ICRISAT Sahelian Center
and
West African Programs

Quarterly Report

January - March 1992

R.W. Gibbons
Executive Director

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FARM DEVELOPMENT AND OPERATIONS

Field activities

Several millet fields were stubble plowed by two crosspasses with the soil saver for wind erosion protection and to control stem borers. An *Andropogon* nursery was sown on field 7A3 to provide young shots for the beginning of the rainy season and to reclaim 30 ha of farm land. The field is irrigated using a linear movement system with two light irrigations per week. Tree lines between block 7E and 7F were cut. *Andropogon* will replace all tree lines as wind erosion protection in block 7. Trees have been pruned along the road sides and station fences.

Irrigation

At the end of March, there were 21 ha under irrigation, distributed as follows:

GIP

Agro:	6 A3 (0.04 ha), 7D3 (1.5 ha)
Patho:	3E (0.6 ha), 4B (0.16 ha), 5B (0.1 ha), 7B3.
Breed:	7C2 (1.5 ha), 5B(0.5 ha)

PMIP

Breed:	ISOIII (0.1 ha), 6F1 (1.5 ha), 6D1 (1.5 ha), 5B (0.6 ha)
& Rmb	7D2, 7E1
Physio:	7F1 + 7F2 (3 ha)
Patho:	5C (0.17 ha), 4E (0.6 ha)

RMP

Physio:	ISOIII (0.01 ha)
IBPGR:	ISOIII (0.06 ha)
IFDC:	6A3 (0.5 ha)

FDO: 7A3 (1 ha)

A drip system was installed on field 6A3 covering 390 m^2. It is used by GIP/Agro and an irrigation scheduling scheme will be developed for this system. With the existing pumping facilities (seven wells working), there is an irrigation limit of 20 ha. Water level in the main reservoir dropped dramatically during March. Three wells need new pumps and the ED has approved replacements. Work orders were sent to PPS to place two water meters for monitoring the reservoir inflow. Placement of the small pump at the reservoir by PPS is not finished yet.

Equipment

Spare parts for the road equipment were received and PPS is working on the bulldozer. The Blue Boy sprayer was tuned and calibrated. Nozzle filters are missing and will be ordered. The Barber fertilizer applicator was tested for application uniformity. The

two Wintersteiger precision planters were cleaned but staff training is required for their operation. Injectors for the dryers were ordered. Segments for Fiat 466 tractor engine and PTO transmission for Fiat 766 tractor are urgently needed before the beginning of the season.

Fertilizer and pesticide orders, stock management

To maintain adequate stocks, research programs were asked to evaluate their needs for the coming season. The farm manager strongly feels PSD should implement a computerized stock management system for pesticides, fertilizers, and FO spare parts. This would result in an efficient, faster stock status information and cost savings.

Livestock

The herd is in healthy condition. Supplemental food is helping to maintain animal weight during this stressful period. Rangeland in the station is not sufficient by itself to feed the herd during the dry season and overgrazing problems have to be closely monitored. With 30 ha of *Andropogon* by next year, FO should be self-sufficient in forage needs. Discussions have taken place with ILCA scientists to improve livestock management.

Disposal

In March, 21.6 MT of millet representing last season's production from various research programs and farm operations were given to PSD. A sale to ICRISAT staff was organized with a price of CFA 2,500 per 80 kg bag.

Research station management course

A four week course on Research station management took place at ISC from 9 February-6 March. The course, given in French to 30 participants from 10 African countries, was cosponsored by the University of Arkansas, AID, IITA and ICRISAT. FDO gave full support to the course by providing equipment, field experience, and staff for lab sessions. BG gave class, lab, and computer sessions on irrigation and class sessions on GIS applications to land management. Participant evaluations showed that the course was highly appreciated by trainees. A real training need on Research Station Management exists in West Africa and we think that similar courses organized in the future will have a beneficial impact.

Travel

BG traveled to ICRISAT Center to work closely with D.S. Bisht for three weeks. BG's activities at IC during that period were:

- global overview of Farm Development and Operations at IC;
- work and discussions with the various FDO units on:
    - crop protection and pest monitoring;
    - farm machinery with specific interests on planters;
    - irrigation;
    - glasshouses;
    - stock management;

- on-the-job training;
- land management;
- use of data base software for work planning, record keeping;

- work with D.S. Bisht on Atlas GIS for his specific needs;
- meeting with Mr. R. Eaglesfield to discuss GIS and networking;
- participation as an observer to Legume Technology Exchange in house review;
- participation as an observer to board working session on GIS;
- visit of information services, PPS, RMP/GIS team;
- meeting with Wintersteiger technical representative to discuss problems with our planters.

On 16 March, BG attended a seminar on geostatistics at the Faculté des Sciences Agronomiques, Université Catholique de Louvain (UCL).

On 17 March, as it was agreed with Dr. Murty, BG visited the UCL brewery laboratory and discussed possible WASIP collaboration with Pr. J.P. Dufour, head of Unité de Brasserie UCL. Information collected will be sent to Dr. Murty.

STATISTICS AND COMPUTER SERVICES UNITS

Research Support

This is the annual report period. Hence, most of the time for the Statistics staff was devoted to the assistance of staff with analyses and discussions on sections of the annual report.

Training.

Many staff were involved in the 4 week course entitled "*Computer Applications and Statistical Analysis in Agricultural Research*" held from 6-31 January 1992.

There was a joint WARDA/INRAN/ICRISAT course. In particular RDS and GAO were lecturers and either ZM or AE was a demonstrator for each session. This course confirmed again the value of TVC as a training facility as is highly effective for computer based courses. One feature of this course was series of 5 evening seminars on topics of general interest. These were useful events and were also open to ISC staff.

Following this course, one week of internal training was given by GAO at TVC. This consisted of a short course on DOS-5 basics followed by two courses on WordPerfect, one for beginners and one more advanced. The demand for each of these courses exceeded the maximum number of 20 people that can be accommodated in a practical course. These courses will be repeated when resources permit.

The computers were in use again during the 4 week course on Farm management, from 10 February to 6 March. GAO gave 4 days of tuition for this course on basic computer use.

Five national students have been attending practical training under the supervision of GAO and ILA in data entry and programming.

Accommodation

The new room for CSU/STATS was occupied in mid-February. While still not complete, it provides a much better working environment, both for our staff and for other staff in the Institute who wish to make use of the facilities in CSU.

Support for Administration

Following discussions, a project plan was prepared by GAO for work on computerization in personnel. As a first step in this process, Mr. Marafa has been working with ILA combining personal training with the preparation of programs.

Following discussions with Finance, a short course was given (3 sessions on Saturday morning) by GAO for senior staff in administration. The main objective was to give staff the experience so they could direct fully the computerization process in their section.

ILA assisted RAO during some financial statement compilation. Following internal Unit discussions, ILA installed LANTASTICS Version 2 at PSD and GAO at CSU. LANTASTICS Version 3 has also between tested between PSD and CBMS office. Unfortunately the two versions are not compatible according to ARTISOFT Inc.

Leave

A. Seydou took annual leave from 10 February to 6 March. We belatedly also congratulate him on his marriage on 19 December.

ILA was out of work during January and first week of February due to hospitalization and sick leave.

Other

Mr. Mamadou Diedhiou, Biometrician. ILCA, Mali visited ISC from 21-26 March for discussions with ILCA staff. He had discussions with RDS on the proposed ILCA course to be held at ISC from September 7-18 1992 which will involve support from ISC statistics staff. We also discussed whether he could give support to Wasip-Mali staff similar to the support given by Stats/CSU at ISC to ILCA staff. He was, in principle, happy to do this and will write to ILCA headquarters to check that they have no objections.

Some new virus problems appeared and some old ones re-appeared. This will clearly be a recurrent (and time consuming) problem for which we must remain vigilant.

RDS worked with Osebekwin Asiribo, Statistician, IAR, Nigeria for one week following the WARDA course. They worked on the analysis of climatic data for a conference to be held in Portugal in April 1992.

PHYSICAL PLANT SERVICES

Work order status

Total work orders received :	706
Total work orders completed:	682
Total work orders pending :	24

Reason for pending

Most of these jobs are pending due to the non-availability of required materials. Some of them are in progress and are expected to be completed soon.

Action taken to expedite pending jobs

Apart from raising requests for purchase of materials, we procured small items through local vendors and asked staff to work additional hours when the job was urgent.

Plant preventive maintenance

Plant preventive maintenance was carried out on the following equipment:

- Generators (big and small);
- A/C and refrigeration systems;
- Water treatment plant;
- Pumps;
- Electrical switch gears;
- Plumbing installations;
- Photocopiers, computers;
- Conference equipment;
- Light and heavy vehicles.

Jobs performed without work order

More than 500 jobs were attended during this quarter without work orders. As most of these jobs were a part of PPS maintenance, work orders were requested.

Physical facilities for Conference/Training/Workshop were provided for all training and conference activities.

Drawings and specifications were prepared for the USAID funds for Tara development.

Lights and a telephone extension were installed at the main entrance of the Sadore complex for better security.

Capital Jobs

The capital jobs committed in 1991 were completed with the exception of the vehicle ramp shed and the crop work area modification.

Energy Management

PPS was authorized by the Executive Director to start energy conservation and management for ISC. We are developing a systematic plan for Energy Management. Once the plan is ready and approved by the Executive Director, PPS will start implementing the procedures step by step. This will take some time because the proposal will be based on data collected by PPS through an energy audit of the ISC facilities at Sadore and TVC. We are compiling a format to collect the data. The energy audit will help us to determine how the energy is consumed, where we can save, etc. As an immediate measure, we have already reduced some of the excess lighting loads to conserve energy. By disconnecting the excess lighting loads, we will save approximately 100 KW every day or 2500 KW a month. More information will be sent to all programs in the future.

Future Plans

A. Improve safety devices in the labs and other areas.
B. Improve communication systems for emergencies.
C. Training for PPS staff on computer (in-house).
D. Better spare parts management within PPS.
E. Improve documentation for contract jobs in accordance with the auditors recommendations.

Travel to ICRISAT Center

The highlight of the January - March 1992 quarter was RHG's orientation trip to ICRISAT Center, from 18 January - 10 February. The purpose of the trip was to become familiar with the operations of Information Services and the Library and to establish a framework to coordinate activities. The three week trip enabled RHG to spend time with staff involved in editing, translating, production, printing, public awareness, distribution, photography, visual aids, and graphic arts.

This visit also presented the opportunity to meet research and administrative staff. It became apparent that IC is highly interested in ISC and would like to know more about our activities, as well as the two WASIP Programs. Many staff did not know we published a weekly newsletter and circulation was increased to include divisions as well as programs at IC. Interest was also expressed in receiving ISC quarterly reports at the division level. The sole copy sent to each program leader is not widely circulated.

Specific areas of collaboration were established as follows:

1. Communications. RHG will coordinate communications between IC Information Services and ISC. There are always a lot of questions and follow-up with respect to *"pending publications"* and it is best if all inquiries are directed to one person. This should also enable quicker response and turn-around time.

2. Publications. All french publications in stock at IC were sent to ISC. It was agreed that all french publications will be sent to and managed by ISC. IC receives very few requests and will only keep a minimal supply. In mid-March, we received 14 metal footlockers of english and french publications. This translates into 6300 publications, representing 20 titles. We are currently working on an adequate storage area as we are out of storage space; they are temporarily housed in the Library.

   Sales and Publication System (SPS) is a Foxpro data base system which manages the sales and distribution of publications. Whereas ICRISAT publications will be distributed gratis in West Africa, we do need to manage the information pertaining to who receives them and quantities in stock. CSU/IC provided diskettes and a users manual to set up the same system at ISC as used at IC. SPS will also be implemented in Mali and Nigeria. Some technical and logistical problems were encountered and SPS should be operational in the second quarter.

3. Mailing List. This area needs a tremendous amount of work, both at IC and ISC. It was discovered that the *"ISC French List"* contains every francophone country, including Europe. As IC routinely mails publications to all donor and international institutions, there is no reason for ISC to duplicate the effort (and expense). Jim Estes downloaded the mailing list from the VAX to Foxpro and I returned with the complete ICRISAT list. Screens were added to identify ISC, WASIP-M & N, and to enter addressees by categories of interest. This system will eventually permit mailings to be done by topic, language, program, locations, etc.

