

# RAFI COMMUNIQUE

RURAL ADVANCEMENT FUND INTERNATIONAL

July, 1987

A Report On

The Security of the World's Major Gene Banks

**ISSUE:** The International Board for Plant Genetic Resources is undertaking an evaluation of each gene bank which it previously designated as a "base" for plant germplasm storage. A partial report covering the first 17 banks was submitted to the Board in February, 1987, exposing major security problems.

**COUNTRIES AFFECTED:** All countries - but immediately - Australia, Canada, Greece, Spain, the USA and ICARDA (International Centre for Agricultural Research in Dry Areas). Other implications are noted for Ethiopia, the Philippines and the Federal Republic of Germany.

**IMPACT:** The majority of the world's collected crop germplasm is not securely stored and some of it has been lost due to financial and technical shortcomings.

**ACTION:** Issue will be raised during the FAO biennial conference in November, 1987, and will affect the future of IBPGR and the proposed International Gene Fund (see RAFI Communique, April, 1987).

According to a report restricted to IBPGR's Board of Trustees, seven of the 17 evaluated "designated base" gene banks in the IBPGR network do not meet the Board's standards for registration. The substantial - possibly overwhelming - majority of the IBPGR network may fall below acceptable safety standards. Four other "designated base" banks asked that the evaluation be delayed and, in a concluding comment to the confidential study, the secretariat notes:

"It would be highly beneficial also to evaluate the other twelve designated genebanks which did not respond to earlier invitation letters. It is likely

that these genebanks have relatively poor conditions."

Although only 7 of the 17 banks so far evaluated fall below IBPGR standards, these represent exactly half of the available storage space (in the survey) and 60% of the surveyed germplasm. Thirty-seven out of 64 "designated base" crop collections are affected in the evaluation report. Among those found wanting are major gene banks in Australia and Canada as well as the world's largest and most commercially important bank - the National Seed Storage Laboratory in the United States.

IBPGR Secretariat Evaluation  
of First 13 Genebanks

Country	Institution	Status
Australia	CSIRO-Canberra	Unacceptable
Australia	CSIRO-Samford	Unacceptable
CGIAR/IARC	ICARDA-Syria	Unacceptable
USA	NSSL-Ft. Collins	Unacceptable
Greece	GGB-Thessalonika	Unacceptable
Spain	Polytech-Madrid	Unacceptable
Canada	PGRC-Ottawa	Unacceptable
CGIAR/IARC	IRRI-Los Banos	Acceptable
Taiwan	AVRDC-Taiwan	Acceptable
Italy	CNR-Bari	Acceptable
Thailand	TISTR-Bangkok	Acceptable
F.R. Germany	FAL-Braunschweig	Acceptable
Nordic	NGR-Lund	Acceptable

Among important national banks still awaiting evaluation are those in Kyoto and Sendai, Japan, the German Democratic Republic's bank at Gaterslaben and the huge facilities at Leningrad and Krasnodor in the Soviet Union. Among International Agricultural Research Centres, ICRISAT (with important sorghum and millet collections) has not replied to an invitation to be evaluated and CIMMYT (with wheat and maize) was not invited at all - a sign of strained relations between CIMMYT and IBPGR.

Notes from the Evaluation

Unless otherwise indicated, all quotes used in this issue of RAFI Communique are taken from Progress on the development of the Register of Genebanks, Provisional Agenda Item 10, International Board for Plant Genetic Resources, 14th Meeting of

the Board of Trustees, Rome, 25-27 February 1987.

Even those gene banks found acceptable by the secretariat may have severe faults. The Italian gene bank at Bari is a case in point. In the past, IBPGR has placed appropriate importance on banks having backup generators in case of power failures. Yet, the Bari facility was registered as responsible for globally-important wheat germplasm despite the absence of a back-up generator, because... "there is an agreement with the electricity company for a continuous supply of power."

Lowest on the scale is the Greek gene bank which is cited for a long list of failures both administrative and mechanical. In the document's summary, the secretariat says, "The evaluator states that this genebank is the poorest of all those he has visited."

