate research approach should include the following components:
   - farmer-based identification of problems
   - long-term experiments to evaluate system sustainability
   - exploit possibilities for systems transfer, in order to benefit farmers sooner
   - develop various options rather than single solutions
   - involve farmers in all research steps
   - evaluate systems by multiple criteria, including agronomic, economic and social parameters.

2. Consideration should be given by national programmes and steering committees to the initiation of collaborative research projects to improve the following three cropping systems found in all three regions comprising CIAT's African bean network:
   - banana/bean/coffee system
   - bean/maize or bean/sorghum system
   - systems that include in-situ composting

3. Close collaboration should be sought and maintained with ICRAF for the development of agroforestry systems with a bean component.
In response to the working group recommendations for greater integration and coordination of soil fertility research, the plenary session decided to form two working groups that would act as organising entities for future soil fertility research efforts on beans in Africa. One working group will deal mainly with soil fertility and soil/plant interactions, whereas the other will be more concerned with cropping systems as they pertain to soil fertility. Each working group is composed of 2 or 3 representatives from each of the existing CIAT regions.

The following participants were elected to the two working groups:

**Soil Fertility Working Group**

- Johnson Semoka (Chairman) - Tanzania
- Peter Kamoni - Kenya
- Lunze Lubanga - Zaire
- Jonathan Lynch - CIAT Colombia
- Spider Hughgho - Malawi
- Albert Sereno - Angola
- Andre Sebahutu - Rwanda
- J Y R Zake (in absentia) - Uganda

**Cropping Systems Working Group**

- John Kavuma (Chairman) - Uganda
- Willi Graf - CIAT Great Lakes
- Todo Edje - SADCC/CIAT
- Wakama Mathias - Burundi
- Enos Shumba - Zimbabw
- Teshome Regassa - Ethiopia
- Vahiye - Tanzania
APPENDIX 3

SADCC/CIAI REGIONAL PROGRAMME ON BEANS IN SOUTHERN AFRICA

REGIONAL COORDINATOR'S REPORT TO THE 5TH STEERING COMMITTEE MEETING, GABORONE, 3-4 NOVEMBER, 1988

INTRODUCTION

The 1 months since the last report to the Steering Committee, at its 3rd Meeting held in Lusaka, has been a period of establishment for the bean component of the SADCC/Grain Legume Improvement Programme. The headquarters in Arusha now enjoys its full complement of senior staff and only the Malawi position remains vacant. Considerable progress has also been made in filling other regional staff positions both in Arusha and elsewhere.

One further Steering Committee Meeting was held, attended by 7 of the 9 National Coordinators and representatives of SADCC, the donors (ILUA) and the regional Programme. Equipment needs are being met, overseas training is in progress, funds have been allotted for research, and training courses, monitoring tours and workshops have been organized. SADCC participants have also attended training courses and workshops organized by CIAT HQ and the Eastern African and Great Lakes regional programmes.

FUNDING AND AGREEMENTS

The first full financial year was completed on 31st March 1988. Only S5% of the funds allotted for the period were expended, but this was due principally to delays in filling staff positions, initiating overseas training and the shipment of materials for the project. Building expenditure in the second financial year (from 1 April, 1988) is proceeding according to budget.

RECRUITMENT

All senior staff positions in Arusha are now occupied. The Regional Coordinator/Pathologist (Dr. David Allen), Breeder (Dr. Barry Smithson) and Crop Protection Systems Agronomist (Dr. O. Todo Edje) were already in position at the time of the last report. The Entomologist (Dr. J. Iwasi Amapotho) assumed his duties on 22 August 1988.

A candidate for the breeder position in Malawi was not approved and the position has once again been advertised, both within the SADCC region and outside.

Dr. Julia Lornegay, the Postdoctoral Fellow (FDF) at CIAT HQ, funded 1/7 by the regional programme, was succeeded by Dr. Joe Lohme in March 1988. CIAT has recently proposed a second FDF position at HU out of contingency funds, open to national scientists of SADCC to provide an opportunity for research experience in an international environment. This is still under
discussion with CIDA but one option is for one, year terms for candidates approved by SAGAN and CIDA conducting research in agreed disciplines.

Progress has also been made with other regional staff position. An administrative and finance assistant was appointed on November 1987 but remained on only before completing his probation and Mr. B. Travis succeeded him on 1 June 1988. The Secretary and Driver positions are now filled.

Applicants for training Officer were interviewed but a suitable candidate was not identified and the post has been upgraded to a senior research fellowship (2 yrs) position to be held in Ethiopia from where the above regional program can be implemented by CIDA in Africa will be served. Being advertised.

Field technicians have been recruited mainly in Malawi to assist national programs to conduct regional. oriented research in famine-trial Technicals were recruited for Lageni, Lushoto and Arusha.

Outside the area Technicals were recruited in response to specific requests from National Programmes for the period up until on 17 March 1988, in the Agrometeorology Section at Maseno Research Station in Kenya where he is supported by the U.S. F.I.P. Project. A second has been recruited for on-farm and on-station operations in Malawi in northern Zambia a key breeding site for the region. Staffing details are summarized in Table 1

BUILDINGS AT TARIO-SELIAN

Materials for the building to house the Tanzanian national and regional staff have only recently arrived in Arusha. Travaux has now commenced with the aim of completing the building before the end of 1989.

STEERING COMMITTEE

National Coordinators have now been appointed by all member countries and the Steering Committee has already exercised its full responsibilities in directing the expenditure and activities of the regional programme.

Representation at the meeting is shown in Table 2, which also illustrates the manner in which venue, chairmanship is rotated. Three of the full meeting have been run as satellites to another meeting so as to increase efficiency.

TRAINING

a) Academic Scholarship

Mr. D.S. Mbaya (Tanzanian) left on 31 December 1987 for the University of Florida and has successfully completed his MS in Agronomy.
The Steering Committee approved funding for Ms Ollia Venge (Zimbabwe), Mr E M Itoinange (Tanzania), Mr Henry Mloza-Banda (Malawi), Ms C Naphenyane (Lesotho) and Ms I L Pomela (Lesotho). Table 1 summarizes the status of awarding academic scholarships. Mr Itoinange left on 18 September for the University of California at Davis, and Ms Venge will be registered at the University of Cambridge, with effect from the Lent term 1989, conducting her field work in Zimbabwe. Ms Naphenyane has received a firm offer of a place for a PhD at Cornell University. Mr Mloza-Banda and Mrs Pomela have each secured places for postgraduate work at US universities but neither yet has (to the FF's knowledge) a firm offer to a PhD programme.

b) Short-term training at CIAT headquarters

Messes Lamarada (Angola) and Massamba (Mozambique) spent four months at CIAT HQ from February to May this year for multidisciplinary and on-farm research training.

Dr Joyce Mulula-Mili (Zambia) visited CIAT to become acquainted with its bean breeding programmes, for two weeks during September, and Mr Dimoso and Ms Marenga (Tanzania) are currently undergoing 2 months training in breeding. Visits to CIAT by two scientists from Angola were approved at 4th SC. These and other possible candidates are presented in Table 4.

c) Technical training within region

A field technicians course in Arusha for 6 weeks from 27 May to 1 July had nine participants from Ethiopia, Lesotho, Malawi, Zambia and Tanzania. A similar course is planned for Maputo for the Lusophone countries, Angola and Mozambique, next March. The status of this cadre of training is shown in Table 5, which also shows that two of the three courses span the grain legume crops in general being jointly supported by the CIAT and other international centres in oil ed in SADC/QLIF.

TRAVEL

Regional scientists travelled in all SADC countries with the exception of Angola (which Dr. Allen plans to visit in November 1989). Much of this travel, totalling some 2,000 days, was with national scientists, discussing and monitoring research activities. Further 2 weeks were devoted to similar travel in CIAT's other regional projects.

MEETINGS, WORKSHOPS AND MONITORING TOURS

Altogether, some 120 days were spent by FF staff in attending meetings and workshops. Those within the region included the SADC Workshop on Integration of Research, Training and Extension in Arusha, SFAAR Workshop on developing a Tanzania Agr Cultural Research Masterplan, in Arusha, national planning meetings in Tanzania and Zambia, the latter including attendance...
or the groundnut/grain legume seminar, the 7th bean research workshop in Morogoro, and the CIMMYT/TAU intercropping workshop in Arusha, Tanzania. CIAT-organized meetings included a breeders workshop in Colombia, a pathology workshop and regional seminar in Rwanda, a drought working group in Harare, an agronomy/soil fertility workshop in Ethiopia, and a biological nitrogen fixation workshop in Ethiopia.

Workshops being organized are breeders workshops in Colombia in November and in Lesotho in February, 1989 with 2 and 9 SADCC participants respectively. A CIMMYT/CIAT cereal/legume workshop is also planned for January, 1989. The steering committee has also approved a SADCC regional bean research workshop in alternate years outside of Tanzania, with continued support for the Morogoro workshop. The status of, and participation in, regional workshops is summarized in Table 6.