4. Library. J. Haravu was extremely helpful at explaining the structure of the IC Library, SATCRIS, SDI, and development plans to upgrade the ISC Library. One important objective is to have SATCRIS available at ISC Library. There is an IDRC grant which will provide the basis for our Library to further develop its potential in this area and to establish close links with national institutes in West Africa.

5. French Publications. It should be noted that additional focus needs to be placed on translating relevant ICRISAT publications into french for distribution in West Africa. A non-scientific survey was conducted and **from an approximate 211 ICRISAT publications, only 17 are in french** (Annex 1). It also came to RHG's attention that publications are sent to the UK for translation at considerable cost. ICRISAT translators primarily do editing and not translating. Therefore, RHG has started to establish contacts for translating to be done in West Africa. Considerable attention needs to be placed on this area if ISC is to work effectively with the National Agricultural Research Centers in francophone West Africa.

Visits and Visitors

Pierre Dandjinou, ILCA consultant, March 3-6. ILCA requested ISC assistance as Mr. Dandjinou came to Niamey to conduct a feasibility study to establish an African Documentation and Information Network.

Consequently, we did joint courtesy visits and had discussions with six libraries/documentation centers: INRAN, AGRHYMET, CIDES, CIDR (Ministry of Agriculture), Faculté des Sciences (University of Niamey), and the Bureau Organisation et Méthodes (attached to the Prime Minister's Office and in charge of CDS/ISIS activities)

It was interesting to note that the five libraries we visited used the CDS/ISIS data base, with different degrees of proficiency. The university does not have a computer. The CDS/ISIS network went through some difficulties in Niamey and presently seems to be getting new leadership. (Additional details with respect to INRAN are in the Library section of this report)

1991 Annual Report

All programs have submitted their contribution to the Annual Report. Roger Stern and RHG are coordinating the statistical/text aspects and work is progressing. The format will be changed to a two-column presentation, and black and white photos will be included in the text. We would like to have the french and english versions off the presses and distributed by September 1. As a result, each section will be translated into french as soon as it is completed. As of the end of the quarter, a first draft in french has been produced of the Groundnut Improvement Program.

Arrangements have been made for Vijay Ramchander, (translator with IC) to come to Niamey starting April 15. He will be here for eight weeks to assist with translating, and editing, as both the translator and myself are new to this domain.

Entry Hall Displays

There are extremely limited display resources at ISC. IC is in the process of providing a CGIAR map, with centers in french and english, as well as maps of Africa and West Africa. WASIP M & N are also included in display needs, especially since WASIP-N opened a new research station at Bagauda. Photos have been ordered and are expected in May. Currently, the lobby has a millet exhibit, organized with the assistance of PMIP, to coincide with the ROCAFREMI workshops.

Computerization

An HP III laser printer arrived and the HP II was transferred to the Editorial Committee office to serve the secretary and the translator. The HP III has allowed us to improve the presentation of the weekly newsletter, *INTRA-INFO*. Technical difficulties were encountered in linking the Information Services computers to a Local Area Network (LANTASTICS), in particular linking RHG's computer to the HPIII, and extending the network to the Library.

Translation and Editing Services

French/English/French Translations

The new translator, Aboubacar Madougou, is adapting and becoming familiar with ICRISAT terminology. He has provided approximately 20 translations, covering a wide range of topics for Administration, RMP, PMIP, ILCA, HRD, and ROCAFREMI, as well as composing correspondence in french. In addition, he routinely translates abstracts and articles for *"INTRA-INFO"*. A draft has been produced for the bi-annual french newsletter, *"Nouvelles de l'ICRISAT"*; he will coordinate printing arrangements. Three translations were done from french/english by AM and RHG.

Editing Services

One of the agreements with IC, was for more editing to be done at ISC by RHG, with the objective of providing documents in final format. This applies particularly to program level documents. In addition, editing is also provided for in-house documents, both in french and in english. A program for the DG and DDG's visit was compiled in coordination with Administration. A final report for the EEC grant covering 1989-1991 was completed at the end of March. Various speeches and papers were also reviewed and finalized.

Library and Documentation

Under the supervision of Francis Gbaguidi, data entry was completed on our 5000 catalog cards in the CDS/ISIS data base representing books available in the Library. Updating will be done systematically, as we plan to entirely automate our catalogue system. We now have available a catalog of our books which can be referenced by subject or author. It will be distributed to ISC programs and we can foresee circulation to libraries in the region, such as INRAN, INERA (Burkina Faso), INA (Benin) and RESADOC.

Library Publications

Content Pages of Journals: The presentation of our weekly bulletin was changed. It now includes a cover page which summarizes journals, newsletters, and bulletins received during the week. This service is still well appreciated by scientists and we provide a lot of copies of requested articles.

New Books in the Library: In February, we started to issue a bi-monthly bulletin of new books received in the Library. It is distributed to ISC and WASIP scientists and will soon include libraries in the region.

Press Cuttings: for internal distribution only. We began to circulate two bulletins: (1) Currency rates, from the International Herald tribune, distributed to the ED, Team Leaders, the RAO, the RFO, and to the Purchasing Officer; and (2) articles pertaining to events in Mali, Niger, Nigeria, and agriculture in the Sahel.

New Addition: Multipurpose Tree and Shrub Database

We installed on the library's computer, the Multipurpose Tree and Shrub Database (MPTS), designed by the International Council for Research in Agroforestry (ICRAF) and the Deutsche Gesellschaft Zusammenarbeit (GTZ). The MPTS is a computer-based information and decision-support system which enables quick and efficient access to a consolidated pool of information on tree and shrub species. It provides a tool to assist in the selection of species for use in agroforestry and related research using bio-physical determinants, tree characteristics, and other factors relevant to the chosen agroforestry technologies.

The installation of this new program was brought about by the visit of B.M. Bondole, ICRAF, who is also contributing to the development of INRAN's library, in conjunction with RESADOC (see visitors below).

We also added to the library CDS/ISIS data base, 827 references on agroforestry in the Sahel from RESADOC (Mali), ILCA (Ethiopia), and ICRAF (Kenya). These valuable additions will enable us to increase our reference service to our users.

Visitors

1. Mr Frantao Souleymane (RESADOC consultant) and Mme Adamou (Librarian of INRAN), 10 January 1992 and 25 March 1992. Collaboration between INRAN, RESADOC, and ICRISAT was discussed, especially a new project which would involve compiling a bibliographical data base of documents about agriculture in the Sahel. The last visit of Mr Frantao at ISC was in April 1987, and he was very impressed by the Library and its progress. As the Librarian at INRAN is a new CDS/ISIS and MPTS user, the ISC Librarian will provide on-going support.

2. Twenty trainees from the WARDA Course on Computer Applications and Statistical Analysis in Agricultural Research, 3-28 Jan 1992. They were highly interested in our CD-ROMs and requested searches. Some participants wanted to borrow books to take back to their home countries, which reiterates that an Inter-Library Loan Policy needs to be developed with libraries at National

Agricultural Research Centers. We did assist with photocopying relevant sections of books.

3. Twenty-eight trainees from the course on Experimental Stations Organization and Management, 6 Feb-10 Mar, 1992, accompanied by P.G. Serafini (University of Arkansas) and Hannibal A. Muhtar (International Agricultural Division, Agricon Int., Ontarion, Canada). They were interested in books dealing with farm management. They appreciated the library facilities and the quality of our collection.

Other Activities

We are updating our library with bulletins, newsletters, and annual reports from international and regional institutes (See Annex II). Particular attention is being given to documentation relevant to Africa, agriculture in the Sahel, and increasing our collection of french publications.

Human Resource Development Division

Training Courses

Two external regional courses took place at ISC during the quarter:

a) WARDA/ICRISAT-ISC: *"Computer Applications and Statistical Analysis in Agricultural Research,"* from 06-31 January at the TVC. Sixteen participants were from Cameroon, Côte d'Ivoire, The Gambia, Ghana, Guinea (Conakry), Nigeria, and Sierra Leone.

b) University of ARKANSAS/IITA/ICRISAT-SC: *"Experimental Station Operations Management"* from 10 February-6 March 1992. Twenty-eight trainees from nine African countries: Benin, Burkina Faso, Cameroon, Guinea (Conakry), Niger, Senegal, Chad, Rwanda.

Technician in-Service: SAIDOU Abdousalam, Senior Research Assistant in Agroclimatology (RMP) is still at the University of Reading completing his Master degree course work.

Internal Language Courses

- French classes for principal staff, spouses and children resumed on 08 January. During the term, 4 senior staff and 10 spouses and children attended.
- English classes resumed at Sadore on 13 January 1992. They were run by two teachers from the American Cultural Center. About 70 students from ISC support staff attended this language course.

Computer Courses: A one week Training course on *"Basic Computer Use and the Use of Word Perfect"* was held from 3-7 February at TVC by CSU. ICRISAT employees attended the course.

Seminars

- *"Plants Roots Study and Research on the Cultural System in Agroforestry"* by Mr. Arjan Gijsman, candidate for the position of the Resources Management Program Unit in Agroforestry on 08 January.

- *"The Use of Simple Crop Models for the Interpretation of Agronomic Data"* by J.H. Williams, Physiologist at ISC on 23 January.

- *"Soil Properties Under Legume Based Production Systems"* by Somda Zana, ILCA researcher on 29 January.

- *"Microvariability of Pearl Millet Yields in Connection to the Organic Matter Cycle of Arenosols"* by L. Herrmann of the University of Hohenheim/ICRISAT, on 05 February.

- *"Agroforestry, Livestock and Sustainable Nutrient Cycle in the Sahel"* by M. Powell, ILCA on 19 February.

- *"Modelling Economic Outcomes of Crop-Livestock Interaction"* by T. O. Williams, ILCA on 04 March.

- *"Evaluation of Crop Residues as Feed for Ruminants in Crop Livestock Systems"* by S. Fernandez, ILCA, on 15 April.

- *"Agronomic and Physiological Aspects of Postflowering Drought Tolerance of Pearl Millet"* by Peter Bieler on 19 March.

Visitors

14 Jan	Dr. Pierre Antoine, Director of Africa and Middle East Division, Winrock International.
14 Jan	Dr. J.D. Paschke, Coordinator of PRAAN project, Applied Agronomic Research Project, Niger.
1-28 Feb	Mr. N'Diaye Mamadou, Chief Agrometeorology Division of National Meteorological Services of Senegal worked with Agroclimatology Program at ISC from 1-28 February 1992 to prepare the information Bulletin on the Agroclimatology of Senegal.
6-14 Feb	Mr. Lucien Lamarque, INTI from 6 to 14 February.
12 Feb	Commandant Raoul Viger, Technical Adviser at the Ministry of Interior and 3 officers on 12 February.
20 Feb	Mr. Greg Neff, Science Instructor, with 15 students from American School on 20 February.
9-10 Mar	Mr. Ato Getahun KIFLE, Training Assistant/CIPEA, 09-10 March.
23 Mar	Prof. ALLACHE Aomar Daniel, Faculté de Pédagogie, on 23 March.

Travel/Field Trips

- 16 trainees from WARDA Training Course visited AGRHYMET on 16 January and INRAN Kollo on 24 January 1992.

- 28 trainees from the ICRISAT-SC/IITA U. of ARKANSAS Course on *"Experimental Station Operations and Management"* to ARDETEC and INRAN Kollo on 26 February 1992

Staff

The Principal Training Officer will depart Niamey at the end of April 1992 after 3 years of service to return to the USA. Mr. Malam Ari Kori, Administrative Assistant, finished his six month *"Trial Period"*. His probation period was extended for another three months until 10 May 1992. Mrs d'Almeida Zara resumed work on January 20, 1992 after maternity leave.

Purchase

The two photocopiers (Sharp SF-8300) ordered in October 1991 were received in early February 1992, one is at ISC-Sadore, one at TVC. The other former 3-year old photocopier (Sharp SF-7350, ISC-05550) was transferee on 04 March 1992 to the Statistic Division at the request of Dr. R. Stern and with the concurrence of the E.D.

GROUNDNUT IMPROVEMENT PROGRAM

RESEARCH

Annual Report

We completed analysis of 1991 experiments and preparation of the Annual Report for 1991. Below is a summary of the major activities covered in the report.