The Universidad Politecnica in Madrid, Spain, is scored for both poor storage conditions and poorer monitoring of the germination level of accessions. Some germplasm, according to the evaluator, may be beyond recovery: "The genebank is designated for wild Brassica and wild Cruciferae. Some accessions are 20 years old and cannot be recollected."

The problem of personnel and management are recurring themes in the report. The Australian gene bank at Samford (Brisbane) managed by the prestigious CSIRO is shown to be far from immune to these problems:

"The material in the genebank involves seed dormancy and empty seed problems. Besides the genebank manager...there is only one technician to handle the sample registration, seed testing, drying, packing, storage and exchange, therefore the genebank is unable to conduct initial germination tests and monitoring viability tests for all accessions...Currently regeneration is carried out on the priority materials, that is accessions with some agronomic value... ."

IBPGR's evaluation levels a similar criticism at the CSIRO gene bank in Canberra. Although the bank is judged unacceptable, the report notes, "however, many management standards as listed below are unsatisfactory."

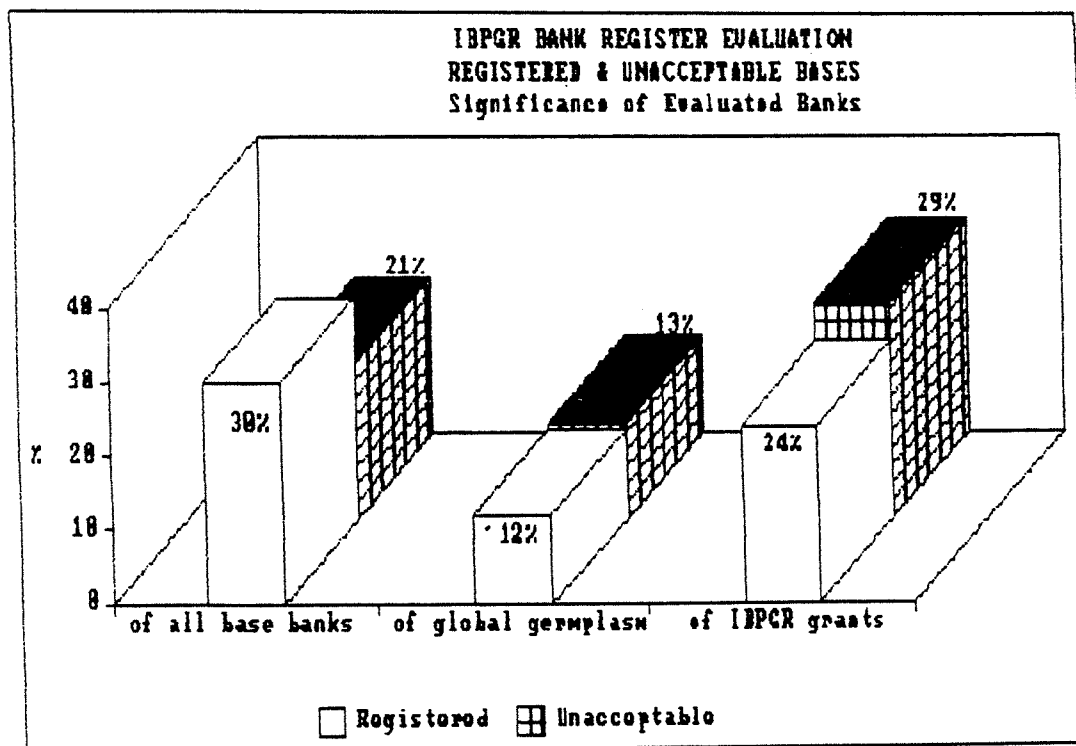
Although the United States has received almost US \$2.8 million from IBPGR over the years (amounting to 22% of all grants given by the Board) and has gained (directly) more than 23,000 seed accessions (28%) covering a dozen economically important crops, the IBPGR staff evaluation found

the Fort Collins National Seed Storage Laboratory below registration standards.