Two group tours were conducted to monitor and discuss research activities in the field. In March, regional and national scientists from Malawi, Tanzania and Zambia travelled together in those three countries. In May, scientists from three Tanzanian institutions concerned with bean research toured Tanzania to monitor and discuss their research programmes in company with regional staff. Four scientists from Malawi, Tanzania, and Zambia participated in a tour in Ethiopia in September. Details are given in Table 7.

The SC allocates RF funding for the participation of SADCC national scientists in most of these activities, which form a vital means of strengthening and integrating intra- and inter-regional bean research.

EQUIPMENT

The SC has already approved the purchase of various equipment for national programmes, such as motorcycles, balances, threshers, projectors and other items. Items to the value of about USD $70,000 have already been received and a further USD $70,000 worth is in process. Additional requests are to be considered. The status of equipment purchases is shown in Table 8.

CONSULTANCIES

Consultancies funded by the RF include Dr. Whitemore to the Urought working group, Dr. Houghgo to the agronomy/soil fertility workshop, and Dr. Lippe-Nolt to the one on biological nitrogen fixation. These visits were funded jointly by the three regional projects. Dr. Tohme accompanied the monitoring tour of Malawi and Zambia and assisted with the evaluation of breeding and other materials at Mtala.

Collaborative projects benefiting the RF but funded from elsewhere include virus survey at Braunschweig in West Germany, halo blight resistance at the National Vegetable Research Station and EF at the College, in the UK.
MATERIALS DISTRIBUTED FROM LIAT

A wide range of materials, comprising some 3000 samples, was sent to Tanzania but only 2 were released due to delays in plant quarantine checks. As a result of improved procedures, the prospects of renewed introduction seem promising. Materials distributed to other national programmes were as follows:

Lesotho

- Large white seeded lines
- International Sugar Bean Nursery
- International Large Kidney Nursery
- Bean Team Nursery (VCF)
- International BCMV Nursery

Malawi

- International Snap Bean Nursery
- International Drought Resistance Nursery

Swaziland

- International Sugar Bean Nursery
- International BCMV Nursery
- Black root resistant materials
- International Halo Blight Nursery

Zambia

- International Large Kidney Nursery
- International Sugar Bean Nursery
- International Snap Bean Nursery
- Bean Team Nursery (VCF)
- Germplasm materials
- International Ascochyla Blight Nursery
- International Bean Anthracnose Nursery
- International Angular Leaf Spot Nursery
- International BCMV Nursery
- Anthracnose differentials
- Rust differentials

REGIONAL AND NATIONAL RESEARCH

Significant progress is occurring in most national programmes in the region. Notable are the large yield improvements being demonstrated by introduced over local materials in Lesotho, Swaziland, Zambia and Zimbabwe. Some of these have already given rise to improved cultivars, like Lyanungu 85 and Uyole 84 in Tanzania and Lariuta and 71V 24 in Zambia and many others are in the pipeline.

To further strengthen research, the SC have allotted funds for three regional collaborative research sub-projects, on angular
leaf spot and biological nitrogen fixation (both Malawi) and
drought (Malawi, Tanzania and Zambia). A fourth project, on rust
(Tanzania) is under review and two others, on threshing and seed
storage (Tanzania) were rejected by the SC as inappropriate.
Further proposals are anticipated (Table 9).

The joint project on drought was developed at the recent drought
working group in Harare. Care is also taken to maintain links
with research sub-projects being conducted in other regions to
complement rather than duplicate research effort.

Inter-regional cooperation is especially important in the
establishment of Africa-wide nurseries. An African Bean Yield
Adaptation Nursery (AFFYN) and the African Bean Resistant
Nursery, AffNN, both composed of cultivars contributed by
national programmes from all three regional projects are already
in progress and a Drought Resistance Nursery and disease
resistance nurseries are being assembled.

Some 11 nurseries comprising over 10000 samples were requested
from CIAI by Lesotho, Malawi, Swaziland and Zambia. After delays
due to quarantine in Tanzania about 10000 samples have been
cleared for growing in isolation out of season. (Note: CIAI takes
stringent measures to ensure clean seed is distributed, but to
enable rapid dissemination of seeds and reduce the risk of
spreading infection, close collaboration with national plant
quarantine authorities is essential). However, considerable
variability, already exists in the region among local and
previously introduced materials and still remains to be
cultivated, notably in Malawi.

In addition to plant improvement, attention is also being given
to other improved technology, emphasising reduced dependence on
inorganic chemicals and sustainability, for example by the use of
leguminous tree species to maintain soil fertility, reduce
erosion and provide support for climbing beans.

Regional and national staff are placing much greater emphasis on
on-farm testing and extension. The field staff we are employing
at the moment will be engaged principally in on-farm research
and work has already been expanded in Tanzania - in Arusha, the
Usambara Mountains of Lushoto, and in Tabora, and will be
expanded in northern Zambia next season, all in collaboration
with national organizations. These activities are obviously 'little
new technologies are to have impact on our main target, the
crop production.
FUBLICATIONS

Allen, D J (1985) *Beans Production Systems in Africa* (44EB-1) Haedtutorial Unit, CIAT

Allen, D J (1987) *Principal diseases of beans in Africa* (44EB-1) Haedtutorial Unit, CIAT

Allen, D J, Dessert, M, Trutmann, F and Voss, J (in press) Common beans in Africa and their constraints, in *Bean Production Problems* (eds Schwartz, H F and Pastor-Corralas, M A) 2nd Ed CIAT


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<td>D J Allen</td>
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<tr>
<td>J L Ampofo</td>
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<td>Ghana</td>
<td>22 88</td>
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<td>D T Edge</td>
<td>Cropping System Agronomist</td>
<td>Michigan, Iowa</td>
<td>5 9 87</td>
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<td>J B Smithson</td>
<td>Breeder</td>
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<td>11 2 87</td>
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<td>J A Maimu</td>
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Circles represent Chairmanship
* Satellite to 5th Bean Research Workshop
** Satellite to SALLAR/GLIP technicians training course
*** Satellite to Drought Working Group
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* Firm PhD place not yet secured
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<td>Physiol</td>
<td>July-Aug 89</td>
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Table 4: Status of short-term training of professionals at ICAI headquarters 1988-89
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<td>9-11 March 88</td>
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<td>Legume Seminar</td>
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<td>Drought Working Group</td>
<td>Harare, May 88</td>
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<td>Dr J Mulline</td>
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<td>Dr. A. B. C.</td>
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<td>Ms. Mafola</td>
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<td>Agronomy and Soil Fertility Workshop</td>
<td>Addis Ababa, 5-9 Sep, 88</td>
<td></td>
<td>T. L. Haule</td>
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<td>G. Muttia</td>
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<td>7th Bean Feasibility Workshop in Tanzania</td>
<td>Morogoro, Tanzania, 28-30 Sept 88</td>
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<td>Dr. M. Mmbaga</td>
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<td>Nitrogen Fixation</td>
<td>Tigali, 27-29 Oct, 88</td>
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<td>Dr. S. Muhongo</td>
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<td>Dr. M. P. Salema</td>
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<td>Workshop on Research Methods for Cereal/Legume Intercropping</td>
<td>Lilongwe, MW</td>
<td>23-27 Jan, 89</td>
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<td>Breeders Workshop</td>
<td>Maseru, LD</td>
<td>30 Jan-2 Feb, 89</td>
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<td>First SADCC regional bean research workshop</td>
<td>Lusaka, ZA</td>
<td>Sept-Oct, 89</td>
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<td>Remarks</td>
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<tr>
<td>B Mugogho (MW)</td>
<td>Malawi</td>
<td>Mar 88</td>
<td>To visit the main research sites in this small, diverse and important area of bean production spanning three countries at peak season</td>
<td>Accompanied by D J Allen, J B Smithson (CIAT-Arusha) and J Iohme (CIAT-Palmira)</td>
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<tr>
<td>A B L Mkandawire (MW)</td>
<td>Tanzania</td>
<td>Mayona (LA)</td>
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<td>L Kantili (MW)</td>
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<td>L Mayona (LA)</td>
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<td>L Mitti (LA)</td>
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<tr>
<td>J Muilla -Mitti (LA)</td>
<td>Ethiopia</td>
<td>Sep 88</td>
<td>To give opportunity for breeders to visit key sites where local and introduced germplasm being evaluated in a well-structured programme</td>
<td>Accompanied by J B Smithson (CIAT-Arusha) and R Acosta (CIAT-Kampala)</td>
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<tr>
<td>K Kamala (LA)</td>
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<tr>
<td></td>
<td>Mozambique</td>
<td>April 89</td>
<td>To cover the main research sites used for grain legumes nationally, with emphasis on bean cultivar development</td>
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<td>Item Description</td>
<td>Date Ordered</td>
<td>Cost USD</td>
<td>Suppliers/Agents</td>
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<td>29/6/88</td>
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<td>ICC</td>
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<td>Projector (1)</td>
<td>18/6/88</td>
<td>$1190</td>
<td>Dev Corp/ICC</td>
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<td>Small Bundle thresher (1)</td>
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<td>Planter (2)</td>
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<td>18/6/88</td>
<td>$1190</td>
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<tr>
<td>MALAWI</td>
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<td>20/10/87</td>
<td>$6150</td>
<td>Jackys Dubai</td>
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<td>Soil Steril</td>
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<td>17/8/88</td>
<td>$1440</td>
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<td>Tires (4)</td>
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<td>$815</td>
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<td>Country</td>
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<td>I</td>
<td>Msuluma &amp; Polosi</td>
<td>MW</td>
<td>Mulunau, Zaire (Fyndji)</td>
<td>Approved by 3rd SC &amp; funded (CDN $11,000 paid)</td>
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<td>Bloza-Banda, Mwango &amp; Kigoma</td>
<td>MW</td>
<td>Rwanda (Athanase)</td>
<td>Approved by 7th SC &amp; funded (CDN $2,600 paid)</td>
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<td>Miandawire &amp; Muhohe</td>
<td>MW</td>
<td>Members of Drought World Group, and Nazret, Ethiopia (Aidane)</td>
<td>Approved by 4th SC &amp; funded (US $10,000 paid)</td>
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<td>Race</td>
<td>Mbabu</td>
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<td>Nazret, Ethiopia (Aidane)</td>
<td>Subject to revision before 5th SC</td>
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<td>Deemed inappropriate by SC and rejected</td>
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<td>Sheeza</td>
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<td>Deemed inappropriate by SC and rejected</td>
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<td>viral disease</td>
<td>Lana Juma &amp; Jenge</td>
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<td>Makerere Uganda (Owera)</td>
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<td>Resistance</td>
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Regional Programme Work Plan for the period 1.11.88 - 31 10 89