During 1991 we continued to develop screening procedures for drought and heat tolerance. We further examined the role played by crop residues and mineral nutrients and initiated a complex rotation trial aimed at developing a system that not only improved agricultural production but also ensured fertility maintenance and water use efficiency. Intercropping studies were conducted to identify compatible and productive pearl millet and groundnut genotypes for intercrop situation. Studies were initiated to determine the most appropriate period for sowing post rainy season groundnuts.

Our knowledge on factors causing crop growth variability in groundnut and their management was enhanced and our studies on both early and late leaf spots was consolidated. We conducted a survey of groundnut viruses in collaboration with IRHO in selected countries in West Africa and studies on the aflatoxin problem received increased attention.

A number of introduced and existing lines were evaluated for identification of parental lines for use in the hybridization program. Several crosses were made during the year involving parents with different attributes that had been evaluated earlier. We conducted preliminary and advanced yield trials, SADCC/ICRISAT trials and Regional Trials.

Our collaboration with NARS was expanded to include Guinea Bissau in addition to Benin, Guinea, Niger, Nigeria, Senegal and Sierra Leone. We attended the Second International Conference on Groundnut held at ICRISAT Center. We continued to train students during the year.

Hybridization

Of the 3170 pollinations made in November and December 1991, we harvested 1139 hybrid pods. (i.e. 36% rate of success). This was an improvement over the previous hybridizations in which the average success rate was less than 30%. The resulting 70 F_1 different crosses were sown in the field to advance the generation and confirm hybridity.

Crossing Block: We established a crossing block in the glasshouse for the fourth series of crosses and started making pollinations. We also started making backcrosses for IAR-Nigeria at the request of the groundnut breeder (Dr. P. Olorunju).

Sowing date trial

We completed sowing the remaining sowing date treatment (5 to 8). In 1991, harvesting of the earliest maturing line, 55-437 in the first sowing treatment was on 13 March. But this year, the same line had not attained physiological maturity. This may be attributed to the below average night temperatures during December and January which retarded canopy development and flowering.

Heat stress trial: We sowed the heat stress trial on 24 February 1992.

Drip irrigation: We sowed a trial in which we are testing drip irrigation as a means of screening for drought and heat stress on 4 March 1992.

Aflatoxin trial: A trial investigating the effect of varying water regimes on aflatoxin contamination was sown on 20 March 1992.

Conferences/Workshops/Seminars

BJN attended the Annual Research Review Meeting held in Banjul Gambia 24-27 February 1992. He also attended the Fifth SADCC/ICRISAT Regional Groundnut Workshop held at Lilongwe, Malawi, and presented two papers. BRN participated in the fourth program work conference of the Sierra Leone Institute of Agricultural Research at Njala.

BRN also participated in the RMP and PMIP Inhouse-Reviews and presented a terminal report on the cowpea project.

Third Regional Groundnut Meeting for West Africa

Invitations for the Third Regional Groundnut Meeting for West Africa were sent to NARS in the region as well as regional and selected international organizations. Responses have been received from Congo, Benin, Cameroon, Nigeria, Liberia, SAFGRAD, IRAT-IRHO, and ICRISAT Center. Reminders are being sent to those that have not yet responded. We travelled to Ouagadougou to sort out logistics for the meeting.

Seed supply

We supplied 15 kg of seed for 55-437 to WARDA, and 4 kg each of 11 cultivars to IAR-Nigeria for state trials. We also sent to Algeria, 200 gm seed of each of 13 early maturing lines at the request of the Director of Agricultural Research. We started receiving seed requests for the 1992 trials.

Training

Aoua Traoré, Groundnut Pathology Research Assistant, went for two months training course to ORSTOM Dakar to learn about culturing groundnut nematodes, especially *Scutellonema* spp.

Collaboration with NARS and other Organizations

We completed the statistical analysis of our collaborative trials in the region and sent results to each NARS involved with our trials. We held a meeting with IAR-Nigeria groundnut breeders to discuss areas of collaboration. At the request of USAID we started working on the etiology and management of unknown disease that kills neem trees in Niger.

Visitors

06 Jan:	Mrs. A. Kruiter, Ministry of Foreign Affairs of the Netherlands, Directorate of International Cooperation.
26-29 Jan	Drs. Boye-Goni and P. Olurunju, IAR Groundnut Breeders

07 Feb	Mr. Lucien Lamarque, NRI/CNEARC
10 Feb	Mrs. and Mr. Canningham, forage legume breeder and catchment advisor, respectively, from Australia.
12 Feb	Ms. Valentina Mazzucati, Research Assistant and Mr. Philip Pardey, Senior Research Officer, ISNAR.
14 Feb	Mr. Sikora, Chief of the Division of seed at FAO Rome.
06 Mars	Drs. Mudock and R. Kitch of Bean cowpea CRSP, Purdue University, USA.

6. Publications

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PEARL MILLET IMPROVEMENT PROGRAM

General

We held an IHR on 13 & 16 March, 1992. We presented progress reports for seven projects, revised proposals for three projects, seven terminal project reports, and five new project proposals. Two documents - one for projects and the second for data and figures - were prepared and circulated. Summary of discussions and current status of the projects are being prepared for the revised RPMIS format. These will be sent to DDG, IC. Two representatives, one of INRAN (Dr. B. Ouendeba) and one from IER (Mr. M. Bagayoko) participated in our reviews. The project proposal on the *"Development of pheromone traps for improvement strategies to reduce loss of pearl millet caused by stem borer"* submitted to ODA was not favorably considered for holdback funding. Mr. Peter Bieler, Ph.D student in millet physiology completed his thesis for submission to Swiss Federal Institute of Technology in Zurich. He delivered a seminar on his research on March 19. He left ISC on March 29, 1992. Seminars were delivered by W.A. Payne (27/1/92) and D. Hess (6/2/92) on progress made and future plans of research in their respective subprograms. First draft of annual report for the program was completed. Arrangements for the Network meetings (Steering Committee and General Workshop) were completed.

Research Activities

Our research projects were recently reviewed in the Pearl Millet Improvement Program's In-House Review. The following projects were presented and approved with very minor modifications : 1) Evaluation of Pearl millet for tolerant to terminal drought in West Africa 2) Pearl millet adaptation and acclimatization to environmental stress in West Africa and 3) Evaluation and Intensification of millet production systems in the Sahelien zone.

We have completed analyses for Bray I available P, total N, pH, and organic matter for the Gao experiment conducted in collaboration with RMP/Physiology. There is a marked gradient of decreasing fertility with increasing distance from the tree. The gradient is particularly strong for available P. Photosynthesis data still have not been analyzed because the leaf chamber apparatus had a faulty PAR sensor and leaf thermocouple. Since PAR and leaf temperature were measured independently, corrections can be made to the gas exchange data. However, this will require considerable programming time. We have received a new leaf chamber for this year's experiments.

A revised experimental plan has been implemented for the terminal drought project. The experiment, which is currently underway, uses historical rainfall and potential evapotranspiration records to simulate three rainfall zones: 200 mm, 300 mm, and 600 mm. Twelve millet varieties have been planted at four densities. Detailed growth analyses and soil water measurements are also underway, and the experimental site is being used to test microlysimeter and canopy analyzer equipment.

Preliminary data from our compost pits continue to suggest that the design has lead to considerable decrease in the amount of water (and therefore labor) required. We will have ample supply of compost, with and without rock phosphate, to begin preliminary yield trials for this coming rainy season. We have ordered an oxygen probe and suction lysimeter to begin chemical analyses. For the geomorphological farming system experiment, we have tested eight varieties of leguminous species for their ability to establish themselves on the plateau position. Thus far, only Sesbania seems to be establishing well, with three others

showing moderate establishment ability. The remaining four species will be dropped from consideration. Four new species, which were suggested by RMP/Agronomy, will also be assayed during this rainy season. We are also planning to obtain rice residue to meet experimental objectives of this study. We have not identified a satisfactory method of determining soil N balance in the rice fields, but discussions with B. Christianson IFDC, have indicated that the total N content of the riverbed position is high enough that removing rice straw should have no substantial effect on sustainability of rice production.

The article *"Soil phosphorus availability and pearl millet water-use efficiency"* will appear in the July issue of Crop Science. Two companion articles are nearing completion. The first is on photo-synthetic mechanisms of pearl millet as affected by P deficiency. The second is on millet nutrient uptake and partitioning as affected P, growth stage, and water stress. We have begun work in collaboration with our pathologist on a manuscript which describes long term spatial and temporal trends in *Striga* counts, and relates these to rainfall records. An abstract reporting the non-destructive estimation of *Striga* biomass from shoot length and diameter has been submitted in collaboration with PMIP/Pathology for the American Phyto-Pathological meetings. Results of these studies have enabled us to develop new hypotheses, which are being tested in preliminary field trials this year, on the cultural control of *Striga*.

In our pathology subprogram, the off-season DM nursery at Sadore consisted of six trials and included 704 lines. Final observations were made at the dough stage at which time (98 DAS) DM incidence and severity in breeders materials were 13 and 12%, respectively. DM incidence and severity were both 24% for the improved control CIVT. For the DM susceptible controls ICMS 8410 and 7042, respective DM incidence were 50 and 82% and severities were 47 and 81%. During the course of the season 25% of breeders' materials were disease free and 18% showed low levels of disease (DM incidence $\leq$ 5%).

The International Pearl Millet Disease Nursery (IPMDMN) which had been sown at Bengou during the rainy season was conducted again at Sadore during the off-season. Both DM incidence and severity within the trial were 13%. Six entries were free of disease: ICMB 88004, ICMB 89111, ICMB 90111, ICMA 90111, PRLN 2/89-169 and GL 29. Entry ICP 220 was most severely attacked with DM incidence and severity of 56%. DM incidence and severity on the improved check 7042 DMR were 18% and 43% on the susceptible check 7042 DMS.

At Bengou, DM incidence and severity in IPMDMN had been higher (42 and 39%, respectively). All entries had shown some disease but incidence on ICMP 423, ICMB 90111, ICMA 90111 and ICTP 8203 (original) was low ($\leq$ 5%). The entries ICP 220, 7042 (DMS) and 7042 (DMR) were severely attacked (with DM incidence of 99, 94 and 100%, respectively, and DM severity of 99, 93 and 100%, respectively).

Data for the WADMSON regional trial were received from all but one participating national program. The average disease severity at the dough stage ranged from 4% at Samaru (Nigeria) to 17% at Bengou (Niger). DM incidence at Bambey (Senegal) was 6%, 12% at Cinzana (Mali) and 9% at Kamboinsé (Burkina Faso). All entries were attacked at Cinzana (supporting an earlier report of the high aggressivity of the DM pathotype there) but eight lines showed resistance (severity $\leq$ 5%). At Bengou only Synth 16-Co (from Mali) was free of disease but 7 other entries showed resistance. At Kamboinsé although only Mooni Nord (from Guinea Bissau) showed no signs of disease, 19 entries were resistant. At Bambey and Samaru, 25 and 12 entries, respectively, were free of disease. Entries from Chad, Côte d'Ivoire, Gambia, Guinea Bissau, Niger, Nigeria and Mali showed average DM severities of 3 to 7% across all locations. Entries contributed by Burkina Faso, Cameroon,

Mauritania and Ghana showed average DM severities of 9 to 14%. Whereas average DM severity on local susceptible and improved checks was 23 and 12%, respectively, the highly susceptible 7042 showed 82% DM.

The entries of the WADMSON trial were also screened for reaction to smut. Results were received from four locations: Bambey, Bengou, Kamboinsé and Samaru. Mean smut severities were 48, 21, 7 and 3% for each respective location. The same trend was observed for smut severity on each variety tested with four exceptions: ICMV IS 82271 from ISC was more severely attacked at Kamboinsé (10%) than at Bengou (6%); ICMV IS 82298 also from ISC, Ex-Laebi from Gambia, and CMB 34 from Burkina Faso were more severely attacked at Samaru (15, 8 and 19%, respectively) than at Kamboinsé (4, 6 and 7%, respectively).

Emergence of *Striga* on millet grown in pots in the glasshouse was low through December but is improving in succeeding plantings. We are conducting a preliminary trial in a farmer's field to investigate the effect of preseasonal rainfall on *Striga* infestation in the following growing season.

In our millet entomology subprogram, data analysis on experiments carried out during the last rainy season and report writing were completed. Research plans for the 1992 rainy season are underway.