Regarding personnel and management, the evaluation noted: "The genebank is understaffed. There are ca. 210,000 accessions but only 13 staff (including part-time and vacant posts). In addition, there is currently no seed physiologist." In the evaluator's concluding comments, he added, "information promised to be mailed to me (unavailable during visit) wasn't" and "subsequent correspondence not replied to".

Most serious, however, are the technical shortcomings of the world's most important gene bank. The staff study reports ... "The regeneration standard is low (60% of initial viability). Arrangements need to be established for regeneration of tropical species."

The following graph offers an overview of the security of the 17 evaluated banks in the IBPGR genebank system. In summary, the 7 unacceptable banks thus far evaluated account for about 13% of global germplasm in storage and have received (or their countries have received) 29% of all grants from IBPGR.



## Urgent Problems

### The Conflict between FR Germany and Ethiopia:

The IBPGR evaluation gives passing grades to both the FAL gene bank at Braunschweig, Federal Republic of Germany, and to the Plant Genetic Resources Centre/Ethiopia. Expressing mild concern for germination standards in Germany, the secretariat makes particular note of FAL's failure to provide full duplicate samples of IBPGR material to other gene banks as per its commitment. The summary report states, "With the exception of the Beta collection received from the Greek Gene Bank, almost all the accessions of the IBPGR designated crops are not duplicated elsewhere."

The same study also records that Ethiopia has not duplicated its germplasm elsewhere. The difference, however, is that Ethiopia has not committed itself to do this through IBPGR and, further, that the germplasm originates in Ethiopia and has not been sent to it for safekeeping from elsewhere. In fact, the evaluation offers Ethiopia the only direct compliment given to any gene bank elsewhere in the report:

"This bank is extremely well run and a credit to all the staff I met. There are some deficiencies in seed laboratory equipment, but the staff work hard to overcome such difficulties. Particularly impressive was the fact that the conservation unit manager had taught himself seed physiology (partly from IBPGR publications), and the ability of the documentation unit to provide detailed answers to my questions. All concerned with PGRC-E should be heartily congratulated for their excellent work."

Although outside the boundaries of the IBPGR evaluation, the crucial issue here is the dispute between the Federal Republic of Germany and the Ethiopian Government over the future of the Ethiopian banks and the duplication of barley germplasm. The Ethiopian bank was originally constructed and financially supported by GTZ (the German development agency). Control and management of the bank has been in the hands of Ethiopia for several years but GTZ funds have continued to provide the hard currency necessary to maintain equipment. In return for the bank, Germany has demanded a duplicate sample of Ethiopia's germplasm - especially barley. Ethiopia agreed to this request more than a decade ago but has not provided the material. Now Germany refuses to continue crucial financial support to the bank until it gets its barley. The last GTZ official left Ethiopia June 15, 1987, after two years of

failed negotiation.

Technically, Ethiopia is prepared to make duplicates available but points out that its accessions are in "populations" making it scientifically impossible to provide duplicates. Any division of seed samples would leave each party with genetically different material rather than duplicates. Behind the dispute is Germany's economic interest in Ethiopia's barley and Ethiopia's right to retain sovereignty over its botanical treasures.

At risk is one of the best gene banks anywhere in the world. Also at risk is unique seed of barley, sorghum, durum wheat, millets, oats, etc. from one of the world's most important Vavilov Centres of Genetic Diversity - Ethiopia itself.

The Federal Republic of Germany appears prepared to risk the loss of this resource in order to extract the barley seed it values. Its argument is that it is not safe to have all the seed stored in one bank. They are right. But the IBPGR evaluation shows that the Germans should - at least - take their own advice.

#### The Canadian Collection:

If the Greek bank is ranked the worst by its evaluator, the Plant Genetic Resources Centre - Ottawa, Canada, did not even warrant its data sheets. The detailed evaluation sheets were omitted from Appendix 1 of the report and the Ottawa bank was given its own special Appendix II. The five page appendix could hardly be more critical. Regarding the database documentation, the evaluator notes, "...The CGB is handicapped in having to rely on the TAXIR software programme long discarded elsewhere. This...places a severe restraint on the effectiveness of the curator...[in] meeting modern requirements... ."