November 1988

- Plan and attend 5th SC meeting, Gaborone (RL)
- Assist in data analysis and report compilation (EL)
- Attend Tanzania Commodity Crop Coordination Meeting Arusha (RC/RL/LSA/ENT)
- Attend Regional Seminar in Bean Research in Great Lakes Bulava (EN1)
- Tour Rwanda and Burundi to establish contact with national entomologists (EN1)
- Assist in selection of sites for on-farm trials in Arusha Kilimanjaro and Lushoto (LSA)
- Travel to Angola to guide national programme planning (RL)
- Advertise Malawi Breeder position in SADC region (RL)

December 1988

- Finalize Annual report and revise Work Plan according to SC recommendations (RL)
- Attend and contribute to CIN11 Internal Review (RL/RL/LSA/EN1)
- Finalize editing and plan publication of Drought Workshop proceedings (LSA)

January 1989

- Support staff evaluations (RL)
- Assist in recruitment of NL Breeder for Malawi and establish operational base at Bunda (RL)
- Finalize plans for CIMMYT/CIN11 Intercrop W/shop in Lilongwe (LSA)
- Finalize planning of Breeders W/shop in Maseru (RH)
- Attend Management Training Course, Nairobi (RL)
- Attend and contribute to CIMMYT/CIN11 Intercrop W/shop, Lilongwe (LSA/RL)
- Attend and contribute to Breeders W/shop Maseru, and visit field trials (RH/RL)

February 1989

- Travel to Malawi, Zimbabwe and Zambia to assist in evaluation of breeding trials/subprojects (RH/RL)
- Travel to Malawi, Zimbabwe and Zambia (with Headquarters Entomologist) to set priorities for cooperative research on insect pests (EN1)
- Travel to Mozambique to finalize plans for training course (FL)
- Finalize plans for on-station agronomy and on-farm trials in Tanzania (LSA)
March 1989

- Assist in evaluation of breeding materials at
  Arusha, Korogoro
- Conduct SAGRC training course for Maize research technicians 
  at Maputo
- Finalize field plans for trials in northern Tanzania

April 1989

- Plan and take part in monitoring tour of grain
  legume research sites in the amburrue
- Attend 6th SI Meeting in the amburrue (sub-project reports)
- Assist in running field trials in northern Tanzania
- Finalize compilation and plan production of
  bean pathogen checklist
- Attend SAGRC regional bean research workshop
- Travel to Zambia to evaluate on station and
  on-farm trials

May 1989

- Travel to help evaluate on-station trial in
  northern highlands of Tanzania and on farm
  trials near Ilala Zambia
- Participate in data collection in field trials
  in northern Tanzania

June 1989

- Assist with harvest of trials in northern
  Tanzania
- Complete material for an audiotutorial on field
  pests of beans in Africa
- Draft an outline for an audiotutorial on disease
  evaluation

July 1989

- Continue with harvesting and data compilation
- Start preparation of field manual on pests and
  diseases of beans in Africa
- Plan for trials for Iringa and Lushoto in
  short rains
- Compile material for preparation of an audiotutorial
  on design layout and analysis of field trials
- Visit entomology working group

20
August 1989

- Attend SACCA/ Board Meeting
- Prepare for mid-term review
- Finalize plans and contribute to Entomology Working Group, Nairobi
- Assist in sowing of field trials in Lushoto
- Plan off-season multiplications

September 1989

- Assist in sowing off-season multiplications, Miwalemi
- Finalize plans for 1st SADCC Regional Dean Research W/shop
- Continue preparations for mid-term evaluation
- Assist in data compilation and analysis

October 1989

- Attend and contribute to 1st SADCC Regional Dean research W/shop, Swalland
- 1st SC meeting attendance (as satellite to SADCC Regional Workshop)
- Prepare to move RH and NH to Koan building at Sellan
Pathogenic variation within the rust fungus (Uromyces appendiculatus (Pers ) Ung ) on beans in eastern and southern Africa and its applications for resistance breeding

INTRODUCTION

Beans (Phaseolus vulgaris L ) are an important source of protein in most African countries. They are grown in highly diverse ecological and climatic conditions ranging from humid highlands to the moderately moist lowland areas. The bulk of bean production is from small scale farms and only a small proportion of beans is grown in large-scale farms. Despite the importance of beans in Africa, yields are very low due to many factors such as poor varieties, soil infertility, disease and pest problems. Yields as low as 200-670 kg per hectare are common in Tanzania compared to the potential of 1 500 kg per hectare (Karel et al ., 1981). This has resulted in inadequate supply compared to demand and escalated prices of this important food item. Diseases such as anthracnose (Colletotrichum lindemani anum) rust (Uromyces appendiculatus), angular leaflet (Phaseolus vulgaris griseola) and bean common mosaic virus are particularly destructive. To date, these diseases have not been adequately controlled and severe losses in yield occur.

Even though pesticides are credited for giving immediate benefit to farmers (Gunn and Stevens 1978), their availability and cost-benefit margins in developing countries show clearly that they should only be used to supplement other methods and should not be the major method for controlling plant diseases. All pesticides have to be imported using limited foreign exchange, consequently priority is given to the protection of export crops.

* Senior Lecturer Department of Forestry Universiti, of Dar es Salaam
P O Box 35060 Dar es Salaam
at the expense of food crops. In addition, problems resulting from misuse of certain chemical products, damage to environment and non-target organism, intoxication hazards together with inadequate facilities and limited technical knowledge in pesticides application, often result in extremely high application costs and sometimes in ineffective control of pests and diseases. More appropriate methods for controlling plant diseases are necessary. Disease resistance breeding is perhaps the most important.

2 LITERATURE REVIEW

Disease resistance is not always permanent because pathogens are often variable. The selection pressure imposed on a pathogen by the introduction of a variety possessing a new gene for resistance often results in the emergence of a physiologic race against which the new variety is not resistant. It is important therefore to look for durable resistance, that is not rapidly overcome by pathogens (Johnson 1981).

Where variability of the bean rust pathogen has been studied, tremendous variation has been found. For instance, in the USA alone 57 races have been reported (Stavely 1984), and 150 have been reported from other countries including Australia (Billinton 1978), Mexico (Crilpin and Dongo, 1962), Colombia and other Latin American countries. In East Africa variability of the rust fungus was indicated by Macartney and Howland (1966), Allen (1975), Mwateba and Mmbaga (1985), Mmbaga and Stavely (1986a). Isolates from Mbeya and Morogoro areas in Tanzania alone were found to comprise nine races of Uromyces appendiculatus (Mmbaga and Stavely 1986a).