Development of a rearing technique for Millet Stem Borer (MSB) has given encouraging results. A suitable commercial diet (Bioserv mix # 9782) is available. To optimize rearing of MSB, we conducted experiments to determine the role of certain parameters such photoperiod, relative humidity, and temperature on development. We used four temperature treatments (24, 26, 28, and 30°C). Preliminary results indicated no significant differences in treatments, although temperature at 28°C provided more insects which completed development. We investigated the effect of photoperiod on MSB development. Preliminary results showed a 12:12 Light (L):Dark (D) not significant from 14:10 L:D. However, the 12:12 L:D treatment provided slightly lower developmental time.

Employing the technique for infesting millet with MSB using millet plants in cages, we conducted an experiment to determine the number of diapausing larvae which would result in population densities causing at least 70% damage to millet. Results showed that 63% and 87% of plants were infested when 100 and 200 larvae per cage were used, respectively; whereas 48% plants were infested when 300 larvae per cage were used. In the field 3,000 larvae per ha can be used to enhance infestation levels, as effect of crowding is reduced. This technique has particular potential for use in NARS where mass-reared insects are not available for screening for resistance.

Twenty two (22) varieties including IMZAT were observed under natural infestation for their reaction to MSB at Sadore and Chikal. Among these, ICMV 89305 and ICMV 8212 showed some level of tolerance to MSB attack.

In collaboration with the Insect Chemistry Group at the Natural Resources Institute (NRI) in UK encouraging results on MSB pheromone research were achieved. In 1991, we conducted studies to 1) optimize attractive synthetic pheromone blend of MSB, 2) evaluate the efficacy and longevity of the pheromone when dispensed from the new polytene vial dispenser, and 3) identify suitable trap design parameters to enable the use of a pheromone baited trapping system for large scale monitoring. All research activities were conducted in farmers' fields.

We conducted a field experiment to evaluate the effect of increasing amounts of AGC3 with respect to AGC1 and AGC2 on male MSB trap catches, using sticky board traps. Results showed AGC3 to be an essential component of the attractive blend. The effect of increasing amounts of AGC2 with respect to AGC1 and AGC3 showed AGC2 to be an

essential component of the attractive blend. Proportion of AGC2 could be increased to at least 16% with respect to AGC1 without adversely affecting the catch of male MSB.

We observed the catch of MSB males in traps baited with the original polytene vials was reduced over a 32 day period. Difference in attractiveness of new and eight day old polytene vial dispensers to male MSB was not significant. We observed no reduction in catch with new and 28 day old dispensers. New dispensers maintain their initial activity for at least 28 days in the field. We also found new polytene vial dispensers to be more attractive than the original dispensers. Thus, new polytene vial pheromone dispensers should be used for future monitoring studies. sticky board traps baited with synthetic pheromone placed at ground level caught more male moths than traps at or nearer to the top of the crop.

When baited with MSB synthetic pheromone, the sticky board trap was significantly better in terms of numbers of MSB males trapped, however, the sticker needs careful maintenance and replacement at regular intervals. We designed a new trap with a varying combinations of water, oil, or sticky glue. Results showed mean MSB male catch per trap night of 76.4 (a total 840 moths) for water+oil trap baited with pheromone, 49.5 (545 moths) for trap with oil only baited with pheromone, 1.6 (18 moths) for water trap only baited with pheromone when traps were baited with pheromone. Thus, when baited with pheromone blend, traps consisting of combination of water with oil caught significantly more male moths than water alone, or oil alone baited with the same pheromone blend.

We compared the relative efficiency of water+oil-based with non-drying insect glue-based trap. We observed that traps with water+oil when baited with pheromone significantly caught more male moth (total 2,770, mean 153.9) than traps with non drying glue alone baited with same pheromone blend (total 208, mean 11.6). This experiment indicates the combination of water+oil was far better than using non-drying insect glue.

We compared relative efficiency of sticky board trap with water-oil trap. We found the water-oil trap to be much more efficient than the popular sticky board trap. The former caught a total of 1,036 males (mean 45.0 per 2T/N) compared with a total of 518 (mean 22.5 per 2T/N) for the sticky board trap.

We initiated a culture of the millet head caterpillar (MHC) in the laboratory and investigated the role temperature and photoperiod on its development, and encouraging results were obtained. To optimize production of MHC in the laboratory, we used same conditions as described above for temperature and photoperiod levels for MSB. Although not significant, temperature of 28 and 30°C and 12:12 L:D provided lower developmental time. Larval survival until adult was much higher in 28°C temperature. Development of more efficient rearing technique is in progress.

We developed an infestation technique using caged millet heads. Results from this experiment showed that 15 first instars caused significantly more damage (4 average rated damage) than other treatments. We plan to use 15 or more larvae in future studies to determine desirable level of infestation.

Twenty two (22) varieties including IMZAT varieties were observed under natural infestation for their reaction to MHC at Sadore and Chikal. Among these, MBH 110 showed some level of tolerance to MHC attack. Further work will be conducted under uniform infestation levels.

We repeated an experiment related to migration of MHC from millet heads to soil, and found that larval migration mostly occurs between midnight and 0600 h with peak activity around 0400-hr. We also found that migrating larvae do not move to soil by directly crawling along stem. We observed small larvae using a silken thread, indicating that they are able to move from plant to plant, being carried by the wind.

In previous years, we have reported that scarabid beetle (SB) causes significant grain losses on station in 1991, we areas in Niger and sampled farmers' fields for infestation by this beetle to ascertain its pest status.

We sampled following five transects Niamey - Say, Niamey - Makalondi, Niamey - Tillabery, Niamey - Filingué, and Niamey - Birni-Gaouré. In most sites, we found high populations densities. The greatest mean number of beetles per head was 21.1 in Lontuabery in the Niamey - Say transect. Infestation was observed to be more in the South in the Niamey -Say and Niamey - Makalondi transect and showed a tendency to decrease in the North. Our results show that SB is not only important on the station, but also in most millet growing areas sampled. We observed peak activity of SB to be between 2200 and hr and lowest activity between 0400 and hr.

We are collaborating with the Resource Management Program (RMP) Operational Scale Research (OPSCAR) trials to gather information on the effect of crop residues and cultivation methods. Preliminary results showed that soil populations of SB were high in plots where animal traction was used than in treatments where hand cultivation was used. We observed a cultivation technique x residue interaction. We have observed that treatments with high residue levels resulted in more SB in soil. Our preliminary results showed that traditional cropping and hand-cultivated plots had less SB in the soil than in plots where animal traction was used.

In our In-House Review two projects were proposed. The two new projects are: Bioecology and integrated management of the millet stem borer, *Coniesta ignefusalis*, and Bioecology and integrated management of millet head pests with emphasis on the millet head caterpillar and the scarabid beetle.

Our colleague entomologist in Benin reported serious damage to millet by blister beetles in farmers fields in Benin, and requested for help on control measures and literature. We provided a set of literature related to blisters beetles in collaboration with DFPV (CILSS) (Department of Training in Crop Protection) and sent literature to Mr. Alphonse Yehouenou. Discussions were also carried with Dr. Sigilbert Dossou-Yovo, head of Program (Sorgho Mil Fonio), SRCV-INA, N'dali in Benin during a visit in January, 1992.

In the Southern Sahelian Zone (SSZ) breeding unit the major activities were harvest of two isolation plots (ITMV 8001 and ICMV IS 85327) and harvest of male-sterile and maintainer lines from the DM nursery. Postrainy season plantings were completed on Jan 17. Material planted included: 768 half-sibs (in 3 groups) of variety ICMV 86330 for evaluation, male-sterile and maintainer lines (74 pairs), landraces from Niger (for a joint project with INRAN), S_1 progenies of Malian Dwarf Composites (for possible conversion into male-sterile lines), F_2 populations involving *tr* and **bmr** traits, male and female parents for production of 25 inbred x variety hybrids, S_1 progenies of composite 851 for development of eight varieties, 9 varieties for multiplication for inclusion in advanced variety trials, crossing block for production of full-sibs of GRxGB and P3 Kolo x Ex Bornu and Ex Bornu x Mansori (the latter two for INRAN). In addition, three isolation plots were planted to multiply improved SOSAT-C88, random mating of GR X GB population, and multiplication of GB 8735. Breeding operations were started on Mar 9 and by Mar 31 95% of the planned crosses, sibling and selfing operations were completed.

In our Transition Zone Breeding unit data analysis and contribution to our annual report were completed. Project progress reports were prepared and presented at the IHR. Material planted in October last was harvested. December planted material is still in the field. These plantings include material to derive experimental varieties, multiplication of elite lines, crossing blocks. Breeding operations were nearly completed.

Regional Millet Breeding

In the Regional Millet Breeding (RMB) sub-program, activities includes regional yield data analysis, report writing, presentations, organization, and participation in the regional millet network (WCAMRN) meetings.

Analysis of the 1991 regional collaborative millet yield data was completed for seven sites in Niger, seven in Nigeria, three in Cameroon, two in Senegal, two in Ghana, and one site from each Benin, Burkina Faso, Chad, Mali, and Mauritania - a total of 26 sites. Several ISC bred millet varieties showed promise in these countries although data is continuing to be prepared for multilocational analysis to determine stabilities of the varieties tested commonly in these locations.

We presented relevant site yield data results to the six NARS participating in the WCAMRN Project 1 (Jan 21-24, 1992), Nigeria during the IAR Annual Cropping Scheme meeting (Feb 24-28, 1992) at Zaria, Nigeria, and to the ISC In-House Review (Mar 13-16, 1992).

We organized and participated in the following WCAMRN meetings: Project 1 review meeting (Jan 21-24, 1992), Steering Committee meeting (Mar 26-29, 1992), a general regional network planning meeting (Mar 30-Apr 3, 1992) and a subsequent Steering Committee meeting (Apr 4-7, 1992). The annual report of the WCAMRN coordination was prepared and presented during these network meetings.

Out in the experimental fields, planting to making of crosses and self-pollinations were completed Mar 30, 1992.

In the In-House Review, the breeding subprogram presented progress reports for the projects: Diversification and use of genetic variability, Population improvement for high yield and disease resistance, Breeding of seed parents and hybrids, Identification of parents, genetic diversification and use in variety development, Breeding of full-season varieties, Yield tests and exchange nurseries, Regional testing and cooperation in West Africa, terminal report for Germplasm evaluation, and a new project on Genotypic structure of *in situ* populations of wild and cultivated species (ORSTOM).

Training

Our entomology unit was involved in the training course on *"Experimental Station Operations and Management"* (ESOM) jointly organized by ISC University of Arkansas and IITA. Twenty seven participants from 10 countries attended this course held from 16 Feb - 6 Mar 1992. A 28 page-manual in French (program level publication) on *"Pesticide use, biosafety and management"* was prepared by OY and distributed to participants.

Visitors

07 Jan	Dr. A. Gijsman visited and interviewed for the Agroforestry position at ISC.
06 Jan	Mrs. A. Kruiter, Director at of International Cooperation, Ministry of Foreign Affairs, Netherlands.
20 Jan	Dr. O. Niangado, IER, Mali.
23 Jan	Dr. Botorou Ouendeba, INRAN.
24 Jan	Mr. Sidi R'chid (Mauritania), Mr. Demba Farba M'Baye (Senegal) and Dr. Oumar Niangado (Mali).
11 Feb	Mr. Lucien Lamarque, NRI (Natural Resources Institute, ODA, UK).

12 Feb	Dr. Philip Rardey and Mr. V. Mazzucatto (ISNAR).
15 Feb	Mr. Sokora, Chief Seed Division, FAO, Rome.
20 Feb	Mr. Greg Neff, science instructor (American School of Niamey) and 20 students.
24 Feb	Twenty nine (29) trainees attending course on farm management.
27 Mar	Dr. Frank E. Gilstrap, Professor, Department of Entomology, Texas A&M University.

Travel

DEH and family returned from home leave on 26 January.

DEH to Burkina Faso from 27-29 February to participate in the *Comité Technique Zone Est* meeting organized by the Institut d'Etudes et de Recherches Agricoles (INERA).

SNL to ISC, Niamey from 8-18 March to participate in the IHR of PMIP and RMPs.

DEH to Bamako from 10-13 March to participate in a meeting sponsored by the West and Central African Sorghum Network to discuss coordination of *Striga* research.