More embarrassingly, the Ottawa bank had a filing problem: "The curator does not have copies of the original letters of agreement between IBPGR and the Canadian authorities and requests copies from Rome."

On the ability of the Canadian government to meet its international obligations, the evaluator commented on Canada's responsibility as a designated base for barley, millets and oats. Concerning barley, the Nordic gene bank is to give a duplicate sample to Canada but the evaluator warns, "...there are no facilities for storing them if and when they do."

On millets: "Canada undertook in 1977 to provide long-term storage for duplicate samples of ICRISAT material. [The

genebank Director] of ICRISAT visited CGB in March, 1986 to arrange details of transfer of 14,000 accessions, saw the storage facilities and departed to look for an alternative genebank capable of meeting requirements." Other material received from Kew Gardens has been safely stored but, the evaluator comments, "Arrangements for multiplication in Canada have failed due to inability to accept financial support from IBPGR."

The most severe problem, however, lies with Canada's commitment to store oat material. Some 12,600 samples were received in 1980.

"They have been lying, as received, in paper bags and cardboard boxes, for six years, in an annex to the medium-term storage. Lack of personnel and storage space had prevented their germination testing, drying, packaging to acceptable standards and low temperature storage. The accessions have been subjected to widely fluctuating temperatures - (up to 25 degrees Centigrade) - and much of this material must be considered a write-off. Three points emerge:

1. Whether to rescue the surviving materials - which seems impossible with present resources at CGB - or replace from USDA at another centre capable of such storage.

2. Present arrangements constitute a threat to germplasm in generating a false sense of security.

3. This is a classic case of erosion of germplasm in a genebank and provides valuable ammunition to critics of the IBPGR and the international system."

We concur.

### Conclusions

We believe the following points can be drawn from the IBPGR evaluation:

1. The problems of gene bank security continue. Although more gene banks in the North were evaluated than those in the South, the banks in Ethiopia, Taiwan and Thailand fared much better than their larger counterparts in Australia, Canada, the USA or Italy.

2. Aside from the risk of "putting all our eggs in one basket", there is evidence to suggest that the high cost of personnel and administration in the North may be a greater risk

than that of equipment failure in the South. Of the two, the issue of equipment is more solvable and less expensive than personnel. There is a strong financial case to be made for focusing an FAO germplasm network in the South.

3. Although only partly addressed in the evaluation (note the US and Canadian banks discussion above), a second major problem relates to the financial and scientific problems of re-generating exotic germplasm. Thus, there is also a powerful scientific case for developing an FAO network in the South.

4. The IBPGR "network" includes many banks which do not meet its own standards. There is no positive correlation between the quality of a gene bank and the responsibility it receives for "safeguarding" designated base collections.

5. The IBPGR does not make the problems of its bank network public or available to governments. National governments who are contributing germplasm to sub-standard banks at the advice of IBPGR are not aware of the risks they are taking with their botanical treasures.

#### Recommended Action

1. The development of an FAO Network for Genetic Resources Conservation anchored in the South with the redeployment of endangered germplasm from sub-standard banks to existing superior or new facilities in the South;

2. National governments (particularly those in the North holding international collections) should identify specific collections of exotic germplasm in their keeping and, while agreeing to maintain the collections, place them under the auspices of the FAO Commission on Plant Genetic Resources.

3. The development of complimentary conservation strategies to the gene bank system which would include biosphere reserves and community seed conservation;

4. The early implementation of the International Gene Fund via the FAO Commission on Plant Genetic Resources so that, beyond voluntary contributions, one per cent of the retail price of seeds, plants and bulbs as sold in the North be rebated by governments to the Fund for allocation in the collection, conservation and utilization of genetic resources.



### The Ranking of Genebanks

The following graph indicates RAFI's interpretation of the surveys undertaken by IBPGR's evaluators. This evaluation may appear to judge the Nordic Gene Bank at Lund rather harshly. The Bank is well-run but heavily dependent upon other institutes for key services. The Nordic bank (operated on behalf of all Nordic countries) is also unduly dependent on traditional kitchen freezers. In RAFI's opinion this dependence is unacceptable and poses some risks for the the long-term security of the bank.