Evaluations of local and foreign germplasm for resistance to rust have identified some locally adapted cultivars and foreign germplasm which appear to have broad resistance to the pathogen populations in Tanzania (Mmbaga and Stavely 1986a). More extensive study is required to identify and
quantify the variability of the rust pathogen in eastern and southern Africa

EXPECTED IMPACT OF THE RESEARCH

Identification of the rust races in the region would enable their distribution to be mapped. Such information would in turn help to develop effective breeding strategies, including the proper deployment of the available resistance genes, so increasing the durability of rust resistance in new bean cultivars. Thus impact would be long-term, contributing to more efficient breeding programmes.

RESEARCH METHODOLOGY

Field work coupled with glasshouse work will be conducted to cover important bean growing areas in the region. The field study will include rust isolate collection and a bean rust nursery to pick out changes in the pathogen virulence. Glasshouse work will include testing the isolates and determining the races in each collection.

A RUST ISOLATES

These will be collected from all representative bean growing areas in collaboration with national programme pathologists and CIAT's regional scientists relying substantially on receipt of dried material by mail.

These isolates will be inoculated onto a set of 19 rust differential cultivars (Stavely et al. 1983). The races in each isolate will be determined under glasshouse conditions at the University of Dar es Salaam using single pustule isolates and following methods already used by the author. Existing research facilities in the Botany Dept would require some improvement.
B  STORAGE OF ISOLATES

Since bean rust urediniospores lose liability fast, it is proposed to dry urediniospores for a few hours within anhydrous calcium chloride before deep freezing. Thereafter, cultures would require re-inoculation onto a susceptible host at least every two years.

C  BEAN RUST NURSERIES

In order to monitor variability of the rust pathogen over time and location a rust resistance nursery will be developed, including entries from the IBRN, local materials (including TMO 31) which have been selected for being broadly resistant, and other lines identified in the rust research sub-project in Ethiopia, with Ato Habtu Assefa, with whom exchange visits will be made. Periodic collection of isolates will be made to supplement information from the nurseries in identifying any new races.

5  REFERENCES


3. Crispin, M A and Dongo 3 (1962) Plant Dis Repr 46 411-413


8 Ilwetea, R and Mmbaga, M I (1985) Proceedings of the 4th Workshop on bean Research in Tanzania held at Morogoro Sept 1985 129-134

9 Mmbaga, M T and Stavely, J R, 1986 (a) In Bean research Vol 1 66 - 69

10 Mmbaga, M T and Stavely J R 1986(b) In Bean Research Vol 1 56- 65

### PROPOSED BUDGET

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<thead>
<tr>
<th>Items</th>
<th>Prices in US $</th>
</tr>
</thead>
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<tr>
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<td>Air conditioners (two)</td>
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<tr>
<td>Humidifier for construction of incubation moist chamber</td>
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<td>Refrigerator for isolate and inoculum storage</td>
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<td>Fluorescent tube lights</td>
<td>200 00</td>
</tr>
<tr>
<td>Labour</td>
<td>1000 00</td>
</tr>
</tbody>
</table>

| **B** TRAVELS                                                        |          |
|----------------------------------------------------------------------|          |
| Return airfare B'n-ADDLS                                             | 1000 00 | -      | 1000 00 |

*By air to and from Ethiopia plus subsistence Surface travel (nursery management and isolate collection)*

|                                                                  | Year 1 | Year 2 | Year 3 |
|                                                                  | 1500 00 | 1000 00 | 1000 00 |

**TOTAL**

|                                                                  | 10500 00 | 3100 00 | 3600 00 |

*Ethiopia has a sub-project on Rust, exchange visits would be vital at the beginning and end of the project*
APPENDIX 5

CIAT/SIDA Regional Collaborative Research Sub-project

Title of Research Proposal: Regional Nursery for Bean Common Mosaic Virus Disease Resistance

Principal Investigator: Allan Kemi Laha, P.O. Box 1062, Sokoine University of Agriculture, Morogoro, Tanzania

Collaborators: Dr. J. Kannayyan (Chapati, Zambia), Mrs. Olivia Venge (Harrow, Zimbabwe)

Research Objectives:

(a) Evaluate breeding materials and sources of resistance to mosaic and black root strain of BCMV for lowland areas.

(b) Screen promising materials for partial resistance against BCMV and, perhaps, including seed and vector resistance.

(c) Identification of BCMV strains existing in the three participating countries.

(d) Survey for natural alternate hosts of BCMV.

Knowledge and Importance of the Problems:

Bean common mosaic virus disease (BCMVD) is present in bean (Phaseolus vulgaris) from 1 and losses up to 51-80% have been recorded due to the incidence of this disease. Severity of the disease is dependent on host/cultivar susceptibility, vector population, host seedborne infection and strain of BCMV. Several strains of BCMV have also been reported (3, 5, 7, 8, 12). The host-strain combination in certain locations can result in severe host reactions (11, 12) almost to the point of an epidemic (2, 3).

In fact, Silbermangel et al. (11) have indicated that depending on the host-strain combination, losses up to 90% of the potential of seed yield can occur. These strains are grouped into two - the temperature insensitive (TI) strain and the mosaic type, reducing strains (3, 8). On basis of this study, initiated in 1981 in Africa, it was observed that the temperature inducing the highly pathogenic strain prevalent all over Sub-Saharan Africa (11).
Temperature insensitive systemic necrosis caused by strains in groups III, IVa and Vb of BCMV induce blackspot syndrome (1). This is a major problem for breeders in Africa as we are ignorant as to how many of these variants exist (5, 6). For instance, we know that cultivars with dominant alleles II of the necrosis gene are susceptible to the black spot unless, of course, they can be protected by additional genes for resistance. Silbernagel et al. (12) in his report on the identification of the TM strain of BCMV in Tanzania wondered why the BCMV races with many genes for great pathogenicity are so prevalent in East Africa while other genes for resistance (Hannah et al. (1) recently indicated the predominance of the 'L' strain in an agro-ecological zone in Zambia. This situation raises several questions which we expect to answer if funds are provided for this project proposal viz

1. is the prevalence and the pathogenicity of TM and 'L' strains in Africa a result of these strains in some unidentified wild or cultivated legumes? This is not yet known but if this is so, an attempt to control the disease by elimination of contaminated seeds is a wasteful exercise. Furthermore, an identification of an alternate host would contradict Landeplank's theory that unnecessary pathogenicity genes tend to be eliminated from lost populations with no resistance genes (Silbernagel personal communication).

II. Based on previous studies, it seems that the genetics of resistance based on TM genes II will be the best long range solution to this problem. Certainly, germplasm collection, screening, procedure and breeding strategies will be needed to answer these questions.

I. For lack of certainty of this disease in the create in old ed 'then there is a need to

1. identify all the strains available in this region or
2. identify the alternate hosts for this virus & III's strains
3. use the knowledge from 1 & 2 above to assist with breeders and virus pathologists in choosing the appropriate breeding promising materials and screen them against all the known strains - hopefully well in time. In the end, identify cati istic cultivars.

Procedure: promising germplasm accessions and cultivars will be collected from each of the following countries or accessions from...
each country will be assembled and tested respectively in Morogoro Tanzania, Harare, Zimbabwe and Mzela (Chipata) Zambia. Each testing location will be designated CIAT/SADCC BCMV Resistance Kurser: TMO, CHIZA and MAREZIB.

2 Using the methods of Culver et al (1), Milinga et al (9) and Sembosi et al (10), 3 sets of field experiments will be carried out in each location

(a) In two separate experiments, accession lines will be inoculated separately with the mosaic and necrotic-inducing BCMV strains. The reactions of each lines to each strain will be evaluated both on basis of symptom and ELISA (1,7)

(b) Accession lines will be grown and exposed to natural infections of various pathogens with particular references to vector populations, viral symptom development. These factors will be monitored at each location. Leaf samples will be assayed as above (1,7) for type/strain infection.

(c) Survey of viruses on cultivated and wild legumes will be carried out at each location to determine whether or not there are alternate hosts of BCMV.

Results of all field experiments will be complemented/confirmed with greenhouse studies.

References

1 Culver, J A and J L Shervood (1987) Resistance to Peanut Striped Virus in Arachis germplasm Plant Disease 71 1080-1082


3 Drijfhout, E (1978) Genetic interactions between Phaseolus vulgaris L and bean common mosaic virus with implication for strain identification and breeding for resistance Agric Res Rep (Versl landbouw Onderz) 872 98p


8 Morales, F J and M Costano (1987) Seed transmission characteristics of selected bean common mosaic virus strains in different bean cultivars Plant Disease 7 51-53

9 Mulanga, I I, J M Terl and H H Runhulatitle (1987) Performance of selected bean lines at Morogoro In Bean Research 2 91-104

10 Sembosi, J S A, J M Terl and R M Visangu (1987) Screening of bean hybrids for resistance to black root In Bean Research 2 89-93

11 Silbernagel M J, G L Mink, C L Kesiati and L J Mills (1987) Bean common mosaic virus in Phaseolus vulgaris L In Bean Research 1 84-87

Exciting information

Genetic enhancement of important crops through the use of the new molecular biology techniques is essential for the proper implementation and execution of this project, particularly since the proposal for which this project is aimed at is an outcome of the first resident plant virus pathologist in Tanzania and he is making efforts to bring together a new laboratory where rod-1 virus legume - virus problems can be solved without waiting for months for seeds from a developed laboratory overseas. The expendable materials are also essential if this project is to achieve its desired and desired goals.