DEH accompanied a group from USAID-Niamey to Madaoua and the Majya Valley from 19-21 March to observe and evaluate cases of reported *"neem decline."*

Others

An inventory was made of pathology subprogram materials at Sadore and at Bengou. Two fungal species were isolated from twigs of neem trees thought to be affected by the *"neem decline"* disorder. In collaboration with Dr. Waliyar (GIP), inoculations of young neem trees by these organisms were carried out in the glasshouse and observations are continuing. We are also conducting (in collaboration with USAID) a fungicide trial on trees showing signs of the disorder in Niamey. A paper by Hess et al. on *"Selecting sorghum genotypes expressing a quantitative biosynthetic trait that confers resistance to Striga"* appeared in the February issue of Phytochemistry.

Weather

Weather data for the months of January, February and March 1992 are presented below. Mean maximum temperatures in January, February and March were inferior to the long-term averages while the minimum temperatures were close to or above the long-term averages. Relative humidity was lower in February and March in comparison to the long-term averages.

Month	Rainfall (mm)		Max Temp		Min Temp		Relative humidity	
	1992	Avg.	1992	Avg.	1992	Avg.	1992	Avg.
Jan	0.0	0.2	30.3	32.9	16.3	15.9	26	24
Feb	0.0	0.2	34.6	35.9	18.7	18.4	16	21
Mar	8.1	2.2	38.3	39.0	22.7	22.8	16	20

Staffing

Mr. Kimso Alassane, Programmer/Analyst in the Agroclimatology subprogram travelled to FAO, Rome for training in the use of ARC/INFO software for applications in Geographical Information Systems (GIS) from 2-23 March 1992. Mr. Alassane worked mainly on the different GIS data bases on Africa available at FAO.

Lüdger Herrmann, Research Scholar with UH, left in February to return for 2-3 months to Germany to start dust analysis.

John Lamers, Research Scholar with UH, arrived on March 27 and will act as coordinator until the arrival of Dr. F. Mahler on May 7.

After 4 years of collaboration within the UH program, Mr. Boube changed to ICRISAT/ICRAF.

A driver was hired in the UH Program to facilitate travel from Niamey to Cotonou.

RESEARCH

Agroclimatology

Most of the time during this quarter was spent on analysis of data collected during the 1991 rainy season. We prepared two reports: the first for the ICRISAT Center Annual Report 1991 and the second for the ICRISAT West African Programs Annual Report 1991. Salient features included in these reports are given below.

Rainfall Climatology of West Africa: Niger

Collection and analysis of climatic data for West Africa, in collaboration with the National Meteorological Services in the region, is one of the major activities of the Agroclimatology program at ISC. Results of these studies have been published as Information Bulletins in the series entitled *"Agroclimatology of West Africa"*. We published a bulletin on Niger in 1978, but the data used for this bulletin covered the period up to 1969 and did not include the drought years of the past two decades. Hence, in cooperation with the National Meteorological Services of Niger, we analyzed daily climatic data for 42 stations in Niger from 1961-90, the most recent climatic normal period. A document was prepared containing 59 pages of text and 24 figures along with seven appendices summarizing the results of these analyses. This document is being processed by the Information Services at ICRISAT Center for publication as the second edition of the *Information Bulletin No.5 entitled "Agroclimatology of West Africa:Niger"*. Translation of the document into French is in progress.

Wet Excavation Method for Pearl Millet Root Studies on the Sandy Soils of West Africa

The wet excavation method of studying root systems provides a clear picture of the entire root system of a plant as it exists naturally. Although it was recognized that in sandy soils the excavation method works faster, few efforts have been made to apply this technique on these soils in West Africa. This method involves digging a trench and use of water under pressure to remove soil particles from the root system. This technique has been mainly used in studying plant species with woody roots such as trees and shrubs and only to a limited extent for cereals. During the 1991 rainy season, we adopted the wet excavation method for studying the root systems of two millet cultivars, CIVT and Sadore Local, planted on 5 May 1991 on the sandy soils at ISC.

An advantage of the wet excavation method is that no elaborate equipment is necessary. We used water from a gravity-fed mobile 6000 l tank parked adjacent to the plot, approximately 75-cm above ground level. It supplied a 6-8 cm stream of water at a relatively high pressure. A trench measuring approximately 1.0 m long and 0.8 m wide was dug around the selected pocket to a depth of 2.5 m. A slight slope created at the bottom also permitted water flow and collection at one end to allow bailing out water at regular intervals. Washing of the soil was always started at the top and continued steadily downwards. Water pressure and spray pattern were controlled to rapidly remove soil particles with little injury to the roots. Generally it took about 3-4 hours to wash the root system free of soil and extract the whole root system from one trench.

The maximum rooting depth for CIVT was 168 cm as opposed to 125 cm for Sadore Local. In general, cv. CIVT produced more roots than cv. Sadore Local. The maximum root number for cv. CIVT was 506/pocket at 75 DAE while cv. Sadore Local produced a maximum of 521 roots in a pocket. In the case of CIVT at 24 DAE, roots accumulated almost as much dry matter (30%) as in leaves and stems. Afterwards the proportion of dry matter accumulated in roots declined steadily reaching 17% at maturity (98 DAE). The proportion of dry matter accumulated by roots of cv. Sadore Local was higher than cv. CIVT and was over 20% throughout the growing season. The local millet cultivar invested more dry matter in the roots which could explain in part its ability to

maintain a large number of roots till maturity. Root/shoot ratios for the two cultivars also showed that cv. Sadore Local was able to maintain a higher root/shoot ratio in comparison to cv. CIVT.

Comparison of Relay Cropping and Intercropping Systems of Millet and Cowpea

In field trials during 1986 and 1987, we demonstrated that in years with early onset of rains, the long growing season could be exploited by growing a relay crop of cowpea after the first crop of short duration millet of 90-100 days. However questions still remain on the advantage offered by the relay crop relative to the traditional practice of intercropping long season millet with cowpea.

In field trials from 1989-91, we evaluated the relay crop system with the millet/cowpea intercrop, sole millet, sole cowpea and the traditional control. In general, the relay crop accumulated more dry matter due to the fact that it was grown at the sole crop configuration of 0.75 m x 0.80 m in comparison to the intercrop millet which was spaced at 0.75 m x 1.33 m to accommodate the intercrop cowpea between the rows. Also, since the relay crop cowpea was grown essentially as a sole crop for its hay, it was sown at a higher density (0.38 m x 0.40 m) as opposed to intercrop cowpea which had to be sown at a low density in a wider configuration of 0.75 m x 1.33 m to avoid competition with millet. Grain yields of the relay crop millet were higher than the intercrop millet in all three years justifying our approach that yield maximization could be achieved through this strategy. The relay crop outyielded the intercrop millet (by 28% in 1989, 33% in 1990, and 54% in 1991) because it could avoid the competitive effects inherent in the intercropping systems because of differences in the planting density, plant population, planting dates and spatial arrangement of the component crops. The highest grain yields of the relay crop millet of 2.09 t ha^{-1} were obtained in 1991 which had the best rainfall distribution of all the three years.

Soil Fertility

During this reporting period, all the 1991 cropping season data were analyzed and the contribution of the soil fertility sub-program to ISC annual report was prepared.

The off-season trial on interaction between nitrogen and moisture and nitrogen balance using ^{15}N was planted at the end of February.

Soil and Water Management

We continued the analysis of the 1991 rainy season data. After having had repaired three "Solo" neutron moisture gauges, they were field calibrated at the long term soil management experiment. Some problems were encountered in using these probes, but were eventually resolved at the Institut de Radio-Isotopes (IRI) in Niamey.

We started an *in situ* measurement of the unsaturated hydraulic conductivity using the "internal drainage method" in the long term Baobab experiment. We dug three sites of 1 m^2 cross section to a depth of 1.8 m, covered the vertical walls with plastic sheet and backfilled the sites. In each site we installed a neutron access tube and a series tensiometers. We installed a similar site in Tara.

We started to monitor soil water movement in the Soil Fertility program experiment entitled: Interaction between moisture and nitrogen on pearl millet planted at the end of February.

Preparations were made for the 1992 rainy season experiments.

At the request of Mrs. A. Kruiter (Ministry of Foreign Affairs, (DGIS)) we organized a two day visit to Sadore on 6-7 January. Mrs. Kruiter wished to learn more about research at ISC and met with RMP and other program staff. She emphasized the need to work with NARS and on leaving ISC, she seemed favorably impressed. She also told us that the Dutch Government is planning to substantially increase its financial support for agricultural research in the Sahel. However, DGIS would concentrate its efforts on the building of the NARS.

The first draft was completed for a paper on *"Possible beneficial effects of soil and crop growth variability to subsistence farmers in the semi-arid tropics of Africa"*.

Crop Physiology

Analysis of experimental data continued. An experiment to evaluate the effects of photoperiod and temperature on the development of millet varieties continued. There were considerable problems with sheep and birds damaging this experiment.

ILCA

Livestock Nutrition

A grazing experiment was completed in February. Its objective was to determine the rate of disappearance of millet stover as affected by stocking rate, and the effect of residue availability on intake and diet quality. Forty sheep grazed eight pastures at four stocking rates (502, 827, 1166, and 1505 sq. m/head), two pastures/treatment, five sheep/pasture) during 75 days. Fecal output was measured in all animals at three periods using canvas bags supported by harnesses. Each fecal collection period consisted of 7 to 10 days. In these periods extrusa samples were collected using four esophagically fistulated sheep. Residue availability was determined during each fecal collection period, and at the beginning and end of the experiment. Residue was separated into millet leaf, millet stem, and weeds. Feces, extrusa, and residue plant parts are being analyzed in the laboratory.

A browsing trial with goats was started in February in the windbreak fields of the Agroforestry project. The objective is to characterize browse species in terms of feeding value as well as composition of feces. Nutritional evaluation consists of determining chemical composition (N, fiber components, tannins) in samples taken by both hand-clipping and esophagically fistulated goats, digestibility of extrusa samples determined by the nylon bag-pepsin technique, and intake determined from total fecal collection and extrusa digestibility. The rate and extent of millet digestion of stover leaf and cowpea hay are determined by the nylon bag technique to study the effect of tannins on digestion of basal diet. In each browse species six castrated, non-fistulated male goats and two rumen-fistulated goats are used for fecal output and digestibility measurements,

respectively. Four esophagically fistulated goats are used for extrusa collection. Two weeks are used for adaptation and nine days for fecal collection and incubations *in sacco*. During February and March *Bauhinia rufescens* and *Ziziphus mauritania* were evaluated. Other species will be evaluated depending upon the season when they are green and leafy and the amount of material available.

Nutrient cycling

Manure or cropping. Cattle and sheep are being corralled on millet fields at the Sahelian Centre, Sadore for two experiments. In the first trial, cattle or sheep are corralled on fields after daytime grazing, for 1, 2, or 3 nights every 1, 2, or 3 years. This is the third year of this six year experiment. All treatment effects will, therefore, be expressed in 1992 harvest. In the second experiment, cattle or sheep are corralled on cropland for two nights every 1, 2, or 3 years but manure in the corralled area is transferred to adjacent plots to separate manure and urine effects. This is the second year of this 6 year trial.

Mille response to leaves and feces from sheep fed different diets: A greenhouse study. Analysis of data from a greenhouse trial to assess the relative decomposition of feces from sheep fed different browse-based diets versus the decomposition of browse leaves themselves. The response variables are millet DM, N, and P yields. Soil measurements include OC, N, and P at the beginning, middle and end of the trial. The remaining organic matter in pots at trials end has been separated into light and heavy fractions.

Assessment of decay rates of and N and P mineralization from sheep manure, browse leaves and crop residues. To monitor the decomposition rates and nutrient release from the different organic materials, samples of feces from sheep fed different diets, browse leaves and crop residues were ground through a 1 mm sieve, and mixed with a sieved (2 mm) sandy soil (Psammentic Paleustults) at the rate of 120 kg N ha^{-1}. The soil mixtures were packed to a bulk density of 1.7 g/cc in a leaching tubes of 60-ml, 55% water filled porosity, and then randomly placed in an incubator maintained at 30°C in the laboratory.

The soil mixtures are being leached every 2 or 4 weeks after incubation with 75 ml of 0.01 M $CaCl_2$ solution followed by 25 ml solution of 0.01 M KH_2PO_4, 0.002 M $MgSO_4.2H_2O$ and 0.002 M $CaSO_4.2H_2O$. The concentrations of NH_4^+ and NO_3^- in the leachate are being determined calorimetrically using an autoanalyzer. Regression techniques will be used to determine equations for predicting N and P mineralization in relation to organic material composition.

To determine the influence of environmental factors on organic matter decomposition rates, field microplots were established in March 1992. Similar experiments will be established in June and October 1992. Soil from the entire volume of each microplot was removed, sieved (1 mm screen), homogenized, and then replaced in the same trench. Air-dried, intact whole feces (25 g) of sheep fed different diets, 15 g samples of browse or crop leaves were placed in separate 2 mm mesh fiberglass bags (20 x 20 cm) and buried to about 15 cm depth.

Four replicate bags are being removed at 0, 2, 4, 8, 12 and 16 weeks after placement for organic materials DM, total N, P, C, lignin, cellulose and hemicellulose determinations. Daily minimum and maximum soil temperatures are being measured, as

well as daily evaporation (evapotranspiration) and maximum and minimum air temperatures. Regression analysis will be used to develop equations for predicting organic material decomposition and nutrient release in relation to soil temperature and moisture content.

Concomitant to the decomposition study, open-ended PVC cylinders (30 cm i.d.) were randomly placed in the microplots to estimate microbial activity in soil amended with the organic material. The diffused soil CO_2 inside each cylinder is being trapped bi-weekly with 25 ml aliquot of 1 M NaOH in plastic cups for 24 h period, and the unreacted NaOH in each trap determined by titration with standardized 1 M HCl.

Effect of manure and crop residue incorporation by animal traction on nutrient cycling. Soil and plant samples collected from 1991 trials were extracted and analyzed accordingly for chemical properties. Results will be statistically analyzed using ANOVA.

Chemical changes in manure and crop residue during decomposition. Results obtained from a 15 week decomposition experiment using litter bags showed differences in concentrations of lignin, hemicellulose, cellulose, and nitrogen as decomposition proceeded. Millet stalk decomposition was faster than of manure decomposition. The decomposition of lignin hemicellulose, cellulose, organic matter and N mineralization are being fitted to appropriate linear, quadratic and exponential models. The initial lignin concentration in millet stalk and manure was important in determining rate of decomposition in the later part of the experiment while the labile initial N concentration of millet stalk influenced millet stalk decomposition during the first 30 days.

Cropland forages in farmers fields. The disappearance of millet leaves and stalks and weeds is being monitored at six-week intervals in manured and non-manured fields of 35 farmers in the dry, intermediate, and wet zones of western-Niger. This is the second year of this study.

Economics

Village surveys

Collection of transaction data (on sales, purchases, transfers of livestock, crop and animal by-products) continues on a fortnightly basis as part of the survey on portfolio choices of crop-livestock producers. Entry of data collected over the first six months of the survey has been completed and preliminary analysis of the data is underway.

Entry of data obtained from the survey, conducted during the 1991 cropping season on constraints to full utilization of animal traction is nearing completion.

Modelling

A steady-state flock model that was developed to test the effects of random biological variations on net revenues from small ruminant production was revised, based on comments received from animal scientists within ILCA. The paper will be submitted to a journal.

Work continued on the whole-farm linear programming model of crop-livestock interactions. Work carried out during this quarter centered on model construction and verification. This involved designing the model structure in matrix form and incorporating decision variables, constraints, and inter-relationships which were judged to be necessary for a realistic representation of the farm system. The coefficients of the matrix were also quantified. Initial model results are now being verified.

ICRAF

Studies of genetic variation in Faidherbia albida at ISC

In collaboration with Agroforestry, we began bi-weekly evaluations of foliage phenology in the 3-year old provenance trial at ISC. Additional measurements on growth and form will be made on a regular basis beginning in June.

We finished collecting seeds from 80 trees in the Niamey-Say region for a new research project (Genetic variation in growth, form, and foliage characteristics among half-sib families of *Faidherbia albida* in parkland agroforestry systems in Niger). We will establish the experiment on the ISC farm this rainy season.

A draft memorandum of understanding between ICRISAT and ORSTOM was developed for a collaborative research project which will initially focus on developing isoenzyme techniques for vegetative tissue. After that, we will investigate variation in the breeding system and the structure of genetic diversity in parkland agroforestry systems in the semi-arid lowlands of west Africa.

We are in the early stages of preparing a collaborative research project with Institute of Terrestrial Ecology. The research will initially focus on methods of vegetative propagation for the Sahel. After that we will investigate clonal variation in several physiological and morphological characters.

Studies of genetic variation in *Combretum aculeatum* at ISC

We started collecting seeds from trees in the Niamey-Say region for a new research project (Genetic variation in growth, form, foliage and fruit characteristics among half-sib families of *Combretum aculeatum* in parkland agroforestry systems in Niger). We will establish the experiment on the ISC farm this rainy season.

Economics

Analysis of data on areas cultivated show that on the average, sample households cultivated 8.8 hectares in Dantiandou district, 7.5 hectares in the Hamdallaye district, and 4.4 hectares in the Kirtachi district. In the agriculturally better-endowed Kirtachi district, millet/cowpea mixture predominated and accounted for 57% of the cultivated area. Pure millet was cultivated to only 16% of the land while millet/cowpea/sorrel mixture accounted for 10% of the area. Pure sorghum was cultivated to 1% of the land while the remaining areas were cultivated to minor crop mixtures. In the agriculturally poorly-endowed Hamdallaye district, 46% of the area was cropped to millet/cowpea/sorrel mixture; 22% to pure millet; 20% to millet/cowpea mixture while the rest of the land was

cropped to other crop mixtures. In the Dantiandou district, which is located in between the two extreme study districts, observed land allocations were: 31% to millet/cowpea; 24% to millet/cowpea/sorrel; 23% to pure millet and 12% to millet/sorrel. Analysis of stover production potentials, across the three study districts show that distance of farms from villages had a significant negative influence on stover production potential. Stover production in the Dantiandou district was not significantly different from that obtained at Hamdallaye. However, stover production in the Kirtachi district showed significant increase over stover production in the Hamdallaye district. Also, stover production was significantly greater where sorghum was cultivated either as pure or in mixture with millet, than could be obtained from a pure millet field. There were no significant differences in cereal stover production between pure millet and mixtures in which the cereal crop was millet.

University of Hohenheim

After the three observation posts in Niger for the dust study, Ouallam, ISC, and Tara, the transect north-south was completed by installing three more observation points in Benin: N'Dali (in collaboration with the INA-Benin), Agouagon and Cotonou (in collaboration with IITA). Dust samples are and will be collected in regular intervals of a month.

Laboratory analysis such as root counting, the determination of Pf-curves, and field preparation for the Varietal study of Andreas Bürkhardt took place.

Meetings, Seminars

RMP In-House Review

The In-House Review for RMP was held from 16-18 March. Scientists from ISC, WASIP-Mali, WASIP-Nigeria, and representatives of National Programs from Niger and Mali participated in the Review. MVKS coordinated the preparation of the document for the In-House Review which included project progress reports and new project proposals.

Medium-Term Plan (MTP)

CR, member of the MTP committee, convened several meetings to discuss and prepare the contribution from West Africa to the ICRISAT MTP. Staff members from ISC who participated in the meetings and prepared documents included KAK, MVKS, JHW, BJN, FW, and JBF.

Preparations for IGBP Regional Meeting on Climate Change in Africa

Dr. Thomas Rosswall, Executive Secretary and Dr. Richard Moss, Coordinator of the Social Science project, both with IGBP (International Geosphere Biosphere Program), visited Niamey on 26 and 27 February to meet with the IGBP National Committee for Niger and discuss arrangements for the Regional Workshop on Climate Change in Africa scheduled for 23-27 November 1992 at Niamey. MVKS was nominated as Chairman of the Organizing Committee for the Regional Workshop. In preparation

for this workshop, Drs. Rosswall, Moss, MVKS, and Mr. Boulama, Director of the National Meteorological Services of Niger met the Minister for Hydraulics and Environment of the Government of Niger on 26 February.

Evaluation of student Theses at AGRHYMET

Evaluation of theses submitted by the students for the diploma *"Ingénieurs en agrométéorologie"* of AGRHYMET was held on 12 and 13 March 1992. MVKS was invited to act as the President of the Jury for two students and as Rapporteur for one student.

Video film

A video film entitled *"Greening of the Planet Earth"* describing the global warming and its effects on agriculture was screened at ISC on 20 March.

Workshop on Phosphorus DSS

AB attended a workshop at College Station, Texas on 11-12 March 1992. This workshop was organized by the University of Hawaii on Phosphorus Decision Support Systems. He presented a paper entitled *"Soil Phosphorus Status and use of Different Calibration Tests to predict Phosphorus Requirement and Response of selected crop of West Africa"* by Bationo, A., A. Manu and A.U. Mokwunye.

During that meeting Dr. P. Jomini former Ph.D student at ISC, presented also a paper entitled *"A dynamic model of phosphorus fertilization under uncertainty"* by Patrick, A. Jomini, J. Lowenberg Deboer, Robert R. Deuson and André Bationo.

HAPEX Meeting

JB attended a HAPEX-II-Sahel southern supersite meeting at the Institute of Hydrology on 17 December. Plans for the measurement campaign were discussed and made more definite.

On 12 February JB gave a 2-hour seminar to graduate students at the Dep. of Soil Science and Geology, Agricultural University, Wageningen, The Netherlands, on *"Land evaluation at a within-field scale"*.

Seminars at ISC

Jan 29: Somda Zana: *"Soil properties under legume based production systems"*

Feb 19: Mark Powell: *"Agroforestry, livestock and sustainable nutrient cycles in the Sahel"* (Also given at ICRAF, Nairobi 30/01/92 and ILCA/KARI, Mombassa, 05/02/92)

Mar 4: T. Williams: *"Modelling economic outcomes of crop-livestock interactions"*

Mar 23: J.C. Weber presented his research projects for 1992 to RMP scientists.

Lüdger Hermann: *"Micro-variability of soils at Sadore"*, a report of his Msc study conducted in 1990.

Training

Mr. Bonaventure Some, student for the diploma *"Ingénieurs en Agrométéorologie"* of AGRHYMET, worked with MVKS for his thesis from September 1991 to March 1992. His thesis, entitled *"Contribution to analysis of dry spells for rainfed crops in Burkina Faso"*, was judged as *"Excellent"* by the Jury and Mr. Some received a score of 18/20 for his thesis work.

La Direction de la Météorologie Nationale de Sénégal and the ICRISAT Sahelian Center are carrying out a collaborative project on the analysis of long term climatic data for several locations in Senegal. Mr. Mamadou Ndiaye, Chief of the Agrometeorology division of the Direction de la Météorologie Nationale de Sénégal visited ISC from 3-28 February to work with the Agroclimatology program. He has analyzed climatic data for over 35 locations in Senegal using the programs available at ISC. Results of this analysis will be published in an Information Bulletin on the *"Agrometeorology of Senegal"* as a part of the series on the *"Agroclimatology of West Africa"* published by ICRISAT.

MCK contributed to the Experimental Station Operations and Management *"International Training course"*; 4 hours lecturing on soil erosion, and 3 hours practical training on the calibration of planting equipment. CR, AB and MVKS also gave lectures at this training course.

JHW gave a seminar on the applications of crop physiology to improving data interpretations to the WARDA statistics training course. MVKS gave a lecture on agroclimatology data analysis in this training course.

Travel

The Committee on Data for Science and Technology (CODATA) of the International Council for Scientific Unions (ICSU) organized an International Workshop on Integration, Dissemination and Use of Environmental Data for Research on Crop Modeling from 2-5 March 1992 at Chambery, France. The objective of the workshop was to identify new or improved methodologies for multidisciplinary data integration in the area of crop modeling, considering existing case studies for the Sahel region of Africa. CODATA invited MVKS to present a lecture on *"Regional Crop Modeling Issues in the Sahel"*. MVKS also led one of the two discussion groups created for developing recommendations from the Workshop. Scientists from USA, Canada, Netherlands, Norway, France, FAO, Kenya and Zimbabwe participated in the meeting.

AB travelled to Lomé, 28 January to 3 February, at IFDC, regional office for general orientation.