Principal Investigator (PI) - Allan Fern Lanu (Curriculum Vitae attached)

Collaborators

a) Dr. J. Lennart, Pathologist, Food Legume Research Team,
   E+ 5104 Chipata Lusaka

b) Ms. Olivia Lenge
   Plant Protection Research Institute
   P.O. Box 5109
   Gwembe, Harare
   Zimbabwe

Since the importation of seeds into Tanzania from the participating countries is forbidden, these collaborators will assist in preparing land, sowing accession lines as well as carry out some observations at the different locations. This sort of resistance will make the studies less burdensome on the PI as well as promote international cooperation on a common problem. However, the provision of these services to the PI will be at the expense of the grant to be awarded to the PI as a sort of incentive, each of the collaborators will be expected to visit each of the countries. The PI will however go to all the inoculations and most of the data collection.

Short term Trainees. An assistant with some considerable level of experience in crop production will be recruited from the Morogoro area. He will be trained in the art of symptomology and observation, inoculation and data collection. He will be in charge of the day to day operation of the project while receiving overall direction/instruction from the PI.

Equipment. If this proposal is approved, then it will become a pioneer project in plant virology in Tanzania. It
is imperative therefore that a good foundation should be
laid in this discipline that will allow the PI's laboratory
become mini-virus laboratory for plant virus-related
problems. The non-expendable materials will certainly not be
recurrant in the subsequent annual Budget CIAI/SADCC
Regional Programme should take a serious & positive step of
this and leave such a lasting legacy behind in Tanzania

a ELISA Reader and accessories. This is the most important
facet of this project since there is no the reliable one
issuing leaves for BCVR content and to determine virus
relationship (?). Up till now, the CIAI/SADCC has had to
send virus samples to some developed laboratories abroad.
The purchase of an ELISA PLATE READER will certainly be an
indispensable item toward an efficient execution of this
project. The committee is urged to set aside a special fund
for this item is requested in Appendix Il

Institutional Units to be involved

1. BEA/CRSCP Programme in Sokone, Tanzania
2. Soil and Nutrient Research Programme in Chipata /zambia
3. Plant Protection Research Institute in Harare

Zimbabwe

Continuous dialogue and contact will lead to an
effective collaboration throughout the duration of the
project
Proposal Budget

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<th>1st Year</th>
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<th>3rd Year</th>
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<tr>
<td>Labour (Plot layout, Planting, Sampling, Harvesting 100 mandays)</td>
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<tr>
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<tr>
<td>Deep Freezer</td>
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<td></td>
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</tr>
<tr>
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Appended I

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Proposal Budget

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<th>2nd Year</th>
<th>3rd Year</th>
</tr>
</thead>
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<tr>
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<td>15,000</td>
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<tr>
<td>Refrigerator (voltage stabilizer)</td>
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<td>Deep Freezer</td>
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<td>90,00</td>
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<td>Micro-Re/Pettors</td>
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<tr>
<td>50, 75, 100 ml</td>
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<tr>
<td>200, 250, 300, 500 ml</td>
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<td>Pesticides</td>
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<td>Laboratory chemicals</td>
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<td>Plastic Bags, labels and others</td>
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<td>ELISA PLATES</td>
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<td>ELISA accessories</td>
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Appended I


### Personnel

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<th>fringe Benefits to I &amp; Collaborators</th>
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Grand total | 12,976 11,851 11,851 11,051 11,051 11,051
APPENDIX II

SPECIAL BUDGET FOR ELISA EQUIPMENT

1. Fisher Microplate Reader
   Cat = 11-400
   (Fisher Scientific Company)
   $7,000

2. Artek - Comp/Print Programmable
   Calculator/Printer
   Cat = 11-499 - 100
   Fisher Scientific Company
   $9,000
   =========
Aphids are an important pest of bean in the SADC region. *Aphis fabae* Scop. appears to be the most commonly occurring aphid. Infestation by aphids can take place at different crop growth stages. The extent of crop loss caused not only depends on the crop stage and severity of infestation but also on their role as a vector of the Bean Common Mosaic Virus (BCMV), which causes an important disease in beans in the SADC region.

Our knowledge on the seasonal and host distribution of bean aphids in the region and their dynamics as direct pests as well as vectors of BCMV is only sketchy. If we clarify some aspects relating to the ecology of aphids and the factors influencing their severity on beans, it is possible to develop suitable strategies so to reduce the losses caused by them both as direct pests and as vectors of BCMV.

The sub-project is proposed with a view to explore some of the relevant areas, listed below:

- The species of aphids, their distribution on bean in the region in relation to differing ecologies.
- The within season and between seasons shifts in their occurrence in relation to climate, host plants and cultural practices.
- The dynamics of their populations in relation to crop phenology and natural enemy activity, their role in the spread of BCMV.
- Alternatives available for minimizing the crop losses caused by aphids on beans.

A three year study of these aspects is envisaged, with Zambia as the main
center, including some collaborative experiments for chosen observations in Malawi and Zimbabwe. The major research sites in Zambia are Nsekera and Moba which represent two distinct and major ecologies in the sub-region. The former with warm conditions and moderate rainfall and the latter relatively cool and high rainfall. The positioning of a full-time legume pathologist in the Zambia team can be taken advantage of in related BCMV studies. The breeder and agronomist in the team are also available to assist in areas related to them.

**PLAN OF EXPERIMENTS / ACTIVITIES (No OF SEASONS)**

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<th>MRA</th>
<th>ML</th>
<th>ZW</th>
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<td>Survey for off-season host plants (surrounding major bean areas monthly visits for 4-6 months)</td>
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<td>3</td>
<td>2</td>
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<tr>
<td>2</td>
<td>Effect of planting dates and inter-cropping on aphid and BCMV incidence (collaboration with agronomy-on-farm observation)</td>
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<td>3</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Effect of regimes of protection from aphids on BCMV (collaboration with pathologist) supported by monitoring alates and secondary spread)</td>
<td>3</td>
<td>3</td>
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<td>4</td>
<td>Aphid/BCMV resistance/avoidance studies (collaboration with pathologist, breeder, agronomist)</td>
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<td>3</td>
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<td>5</td>
<td>Population dynamics of aphids (role of natural enemies and weather elements besides crop phenology)</td>
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<th>ZA (MB)</th>
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<td>-</td>
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<td>-</td>
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APPENDIX 7

SADC/IAI REGIONAL PROGRAMME ON BEANS
PROPOSAL FOR REGIONAL COLLABORATIVE RESEARCH
SUB-PROJECT

TITLE

Introduction of improved seed type and resistance to necrotic strains of BCMV into a carioca background

SCIENTISTS RESPONSIBLE

Joyce Nulila, National Coordinator, Groundnuts/Grain Legumes, Zambia

Martin Mbewe, Grain Legume breeder, Zambia

COORDINATING INSTITUTION

Matera regional research station, P.O. Box 510089, Chipata, Zambia

COLLABORATING SCIENTISTS AND INSTITUTIONS

h. Kutu Kamala, IAKI, Lyamungu P.O. Box 3004, Moshi, Tanzania

UoL, Usale, P.O. Box 4000 Mbeya, Tanzania

Ns. Olivia Verge, Dr. D.S., Causeway P.O. Box 8100, Haile, Zimbabwe

Lah Station, Meikassa, P.O. Box 119, Naurat, Ethiopia

RATIONALE

Carioca has performed extremely well in many situations in Africa. It has been released in Zambia; it is being proposed for release in Ethiopia. It is one of the best yielders in variety trials in Tanzania and Zimbabwe. It appears to be tolerant of acid soil conditions and multiple resistant to several important diseases. Its seed is smaller than is generally acceptable and of non-preferred appearance (cream with tan stripes). It is also susceptible to necrotic strain of BCMV.

Cultivated populations with Carioca as one parent are now available from IARI. They offer a means of incorporating improved seed type and resistance to necrotic strains of BCMV into Carioca backgrounds.