AB travelled to Texas, from 11-12 March, to attend a workshop on phosphorus decision support systems organized by the University of Hawaï.

JB left for his annual stay at the Dept. of Soil Science and Geology, Agricultural

University, Wageningen, The Netherlands, on 15 December. During his time there he discussed his work with a number of colleagues from Wageningen as well as Senegal and Mali. Travel report will be available early May. JB returned for ten days in March to attend the PMIP and RMP in-house reviews.

JHW travelled to Zimbabwe, Malawi and Kenya from 27/2 to 14/3/92, for the SADCC Groundnut conference, and to finalize passport business and to visit the SADCC/ICRISAT program and EARCAL programs. Two papers were prepared for this conference and presented at this conference.

TOW participated in a planning workshop on *"Livestock and Resource Management Policy"* held at ILCA headquarters in Addis Ababa, Ethiopia, from March 24-27. He presented a paper titled *"Trade and Pricing Policies in the Context of Sustainable Livestock Production in sub-Saharan Africa"* at the workshop.

JCW attended meetings with representatives of ICRAF, CILSS and INSAH in Ouagadougou the first week of February. During the meetings he formally presented his general program of tree breeding research in the ICRAF SALWA research network.

JBF visited WASIP-Mali at Bamako, from January 8 to 11, to discuss economics research plans with Dr. Debrah.

Visitors

15 & 24 Jan	Dr. Prashar from INRAN, Maradi for discussions with MVKS on 15 Jan and 24 Mar.
30 Jan	A team from TROPSOILS including Drs. Hansen, Juo, Day, Wendt and Manu.
10 Feb	Dr and Mrs. Cunningham from the Department of Agriculture, Australia.
12 Feb	Miss V. Mazzucato and Dr. Pardey from IFPRI.
23 Mar	Mr. Ben Mohamed of the University of Niamey for discussions with MVKS.
15-27 Mar	Dr. Jim Wallace of the Institute of Hydrology from 15-27 March for preparations of the SEBEX-II project.
	Drs. R. Tabo (WASIP-N) and S.K. Debrah (WASIP-M), for the RMP inhouse review.

Journal Articles and Conference Papers

Bationo, A., M.P. Cescas, and B.T. Kang. *"Facteurs physico-chimiques responsables de l'adsorption du phosphore et analyse typologique de quelques types de sols de l'Afrique de l'Ouest"* submitted to Agronomie Tropical.

Bationo, A., A. Manu, and A.U. Mokwunye. *"Soil phosphorus status and use of different calibration tests to predict phosphorus requirement and P response of selected crop of West Africa"* submitted to Plant & Soil.

Gavian, S. *"Manure, and Crop Residue Management Strategies Used by Farmers in Selected Regions of the Tillaberi Department, Niger. Final consultancy report"*. ILCA Niger Research Document 1/92.

Hafner, Georges, A., Bationo, A., and, H. Marchner. *"Effect of crop residues on root growth and nutrient acquisition of pearl millet in an acid sandy soil in Niger"* in review.

Lloyd, C.R., Gash, J.H.C., and Sivakumar, M.V.K. 1992. *"Derivation of the aerodynamic roughness parameters for a Sahelian Savannah site using the eddy correlation technique"*. Boundary-Layer Meteorology 58:261-271.

Powell, J.M., and T.O. Williams. *"Livestock, Nutrient Cycling and Sustainable Agriculture in the West African Sahel"*. Submitted to Gatekeeper Series, International Institute for Environment and Development (IIED).

Administration

Fiscal

(a) Annual Closing Returns for 1991, and Monthly Returns for January and February 1992 were mailed on time. The returns for March 1992 are being prepared and will be sent on schedule.

(b) Final budget allocation requests for 1992 (request for additional allocation over and above the interim allocation) has been mailed to ISC with copies to I.C. **In this regard, we would like to draw attention to the latest 71% devaluation of the Naira; the current official exchange rate is now equal to 18.00 N to one dollar as compared to 10.55 N to one dollar in December 1991.** The effect of this devaluation is an escalation of prices for all items, sometimes with price increases as high as 200%. The latest government decision is to increase airfare by 70% (domestic) and 290% (international). This means that our fund allocations (capital and operational) will be grossly inadequate.

Personnel

Our updated Staffing Pattern (as of 1 January, 1992) was mailed to ISC and I.C. A request to transfer the following four positions from the Italian sorghum drought physiology project to WASIP-Nigeria was included in our final budget proposal for 1992:

(i) Accounts Assistant, Cat. VIII
(ii) Stores/Inventory Assistant, Cat. VIII
(iii) Assistant Security Officer - (Bagauda Farm), Cat. VI
(iv) Driver/General Assistant, Cat. IX

Mr. R. Oyebanji, Typist, resigned his appointment with WASIP-Nigeria, effective 1 March, 1992.

Other Matters

a) The Bagauda Building was handed over by the Contractor on 12 March. Arrangements are being made to occupy the building soon.

b) Remedial work on the Workshop/Implement Shed and Crop Work Area are going on under the supervision of the consultants.

c) The law suit instituted by Messrs. Chindo and Brothers has been settled out of court. A cheque for 18,000.00 N written in the name of the contractor's

lawyer, was handed over to our lawyer in compromise settlement of Mr Chindo's claims (he was claiming 26,000.00 N). Our lawyer will release the cheque once Mr. Chindo has removed his two pieces of equipment from the Cattle Ranch.

d) Mr. A.N. Venkatswami and Mr. Laxmiparti (Internal Auditors) visited WASIP-Kano from 17-23 February 1992 and reviewed WASIP's operations.

e) Dr. J. G. Ryan (Director General), Dr. Y.L. Nene (Deputy Director General) and Mr. R.W. Gibbons (Executive Director, ISC and West African Programs) visited WASIP-Nigeria from 9 to 12 February. They also paid courtesy calls on the government and appropriate agencies in Kano State, the Vice Chancellor of Ahmadu Bello University, Zaria, the Director of the Institute for Agricultural Research, Zaria, the Chairman of the National Agency for Science and Engineering Infrastructure (formerly Federal Ministry of Science and Technology) Lagos and the Director General, International Institute of Tropical Agriculture, Ibadan.

International Irrigation Management Institute (IIMI)

The IIMI team in Kano has continued to make much progress in its mission, with administrative support from WASIP-Nigeria. We received Dr. Mark Swendsen (IFPRI/IIMI) from Washington, DC in March.

International Livestock Center for Africa (ILCA)

We received Drs. D. Little (Team Leader), G.B. Tarawali (Agronomist), and K. Agyemang (Animal Scientist) from ILCA, Kaduna, with whom we discussed collaborative studies on 18 March. WASIP agreed to supply residues of sorghum and legume crops for feed studies at ILCA in Kaduna.

Nationally Coordinated Sorghum Research Project (NCSRP)

The first workshop of the NCSRP in 5 years was held in Kano on 9 March. It was jointly organized by the Institute for Agricultural Research, Samaru and WASIP-Nigeria and funded by ICRISAT. The field data from multilocational trials were reviewed with a view to recommend some sorghum varieties and hybrids for official release by the National Varieties Release Committee. The workshop was attended by participants from various universities, agricultural research institutes, agricultural development projects, seed production institutions, and WASIP Scientists. WASIP-N contributed two early maturing sorghum varieties plus a check and two hybrids plus a variety check to the NCSRP's 1992 trials. The IAR is contributing an equivalent number of lines.

IAR Cropping Scheme Meeting

All three WASIP-Nigeria scientists attended the annual IAR cropping scheme meeting which was held 24-28 February. We presented our results for 1991 and agreed with the states on multilocational trials to be conducted in 1992. We have already sent seeds of all the varieties and hybrids agreed upon at the meeting.

New Director of the Institute for Agricultural Research

Professor L.B. Olugbemi, formerly Deputy Director of the IAR, Zaria, was appointed Acting Director of IAR. He replaced Professor J.Y. Yayock who recently joined the World Bank and is currently based in Lagos.

Farm Development and Operations

Farm Development

Bagauda

a) Road construction. The upgrading of the peripheral and internal roads was satisfactorily completed with assistance from Mr. Bruno Gerard, Farm Manager, ISC and Mr. Sodje Umaru, FDO staff, ISC Niamey.

b) Concrete lining of drainage. Work was started but due to some problems of commitment of funds, the pace of the work slowed down.

Farm Operations

Bagauda. Bulk harvest of sorghum grains from experimental fields was done and the sorghum grains disposed. The sorghum and maize stalks were ploughed into the soil. Preparation of the 1 ha *Striga* field for maize (IITA) and sorghum (WASIP-N) screening work continued. Watering of the trees along the fence is in progress.

Research Program Activities

Agronomy

Data analysis continued and the report for the 1991 ICRISAT West African Programs Annual Report was completed.

Progress reports on two projects, improved sorghum production technology for intensive and sustainable agriculture and sole cropping systems in West Africa, and improved sorghum based cropping systems for the sudanian bioclimatic zone of West Africa were prepared and presented by RT at the RMP-In-House Review held from 16 to 18 March 1992 at ISC.

Data from the LCRI/ICRISAT collaborative trial on the agronomic and physiological response of *Masakwa* sorghum grown on vertisols under residual soil moisture conditions at varying plant densities are being analyzed. The report on the survey of *Masakwa* growing areas in Borno State is being prepared.

KNARDA/ICRISAT collaboration on crop mixtures

RT developed protocols for crop mixtures trials which were discussed with KNARDA staff. These trials include sorghum/ millet/cowpea, sorghum/soybean and sorghum/pigeonpea intercrops and are being considered for execution on-station jointly by KNARDA and ICRISAT during 1992 rainy season.

Breeding

IITA Plantings

The sorghum seed production and multiplication plots planted at IITA, Ibadan were harvested and seeds were dispatched for trials within and outside of Nigeria.

Grain Quality Studies

The results of the grain quality and utilization studies conducted by the Kano State Agricultural and Rural Development Authority were received in March. All the cultivars (ICSV 201, ICSV 111, ICSV 400, ICSH 89001 NG and ICSH 89002 NG) were reported acceptable to the panel of tasters who compared them with local cultivars for *tuwo* quality. Their fresh and left-over scores were quite close to those of the local cultivars, keeping qualities were good, and cooking time was acceptable. KNARDA has asked to extend the study to the villages where fire wood rather than gas will be used for cooking the *tuwo*.

Co laboration with KNARDA

The fourth quarterly meeting between WASIP and KNARDA was held on 13 January. We discussed training, joint ICRISAT-KNARDA and ICRISAT-IAR-KNARDA on-station and on-farm trials, grain quality and utilization trials, crop mixture trials and work on pigeon pea.

Collaboration with IITA, Kano

On 25 March, a preliminary meeting was held in Kano with IITA scientists to plan a joint research proposal to improve productivity of the cropping systems of West and Central Africa.

Entomology

The 1991 field data were analyzed and written up for presentation at the IAR cropping scheme meeting on 24-28 February and for inclusion in the 1991 ISC Annual Report. The IAR meeting provided an opportunity to explain the progress made by ICRISAT in the development of sorghum midge-resistant varieties - there was a high incidence of the midge in Nigeria in 1991.

A survey of insect pests of *Masakwa* sorghum was made in January at Ngala in northeastern Nigeria. There was a high incidence of stem borers and three species of *Sesamia* were identified at the Institute for Agricultural Research, Zaria. Some of the hymenopteran parasitoids reared from pupae of the stem borers were sent to Dr. Polaszek in Wageningen for identification.

Visitors

7 Jan	Ismaila Abdullahi, Hadejia-Nguru Wetlands Conservation Project (H-NWCP).
13-15 Jan	A.M.B. Jagne, Regional Administrative Officer ISC, Niamey.
27 Jan	Henry Thompson, H-NWCP.
3-4 Feb	Rob Moss, ICRA, Wageningen, Netherlands. J. Orchard and colleague, Post-harvest pests and quality section, NRI, London.
7 Feb	Chris Okpala, Central Bank of Nigeria, Debt Conversion Secretariat, Lagos.
9-14 Feb	J.G. Ryan (DG, ICRISAT), Y.L. Nene (DDG, ICRISAT) and R.W. Gibbons (Executive Director, ISC & WAPS).
17-23 Feb	A.N. Ventaktswani and Laxmiparti (Internal Auditors), IC.
24-29 Feb	A.R. Das Gupta, Manager, PPS, ISC.
11 Mar	Dr. S. Okatahi, Coordinator (Sorghum and Millet Center) National Accelerated Food Production Program, Samaru.
18 Mar	Doug Little (Team Leader), G.B. Tarawali (Agronomist) and K. Agyemang (Animal Scientist), ILCA, Kaduna.
23 Mar	Mark Swendsen, IFPRI (IIMI), Washington, D.C.
24 Mar	G.I.C. Nwaka (Paedologist) and J.D. Kwari (Soil Scientist), University of Maiduguri.