EXPECTED IMPACT

Expected impact is medium to long-term but should result in cultivars of improved yield and acceptability and parental
materials for further crossing

LITERATURE REVIEW

In Zambia, Larioca has been released for cultivation in northern areas (Reports of Zambian National Programme, 1985-1987) Although, its seed type is less than acceptable, it is popular because of its improved yield performance (Allen and Smithson, 1988) It is now being multiplied and distributed in several areas or northern Zambia

In Ethiopia, it has reached the verification trial stage and has been proposed for release this year (Abebe, 1988)

In Tanzania, it was among the three best yielders in TAKU Uniform Cultivar Trials in 1985 and has been promoted to National Varieties and on-farm trials (TAKU Annual Report, 1987-88)

In Zimbabwe, Larioca considerably out-yielded other entries in advanced trials in 1987 (Uk&W Annual Report 1986-87)

In view of it's success over such a wide range of situations, Larioca can be expected to perform well in other countries where it has not yet been tested

PROCEDURES

Dec 1988 - Mar 1989

Increase F2 seed of segregating populations at Msekera. Widely spaced bulks in unreplicated plots in order to obtain sufficient seed for large F2 populations.


Large F3 bulks at Mbala. Unreplicated spreader rows susceptible to major diseases (anthracnose, rust, scab) to be sown every 3rd row, 2 weeks before bulks and inoculated. Select single plants for disease resistance agronomic worth and seed type.

Dec/Jan - March/April 1990

Progeny rows at Msekera. Unreplicated with black-root susceptible spreaders (carrying 1 gene) every 3rd row and frequent local checks (Larioca, LPV 292 and etc) Select single plants and families for disease resistance, agronomic value and seed type.

April '90 onwards is

Seed of F3 families to Ethiopia (Jun/Jul to Aug/Sept), Tanzania and Zimbabwe (Dec 1990 - March '91) Select single plants for agronomic value, seed type and disease resistance.
In Zambia, single plants to be grown as F\textsubscript{4} progenies at Mbala Unreplicated but with susceptible spreaders and frequent local checks select families for distribution to Ethiopia, Zimbabwe, Tanzania and other countries and single plants for further purification and testing at Msekera and Mbala in Zambia Dec/Jan 1990/91 to March/April 1991

By 1991 early selections from the crosses can be expected to be entering first stage national and regional trials

**BUDGET**

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WORKSHOP ON RESEARCH METHODS FOR CEREAL/LEGUME INTERCROPPING IN EASTERN AND SOUTHERN AFRICA

Sponsored by the Government of Malawi, CIMMYT and CIAT
Lilongwe, Malawi, 23-27 January, 1989

CURRENT LIST OF PARTICIPANTS - 10 November, 1988

1) From Outside Eastern Region and Southern Africa

Dr Roger Mead - Biometrician,
Department of Applied Statistics
University of Reading
Whiteknights
P O Box 217
Reading RG6 2AN
United Kingdom

Agreed to present paper on "Statistical Analysis of Intercropping Experiments designed to Address Basic Research Issues"

Professor Charles Francis - Agronomist
Department of Agronomy
University of Nebraska
Lincoln
East Campus
Lincoln NE 68583
U S A

Accepted, subject to approval from U of Nebraska
Agreed to present paper entitled "New Innovations in Intercropping Research and Implications for Research Methods"

Dr Francis Ofori - Agronomist
Plantations Limited
Ghana Cocoa Board
Private Bag
Accra North
Ghana

No response yet

Dr Philip Thornton - Bioeconomist
IBSNAT
Edinburgh School of Agriculture
Glenbourne
6 South Oswald Road
Edinburgh
Scotland EH9 2HH

Agreed to present paper on "Models in Intercropping"
Professor W R Stern - Agronomist
University of Western Australia
Nedlands, 6009
Western Australia
Australia

Awaiting confirmation of participation

2) National Program Staff

Dr M S Reddy - Agronomist
Maize agronomist
Mt Makulu Research Station
P Bag 7
Chilanga
Zambia

Agreed to present paper on "Measurement of Biological Outputs"

Dr A Sutherland - Anthropologist
ARPT
Mt Makulu Research Station
P Bag 7
Chilanga
Zambia

Agreed to present a paper on "Measurement of socio-economic Outputs" - Participation is subject to Zambia Government approval

Dennis Wanchinga - Manpower and Training Officer
SACCAR
Private Bag 00108
Gaborone
Botswana

No response as yet

Dr G H Semuguruka
TARO
P O Box 9761
Dar es Salaam
Tanzania

nominated, with two more expected soon
Dr Manuel Moraes  
I N I A  
Caixa Postal 3658  
Mapaline  
Maputo 8  
Mozambique  
No response as yet  
(Reminder telex was sent 1 November, 1988)

Dr B K Patel  
Min of Agriculture  
P O Box 50291  
Lusaka  
Zambia  
No response as yet  
(Reminder telex sent 2 November, 1988)

Dr William Wapakala (Reply from J K Rutto)  
Min of Agriculture  
& Livestock Department  
P O Box 30028  
Nairobi  
Kenya  

Nominations  
M N Mwamia - Agronomy  
J J Chumo (Mrs) Breeding  
M Omunyin - Pathology  
F M Murithi - Ag Economics  
R L Milikau - Biometrics  
Kitale  
Kitale  
Thika  
Embu  
N A L

Mr Edouard Niyongabo  
ISABU  
B P 795  
Bujumbura  
Burundi  
Nominated  
Mr Rafykir1 Emmanuel

Dr Seme Debela  
Institute of Agricultural Research  
Addis Ababa  
Ethiopia  

Live nominations  
Kidane Giloqis  
Woldeyesus Sinebo  
Amare Abeba  
Adhanom Negass1  
Ledgesse Dadi
Mr Ron Penner
DR&SS
P O Box 8108
Causeway
Harare
Zimbabwe

Nominations
Dr M Natarajan - Agronomist, Agronomy Institute
Mr Enos Shumba - Agronomist, PSRU
Mr I Mharapara - Lowveld Research Station
Dr Paul Muchena - Nematologist, Plant Protection Research Institute

Professor Schweppenhauser
Dept of Crop Science
University of Zimbabwe
P O Box MP 167
Mount Pleasant
Harare
Zimbabwe

Nominated: Irvine Mariya, Agronomist, Department of Crop Science, University of Zimbabwe

Secretary for Personnel & Training
Office of President & cabinet
P O Box 30227
Lilongwe 3
Malawi

Malawi Nominations
Dr David Munthali - Entomologist
Chancellor College
P O Box 280
Zomba
Malawi

Dr W Musuku - Pathologist
Dr A B C Mkandawire - Physiologist
Bunda College of Agriculture
P O Box 219
Lilongwe
Malawi

Mr D Yiwombe - Extension Officer
Mrs E Chikagwa - Womans Program Officer
Ministry of Agriculture
P O Box 30134
Capital City
Lilongwe 3
Malawi
Dr G Y Mkamanga - Physiologist  
Ministry of Agriculture  
P O Box 30134  
Capital City  
Lilongwe 3  
Malawi

Mr C Chanika - Adaptive agronomist  
Blantyre ADD  
P O Box 30227  
Chichiri  
Blantyre 3

Mr F Nyondo - Adaptive ecologist  
Karonga ADD  
P O Box 97  
Karonga  
Malawi

Dr P K Sibale - Breeder  
Mrs P Ngwira - Pathologist  
Mr F W Kisonbe - Biometrician  
Chitedze Research Station  
P O Box 158  
Lilongwe 3  
Malawi

Dr Noel Govinden  
Director of Sugar Industries Research Inst  
MSIRI  
Reduit  
Mauritius

Will present paper on Mauritius research as an example of an integrated intercropping research program

Professor M J Swift  
Dept of Biological Sciences  
University of Zimbabwe  
P O Box Mp 167  
Mount Pleasant  
Harare  
Zimbabwe

Agreed to present a paper on "sustainability"

3) IARC Centre Staff

Dr Cesar Cardona  
CIAT  
Apdo Aero 6713  
Cali  
Colombia
Dr Roger Kirkby
CIAT, Addis Ababa
Ethiopia

Dr J Davies
CIAT, Butare
Rwanda

Dr D Allen
CIAT, Arusha
Tanzania

Dr R Arias
CIMMYT, Accra
Ghana

Drs A F E Palmer, J Ransom &
P Anandajayasekeram
CIMMYT, Nairobi
Kenya

Drs A Low, Gelaw
CIMMYT, Harare
Zimbabwe

Dr Mahmood Osmanzai
Principal Cereals Agronomist
SADCC/ICRISAT Sorghum & Millet
Improvement Program
P O Box 776
Bulawayo
Zimbabwe

Dr Jonathan Woolley - agronomist
CIMMYT Mexico
Lisboa 27
Apdo Postal 6-641
06600 Mexico D F
MEXICO

Agreed to present papers on
"Specific Diagnostic Considerations for Intercropping" and
"Implementation of Intercrop Experiments"

Workshop Organisers

Dr Todo Edje, agronomist
SADCC/CIAT
P O Box 2704
Arusha
TANZANIA
Tlx No 42106 CANWHT TZ
Mr Lovewell Ngwira, agronomist
and Head of Maize Team
Chitedze Research Station
P O Box 157
Lilongwe 3
MALAWI
Telephone No 767-222

Dr Stephen Waddington, agronomist
CIMMYT
P O Box MP 154
Mount Pleasant
HARARE
Zimbabwe
Tlx No 2462 CIMMYT ZW

df/9/11/88
WORKSHOP ON RESEARCH METHODS FOR CEREAL/LEGUME INTERCROPPING IN EASTERN AND SOUTHERN AFRICA

Sponsored by the Government of Malawi, CIMMYT and CIAT
Lilongwe Hotel, Lilongwe, Malawi, 22-27 January, 1989

Program Draft 2 (1 November, 1988)

Sunday 22 January

1400-2000  Registration
1900-2030  Reception

Monday 23 January

0800-0805  Welcome to the Workshop  Malawi Organiser
            L Ngwira
0805-0815  Welcome Address
            By a representative of the Government of Malawi
0815-0830  Aims of the Workshop S Waddington
0830-0900  Relevance of the Workshop to Farming in E&S Africa T Edje

SESSION 1  THE FUTURE OF INTERCROPPING RESEARCH AND IMPLICATIONS FOR RESEARCH METHODS

Chairman  W R Stern

0900-0940  New Innovations in Intercropping Research C Francis
0940-1000  T E A
1000-1040  Effective Use of Current Intercropping Technologies D Yiwombe
1040-1100  Discussion (Rapporteur)
SESSION 2
UNDERSTANDING CURRENT
INTERCROPPING PATTERNS
AND DIAGNOSIS OF
INTERCROPPING
PROBLEMS IN FARMER'S
FIELDS

(Chairman )

1100-1130 General Procedures for Diagnosis P Ananda
1130-1210 Specific Diagnostic Considerations for Intercropping J Woolley
1210-1230 Discussion (Rapporteur )

1230-1400 LUNCH

SESSION 3
DEVELOPMENT OF AN
INTERCROPPING
RESEARCH PROGRAMME
AND COMPONENT RESEARCH

Chairman B Gelaw

1400-1420 Elements of an Integrated Intercropping Research Programme A F E Palmer & R Kirkby

1420-1445 An Example The Intercropping Research Programme in Mauritius N Govinden

1445-1515 Breeding for Intercrops J Davies

1515-1530 Weed control in Intercrops J Ransom

1530-1545 TEA

---
1545-1600  Fertilizer research in intercrops  L Ngwira & T Edje

1600-1630  Insect pests in intercrops  C Cardona

1630-1645  Diseases in intercrops  D Allen

1645-1700  Spatial arrangements in intercrops  M Natarajan

1700-1730  Discussion (Rapporteur )

Tuesday 24 January

SESSION 4  EXPERIMENTATION WITH INTERCROPS

Chairman  I Mariga

0800-0830  The Planning of OFR Intercrop Experiments  A Low & S Waddington

0830-0915  Appropriate Experimental designs and treatment structures for intercropping  R Mead

0915-0940  Implementation of Intercrop Experiments  J Woolley

SPECIAL SESSION  COUNTRY EXPERIENCE IN INTERCROPPING RESEARCH

(Chairman )

0940-1000  (e.g. Malawi experience)

1000-1020  T E A

1020-1040  (e.g. Kenya experience)

1040-1100  (Another experience)

1100-1120  (Another experience)

1120-1145  Discussion (Rapporteur )
SESSION 5  ANALYSIS AND INTERPRETATION
OF INTERCROP RESEARCH

Chairman  R Milikau

1145-1205 Measurement of Biological outputs    M S Reddy
1205-1220 Measurement of Socio-economic outputs    A Sutherland
1220-1240 An Example Agronomic and nutritional assessment of a Maize/bean intercrop    T Edje
1240-1400 LUNCH
1400-1445 Statistical Analysis of Intercropping Experiments Designed to Address Basic Research Issues    R Mead
1445-1530 Statistical Analysis of On-farm Research Intercropping Trials    F Kisyombe
1530-1545 TEA

SESSION 5  Continued

(Chairman   )

1545-1615 Agronomic Interpretation of On-farm Research Intercropping Trials    J Ransom
1615-1645 Economic Interpretation of Intercrop Trials    P Ananda & A Low
1645-1715 Discussion (Rapporteur   )
Wednesday 25 January

SESSION 5  Continued

(Chairman  

0800-0845 Models of Inter- 

cropping Their 

uses and limitations  

P Thornton

SESSION 6  SUSTAINABILITY AND INTERCROPS

(Chairman  

0845-0900 Sustainability 

issues with 

Intercrops  

C Francis

0900-0940 Sustainability of 

Intercrops in 

relation to manage- 

ment of soil organic 

matter and nutrient 

cycling/nutrient use 

efficiency  

M Swift

0940-1000 Discussion 

(Rapporteur  

1000-1020 T E A 

Group Discussion and Development 

of Guidelines

1020-1230 SESSIONS 1 AND 2

1400-1730 Visit Intercrop Trials 

at Chitedze Research 

Station, in farmers 

fields and at Bunda 

College  

(Rapporteur  

Tour Organiser 

L Ngwira)

Thursday 26 January

Group Discussion and 

Development of Guidelines cont

0800-1230 SESSIONS 3 AND 4

1400-1730 SESSIONS 5 AND 6

1900 - WORKSHOP DINNER
Dear International Participant,

We enclose some information to help make your preparations for travel and your arrival at Lilongwe as smooth as possible.

Visas for entry into Malawi are required by persons with a passport from the following countries in E/Africa, Ethiopia, Rwanda, Burundi and Mozambique.

Most participants will require a PTA. We plan to send out PTA's during the 3rd week of December. If you cannot trace your PTA by the 6th January, 1989, please telex the CIMMYT Harare office (2462 ZW) immediately for assistance.

Malaria is endemic throughout Malawi and the use of a malaria prophylactic is strongly recommended. Persons coming from both West and East Africa should have a current certificate of vaccination against yellow fever and cholera.

Reasonable en-route expenses will be reimbursed in foreign currency by the workshop sponsors provided claims are supported by receipts.

When arriving at the airport, females should wear a dress or skirt that covers the knee, not trousers. Males should not wear long hair.

We plan to register all International participants arriving on Saturday 21 January or Sunday 22 January as they check in at the Lilongwe Hotel. The registration desk will also be open from 0700-0900h Monday 23 January, primarily for the registration of local participants.

The equivalent of MK200 (approx US$75) of new goods per person may be brought into Malawi duty free provided you declare they are for your personal use. Gifts for other persons are liable for duty. Please remember to complete the currency declaration form fully.

Your will be met at the airport by a representative of the organisers and taken to the Lilongwe Hotel. The representative will carry a "Intercrop Workshop" so you can recognise him. If for some event you are not met, and have not altered your flight without informing us, please take a taxi to the Hotel where the taxi driver will be paid.

Any necessary changes to your travel plans less than one week before your scheduled arrival time should be communicated to the CIMMYT office in Lilongwe (Telephone Lilongwe 731316, Telex 43055 MI), not to Harare.
Contact addresses in Lilongwe

Ms Farida Osman or Dr Malcolm Blackie
CIMMYT/Rockefeller Foundation
P O Box 30727
Lilongwe 3
Malawi

Telephone 731316
Telex 43055 MI

Lilongwe Hotel
P O Box 44
Lilongwe 3
Malawi

Telephone 721866
Telex 4321 MI
MEMORANDUM

Workshop on RESEARCH METHODS FOR CEREAL/LEGUME INTERCROPPING in Eastern and Southern Africa, to be held 22-27 January, 1989 at Lilongwe, Malawi

Sponsored by CIMMYT, CIAT and the Government of Malawi

To all Participants

Date 4 November, 1988

1) National Program Staff

Dr M S Reddy
Dr A Sutherland
Dr B K Patel c/o
Dr D Wanchinga
Dr G H Semuguruka c/o
Dr M Moraes c/o
Dr J K Rutto c/o
Mr M N Wania
Mrs J J Chumo
Mr M Omunyin
Mr F M Munthi
Mr R L Milikau
Mr M Nkonko
Dr E Niyongabo c/o
Dr L Gahamanyi c/o
Dr Seme Debelu c/o
Dr M Natarajan
Dr Irvine Mariqa
Professor M J Swift
Dr P Muchena
Mr E Shumba
Mr I Mharapara
Dr E Whingwiri
Dr Noel Govinden
Secretary for Personnel & Training c/o

2) Participants from Outside the Region

Dr C Francis
Dr P Thornton
Professor W Stern
Professor R Mead

Zambia
Zambia
(4 copies)
Zambia
Botswana
Tanzania
Mozambique
Kenya
Kenya
Kenya
Kenya
Rwanda
Burundi
Burundi
Rwanda
Ethiopia
(6 copies)
Zimbabwe
Zimbabwe
Zimbabwe
Zimbabwe
Zimbabwe
Mauritius
Malawi
(10 copies)
United States of America
United Kingdom
Australia
United Kingdom
We enclose the latest draft program for the workshop. Please have a look through the program and let us know if you have further suggestions for improving the content of the workshop.