Travel

5-8 Mar	D.S. Murty visited ISC
15-20 Mar	R. Tabo attended the RMP in-house review, ISC.
17 Mar-18 April	D.S. Murty went on home leave to India.

Administration

Administration closed its books of accounts for 1991, and prepared capital and operational commitment lists. The performance appraisals of support staff were analyzed and annual letters were issued to eligible staff.

Three other capital construction works from 1991 allocations, namely canteen building, workshop building, and additional storage space are currently in an advanced stage, and are expected to be completed in April. Work on additional office space is progressing well. There was some delay in the installation of the telephone system due to additional needs reported by the local telecom department. These have been ordered and the installation is scheduled to be completed by end of April. Installation of the glasshouse was satisfactorily completed.

A team of internal auditors from IC visited WASIP-Mali. The team reported verbally that the systems and procedures were generally in order. They offered suggestions, and action will be taken upon receipt of the formal report through the Executive Director.

New and replacement capital needs for 1992 were prepared and submitted to the ED.

Appropriate action was taken with USAID-Mali for the reconciliation and final settlement of the bilateral program account. Details were forwarded to IC-Fiscal for action.

The DG, DDG and ED visited the Samanko WASIP Complex and Sotuba Station from 19-20 February. They met with support staff and principal staff. This was the DG's first visit to WASIP-Mali. A courtesy call was made to the Minister of Agriculture and meetings were held with IER and INSAH.

Sorghum Breeding

General

Trial results were analyzed and reports were prepared. Grain samples (340) were tested in laboratory for germination faculty, germination energy, and grain mold incidence. Grain mold resistant varieties were received from Senegal (G. Trouche), from IC, ISVHAT, and characterization trials. Some breeding lines were sent to Senegal and WASIP Nigeria.

Off-season activities

Simple crosses and backcrosses carried out and some crosses were sown for generation advancement. F_1 screening of some rainy season crosses was performed to introduce cytoplasm of grain mold resistant variety into a composite entry.

Pathology

We continued to analyze results of 1991 trials. Data from our yield loss experiment on gray leaf spot conducted at Langorola showed that the difference in grain weight between plants treated with benomyl and non-treated plants was insignificant ($P \leq 0.5$). Grain weight was greater for plants treated than non treated plants in three out of the seven genotypes tested. Loss in grain weight was 8, 11, and 18% for ICSV 1001 BF (Framida), Nagawhite, and IS 13922. In other experiments on yield loss on sooty stripe in grain, weight was up to 40% for the genotype ICSV 745 at Samanko.

In the laboratory, we continued our studies on the sooty stripe fungus *Ramulispora sorghi* and on *colletotrichum graminicola* (anthracnose). We observed that conidia of *R. sorghi* on water agar had dimensions similar to conidia formed in nature. In contrast, conidia formed on PDA were usually smaller. In our attempts to study the variability of *C. graminicola*, we observed the formation of both oval and falcate conidia on PDA. In addition, some isolates did not form setae in culture. This latter observation confirms results obtained in 1991.

Entomology

Laboratory analysis of sorghum samples from 1991 rainy season trials was completed; all data were analyzed and preliminary reports were written. Major results and future research emphasis on the subprogram were presented at WASIP-M technical meeting held on 25 February.

Other technical activities consisted of continuous rearing of head bugs and stem borers in the laboratory, initiation of *Rhyzopertha* screening test, and follow-up on off-season multiplications.

Agronomy

Two reports, including three years agronomic trial results, were prepared: (1) *"Etude du milieu et des techniques culturales sur le comportement de diverses variétés de sorgho"* (Feb 92) and (2) *"Evolution de la production et de la fertilité du sol dans des rotations culturales incluant du sorgho, des légumineuses, et du cotonnier"*.

An off-season trial to study effects of post-flowering water stress on sorghum/groundnut intercrop was harvested. The coming season trial protocols prepared.

Dr. P. Salez departed on 19 March to join his new post with the EEC. Mr. François Martin (an agronomist assigned by IRAT for overseas training) who worked with PS since early 1991, will take care of the program until a new agronomist arrives.

Agro-Economics

Village Level Studies

A draft report combining data of the 1989 and 1990 seasons is nearing completion. This report will be presented in the form of a WASIP Economics Program Progress Report. The 1991 data are being verified and questionnaires are being modified to collect additional data in the 1992 season.

On-Farm Evaluation of Technology

We have had a series of preliminary discussions with the Agronomy and *Striga* subprograms concerning on-farm trials. We conducted joint missions to the study villages to identify farmer-cooperators, fields, and availability of manure. Details of the experimental protocols will be prepared in April.

Other activities

We presented results of our on-going projects and submitted two new projects at the RMP In-House Review in March.

SAFGRAD/ICRISAT Sorghum Network

We started harvesting seeds multiplied during the off-season for 1992 regional trials. We organized a working group meeting at Samanko on 9 and 10 March. Principal investigators from four of the six research projects financed by the network presented their latest results and were evaluated. The four projects were head bugs in Mali, long smut in Burkina Faso, *Striga* in Cameroon, and Wheat/Sorghum composite flour in Nigeria. Evaluators included scientists from the national programs of Mali, Niger, and Nigeria, and from WASIP-Mali. The working group meeting was followed by a special meeting on *Striga* on 11 and 12 March at Samanko. *Striga* researchers from the national program of Senegal and Burkina Faso were sponsored by the network. Other participants included representatives from FAO regional office in Accra, IRA/CIRAD in Burkina Faso, the Coordinator of the Pan-African *Striga* Network, the Coordinator of SAFGRAD/IITA Cowpea Network, WASIP-mali, and ISC. The objectives of the *Striga* meeting were to discuss recent results obtained, to develop common research agendas for various aspects of *Striga*, and to synthesize observations and results presented.

Meetings

WASIP-Mali Technical Meeting

A technical meeting was held on 25 February in which subprogram scientists and research assistants participated. Research highlights and experimental plans for the coming season were presented, followed by discussion.

IER Regional Meeting

WASIP-Mali was invited to send one representative to the IER Technical Committee Regional Meeting 24-28 March. Dr. Thomas participated in the meeting. The IER Committee Technical National Meeting will take place in mid-April, to which all scientists are invited.

Millet Breeding

Data Analysis and Report Writing

Analysis of all trial results was completed. Submitted contribution for WA-ISC Annual Report and presented project progress reports for In-House Review.

Off-Season Activities

Harvest of material sown in October was completed and management of December sown material is continuing. This includes materials to derive experimental varieties, multiplication of elite lines, crossing block; sibling and crossing are nearly completed.

Travel

CL	Dec 23 - Jan 10, home leave
CL	Feb 27 - March 9, to SADCC/ICRISAT Zimbabwe
AR	March 1 - April 9, home leave
PS	March 14-17, ISC
PS	March 19, final departure to join his new post
SKD	March 19-24 , ISC
SNL	March 8-18, ISC

Visitors

17 Jan	M. Yudelman, F.L. Nicolier from Ciba Geigy.
19-20 Feb	J.G. Ryan, Y.L. Nene, R.W. Gibbons
18 Feb-Mar 2	L. Lamarque, National Resource Institute, England
28 Feb	US Peace Corp Volunteer trainees
26 Feb-Mar 5	V.S.L. Pati, Internal Auditor ICRISAT
27 Feb-Mar 5	S. Goode, Feb 27 - March 5

ANNEXES

ANNEX I

ISC Information Services January 28, 1991

ICRISAT PUBLICATIONS

Subject	English	French
Germplasm Catalogs	2	0
Plant Material Desciptions	23	0
Books	10	1
Research Bulletins	13	0
Information Bulletins	28	9
Conference/Workshop Proceedings	60	3
Bibliographies	17	1
Newsletters	5	1
General Audience Publications	14	1
Audiovisual Materials	1	1
Total	178*	17

Sources:

1. English: ICRISAT Publications Catalogue 1973-90 and Publications Supplement.

2. French: Draft Publications Catalogue 1992.

* Note: Thirty three publications in the 1992 Draft Publications catalogue are not included in the english count. Three publications from the 1992 Draft in french are included in the french count. This brings the count up to 211 in english and 20 in french.

ANNEX II

Newsletters and Bulletins Received by the ISC Library (30/3/92)

	Titre	Sponsor
1.	Whydah Newsletter	African Academy of Science, Kenya
2.	INSAH Echo	Institut du Sahel, Mali
3.	Echanges Plus	Ministère de l'Agriculture et de l'Elévage, Niger
4.	IUFRO News	IUFRO Secretariat, Australie
5.	Rural Development Notes	Wageningen, Allemagne
6.	Echo de l'IITA	IITA, Ibadan, Nigeria
7.	CGIAR Highlights	CGIAR Secretariat, Washington D.C.
8.	IITA Research Briefs	IITA, Ibadan, Nigeria
9.	Palawija News	CGPRT Centre, Indonesia
10.	Bulletin de liaison	CIPEA, Addis Abeba
11.	IFC	International Potash Institute Switzerland
12.	Review	IIMI, Sri Lanka
13.	CIPEA Actualités	CIPEA, Addis Abeba
14.	ILRAD Actualités	ILRAD, Nairobi, Kenya
15.	ISNAR Newsletter	ISNAR, The Netherlands
16.	C.A.B. International News	C.A.B, England
17.	IAEA Newsbriefs	IEAE, Vienne, Autriche
18.	CIMMYT Update	CIMMYT, Washington, D.C
19.	Newsletter of SAFGRAD	OAU/STRC-SAFGRAD, Burkina Faso
20.	Peanut news	The Peanut CRSP, Georgia, USA
21.	Mutation Breeding Newsletter	FAO/IAEA, Vienna

22.	Insect and Pest Control Newsletter	FAO/IAEA, Vienna
23.	Industry and Environment	UNEP, Paris, France
24.	Dryland Networks Programme	IIED, Netherlands
25.	Entre nous	Rodale International, Senegal
26.	ORSTOM Actualités	ORSTOM, Paris, France
27.	Communauté européenne	CCE, Niger
28.	UNEP News	UNEP, Nairobi, Kenya
29.	Bulletin of the University of Reading, Agricultural Extension and Rural Development Department.	University of Reading, United Kingdom.
30.	Info R3S	CORAF/CILSS, France
31.	Nouvelles Spot Newsletter	Spot Image, France
32.	Ressources Génétiques Forestières	FAO, Italie
33.	News Cast	CAST, Ames,Iowa
34.	Journal de développement Economique	National Chamber Foundation Washington, D.C. USA
35.	Spore	CTA, Wageningen, Pays-Bas
36.	Sahel PV Info	UCTR/PV-Institut du Sahel Mali
37.	Bulletin du CIPEA	CIPEA, Addis Abeba
38.	Le Courrier	ACP/CEE, Bruxelles, Belgique
39.	Agroforestry Today	International Council for Research in Agroforestry Nairobi, Kenya
40.	L'Agriculteur Africain	The Hunger Project Global Office, New York, USA
41.	Research and Training Newsletter	Ministry of Agriculture and Livestock Development Dar-es-Salaam, Tanzania

42.	Our Planet	United Nations Environment Programme, Nairobi, Kenya
43.	Notre Planète	Programme des Nations Unies pour l'evironnement, Kenya
44.	Plant Genetic Resources Newsletter	FAO/IBPGR, Italie
45.	Drought Network News	International Drought Information Center, Nebraska, Lincoln, USA
46.	Surveillance des acridiens au Sahel (SAS)	CIRAD/PRIFAS, Montpellier, France
47.	Agroforesterie aujourd'hui	ICRAF, Kenya
48.	Fews Bulletin (AID Famine Early Warning System)	Fews Project,Tulane/Pragma Group, USA
49.	Environment Events Record	UNEP, Kenya