**VENUE**
We plan to hold the workshop and provide accommodation at the Lilongwe Hotel, close to the Old Town area of Lilongwe, Malawi.

**MALAWI CLEARANCE**
All non-Malawi participants have to be cleared by the Government of Malawi to attend the workshop. To allow us to obtain clearance, if you have not already done so, please send the following details (by telex if possible) to the CIMMYT Harare office immediately (Our telex number is 2462 CIMMYT ZW).

1) Full name
2) Current position/designation and discipline
3) Nationality of passport
4) Passport number and place of issue,
5) Passport date of issue and expiry date

Please note that in addition to the above, Nationals of Burundi, Ethiopia, and Rwanda require a visa (issued outside of Malawi) to enter Malawi. All persons should be vaccinated against Cholera. Persons coming from West Africa need Yellow Fever.

**TRAVEL ARRANGEMENTS**
Most participants will require PTA's. We plan to send them out towards the end of December, 1988. In order to avoid delays when sending out the PTA's, the airlines require full business and home physical addresses, and telephone numbers where possible. Please send this information to the CIMMYT Harare office. Further details of local arrangements will be sent to you before the end of the year.

### IARC Staff (Not all are participants)

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<td>Dr C Cardona</td>
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<td>Dr J Woolley</td>
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<tr>
<td>Dr B Gelaw</td>
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<td>Dr J Davies</td>
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<td>Tanzania</td>
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<td>Dr F Palmer</td>
<td>Kenya</td>
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<td>Dr J Ransom</td>
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<td>Dr R Arias</td>
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<td>Dr R Cantrell</td>
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<td>Dr R Paliwal</td>
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<td>MAMRS</td>
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PRESENTATIONS AT THE WORKSHOP

1) Invited Topic Presentations
Participants invited to present, or that have offered to present, one or more papers at the workshop should check the program carefully to make sure the subject area or tentative title given on the program fits your proposed presentation. Authors should note that the amount of time allocated on the program for the verbal presentation of your topic is to be taken as a firm guide.

You are encouraged to include more details in your written paper for distribution at the workshop. If you have not already done so, please send the full title of your paper(s) to the CIMMYT office in Harare. We would also appreciate a copy of your draft paper(s) as soon as possible.

To ease the burden on photocopying in Lilongwe we ask you to bring up to 50 copies of your full paper for distribution. Full overhead projector, slide projector and flipchart facilities will be available in the workshop room. If you anticipate any difficulties or have any unusual request concerning presentations, please let us know before you arrive in Lilongwe.

2) Country Presentations
Please note that in addition to the invited/offered papers on particular topics, we have set aside four slots of about 20 minutes each for country presentations on Cereal/Legume Intercropping Research. We invite persons nominated to attend from each country within the region to develop a short outline paper (4-6 A4 pages) covering current and past cereal/legume intercropping research in your country, with emphasis on the methods employed and why. Include difficulties encountered and successes achieved. Some ideas on where the author(s) sees intercropping research going in their country in the future should round off the paper.

Because of time constraints we plan that only four of these country experiences will be verbal presentations in the workshop. Nevertheless, copies of all papers will be circulated among participants. We have tentatively included Malawi and Kenya on the program because they have already shown interest in developing a presentation.

Should you have questions or suggestions about any aspect of the workshop, please contact any of the persons named overleaf.
On behalf of the organisers, the very best of wishes and we look forward to seeing you or your representatives in Lilongwe in January.

Cordially yours,

Stephen Waddington

For the Organisers - Lovewell Ngwira, Malawi Maize Team
Chitedze Research Station
P O Box 158
Chitedze
Lilongwe 3
Malawi

Todo Edje
SADCC/CIAT
P O Box 2704
Arusha
Tanzania

Stephen Waddington
CIMMYT
P O Box MP 154
Mount Pleasant
Harare
Zimbabwe
WORKSHOP ON RESEARCH METHODS FOR CEREAL/LEGUME INTERCROPPING IN EASTERN AND SOUTHERN AFRICA

Sponsored by the Government of Malawi, CIMMYT and CIAT
Lilongwe Hotel, Lilongwe, Malawi, 22-27 January, 1989

Program Draft 2 (1 November, 1988)

Sunday 22 January

1400-2000  Registration
1900-2030  Reception

Monday 23 January

0800-0805  Welcome to the Workshop  Malawi Organiser  L Ngwira
           Welcome Address  By a representative of the Government of Malawi
0815-0830  Aims of the Workshop  S Waddington
0830-0900  Relevance of the Workshop to Farming in E&S Africa  T Edje

SESSION 1  THE FUTURE OF INTERCROPPING RESEARCH AND IMPLICATIONS FOR RESEARCH METHODS

Chairman  W R Stern

0900-0940  New Innovations in Intercropping Research  C Francis
0940-1000  T E A
1000-1040  Effective Use of Current Intercropping Technologies  D Ylwombe
1040-1100  Discussion (Rapporteur)
SESSION 2: UNDERSTANDING CURRENT INTERCROPPING PATTERNS AND DIAGNOSIS OF INTERCROPPING PROBLEMS IN FARMER'S FIELDS

(Chairman: )

1100-1130 General Procedures for Diagnosis P Ananda

1130-1210 Specific Diagnostic Considerations for Intercropping J Woolley

1210-1230 Discussion (Rapporteur: )

1230-1400 LUNCH

SESSION 3 DEVELOPMENT OF AN INTERCROPPING RESEARCH PROGRAMME AND COMPONENT RESEARCH

Chairman: B Gelad

1400-1420 Elements of an Integrated Intercropping Research Programme A F E Palmer & R Kirkby

1420-1445 An Example The Intercropping Research Programme in Mauritius N Govinden

1445-1515 Breeding for Intercrops J Davies

1515-1530 Weed control in Intercrops J Ransom

1530-1545 T E A
Tuesday 24 January

SESSION 4 EXPERIMENTATION WITH INTERCROPS

Chairman  I Mariga

0800-0830 The Planning of OFR Intercrop Experiments  A Low & S Waddington

0830-0915 Appropriate Experimental designs and treatment structures for Intercropping  R Mead

0915-0940 Implementation of Intercrop Experiments  J Woolley

SPECIAL SESSION COUNTRY EXPERIENCE IN INTERCROPPING RESEARCH (Chairman)

0940-1000 (e.g. Malawi experience)

1000-1020 T E A

1020-1040 (e.g. Kenya experience)

1040-1100 (Another experience)

1100-1120 (Another experience)

1120-1145 Discussion (Rapporteur)
SESSION 5  ANALYSIS AND INTERPRETATION OF INTERCROP RESEARCH

Chairman  R Milikau

1145-1205  Measurement of Biological outputs  M S Reddy

1205-1220  Measurement of Socio-economic outputs  A Sutherland

1220-1240  An Example Agronomic and nutritional assessment of a Maize/bean Intercrop  T Edge

1240-1400  LUNCH

1400-1445  Statistical Analysis of Intercropping Experiments Designed to Address Basic Research Issues  R Mead

1445-1530  Statistical Analysis of On-farm Research Intercropping Trials  F Kisyombe

1530-1545  T E A

SESSION 5 Continued

(Chairman)

1545-1615  Agronomic Interpretation of On-farm Research Intercropping Trials  J Ransom

1615-1645  Economic Interpretation of Intercrop Trials  P Abeni & A Low

1645-1715  Discussion (Rapporteur)
Wednesday 25 January

SESSION 5 Continued

(Chairman )

0800-0845 Models of Inter­cropping Their uses and limitations P Thornton

SESSION 6 SUSTAINABILITY AND INTERCROPS

(Chairman )

0845-0900 Sustainability issues with Intercrops C Francis

0900-0940 Sustainability of Intercrops in relation to management of soil organic matter and nutrient cycling/nutrient use efficiency M Swift

0940-1000 Discussion (Rapporteur )

1000-1020 T E A

Group Discussion and Development of Guidelines

1020-1230 SESSIONS 1 AND 2

1400-1730 Visit Intercrop Trials (Tour Organiser L Ngwira) at Chitedze Research Station, in farmers fields and at Bunda College (Rapporteur )

Thursday 26 January

Group Discussion and Development of Guidelines cont

0800-1230 SESSIONS 3 AND 4

1400-1730 SESSIONS 5 AND 6

1900 - WORKSHOP DINNER
**Friday 27 January**

0800-1230  *Presentations to Plenary Session and General Discussion*

1400-1600  *Presentations and Discussions cont*

1600-1700  *Discussion on Follow-up to the Workshop*

1700      *Closure of the workshop*  

*Representative of the Government of Malawi*