

A REVIEW OF THE PROCEDURES, SAFEGUARDS,
AND POLICIES ASSOCIATED WITH THE IMPORT
AND EXPORT OF PLANT GERMPLASM BY THE
INTERNATIONAL AGRICULTURAL RESEARCH
CENTERS IN COOPERATION WITH NATIONAL
QUARANTINE SERVICES.

F I N A L R E P O R T

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by

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SUMMARY

The author, Dr. Robert P. Kahn, serving as a Consultant for a FAO-sponsored project and as a representative of PPQ-APHIS, USDA, reviewed the policies, procedures, and safeguards by which the International Agricultural Research Centers (IARC's) working in cooperation with the quarantine services (QS) of their host countries import and export plant germplasm. The review was conducted in 1981 with the approval and cooperation of the IARC's and QS.

After visiting six IARC's of the CGIAR network, the Consultant submitted to each IARC a report containing specific recommendations for IARC major crops. These recommendations, many of which have already been accepted or implemented, have been summarized in general terms in Appendix A.

The Consultant's general recommendations were submitted in each IARC report; and, they were presented to a Working Party which met at CIAT, Cali, Colombia, on June 15-17, 1982 to discuss the safe but rapid transfer of germplasm. The Working Party consisted of representatives from the six IARC's, the QS of four IARC host countries, FAO, IBPGR (regional), IICA, the Consultant, as well as other interested agencies and institutions. The group developed recommendations, which at the request of the Working Party, are included in Appendix B. Reports presented by four IARC's or QS are presented in part or in full in Appendix C.

The present report, which is the Consultant's final report, contains background information, terms of reference, discussions of pest risk analysis and it presents problem areas from both the IARC and QS points of view. The report also transmits the Consultant's general recommendations which are summarized below:

- (1) A post of plant germplasm quarantine officer should be established by FAO for a three-year period. The officer would work with the IARC's or QS when so requested to facilitate the rapid but safe exchange of germplasm. Serving in a liaison capacity, the officer would provide technical support, pest risk and safeguard analysis, and a data base for pests of quarantine significance. In addition, when so requested, the officer would arrange for training for IARC or QS personnel in the phytosanitary aspects of germplasm transfer.
- (2) Each IARC should set up a plant health unit, committee, or post to set phytosanitary standards in cooperation with the host country QS and the FAO plant germplasm quarantine officer.
- (3) IARC's should consider the use of a plant germplasm health statement to supplement but not replace the phytosanitary certificate issued by the QS. If a letter head statement is not used, an alternative could be a brochure which describes the safeguards.
- (4) The implementation of (1), (2), and (3) would be on a voluntary basis-- IARC's could work directly with a QS on a one-on-one basis.

ACRONYMS

- APHIS = Animal and Plant Health Inspection Service,
U.S. Department of Agriculture
- CGIAR = Consultative Group for International Agricultural
Research
- CIAT = Centro Internacional de Agricultura, Cali, Colombia
- CIMMYT = Centro Internacional de Mejoramiento de Maiz y
Trigo, Mexico City (El Batán), Mexico
- CIP = Centro Internacional de la Papa, Lima, Peru
- DGISP = Danish Government Institute of Seed Pathology
- FAO = Food and Agriculture Organization of the United
Nations
- IARC = International Agricultural Research Center
- IBPGR = International Board for Plant Genetic Resources,
FAO
- ICA = Instituto Colombiano Agropecuario
- ICARDA = International Center for Agricultural Research
in Dry Areas, Beirut, Lebanon
- ICRISAT = International Crops Research Institute for
the Semi-Arid Tropics, Hyderabad, India
- IICA = Instituto Interamericano de Cooperación para
la Agricultura
- IITA = International Institute of Tropical Agriculture,
Ibadan, Nigeria
- INIA = Instituto Nacional de Investigaciones Agrícolas
(Mexico)
- IPPC = International Plant Protection Convention
- IRRI = International Rice Research Institute, Manila
(Los Baños), Philippines
- PPQ = Plant Protection and Quarantine, APHIS
- TAC = Technical Advisory Committee, CGIAR

1. INTRODUCTION:

Plant pests of economic and/or quarantine significance can be moved long distances either over natural or man-made pathways--or both. However, not all pests move along both pathways. For example, most viruses, bacteria and many fungi, snails, and insects cannot be moved naturally over long distances. In some cases, pests can be moved naturally by the cumulative effect of a series of very short distance moves over a long period of time until a natural barrier is reached. However, pests can be moved over long distances by man when infested plants or plant parts including seed are transported. At the far end of the pathway, biological variables such as life cycle of the pest, environmental factors and population densities influence whether a pest enters a pathway and is subsequently moved. (Table 1)

When man or man's activities rather than natural factors provide a pathway, the threat of introducing a pest can be lowered by quarantine actions or safeguards applied at the far end of the pathway (i.e., at origin) or the near end (i.e., upon entry). At the far end, actions may include exclusion by regulation, preclearance, phytosanitary certification, and treatments. At the near end, actions may include a requirement for a permit, inspection, treatment, refusal of entry, growing plants in isolation or quarantine and safeguarded utilization of plants or parts including commodities or agricultural raw materials.

The international exchange of germplasm as seeds or vegetative propagations for use in breeding, conservation, or other research projects can provide an efficient pathway for the concurrent transfer of harmful pests (7, 8,9) Quarantine officers tend to be conservative about the entry status of certain genera when such genera in other countries are hosts for pests of quarantine significance to the importing country. This conservatism stems from one or more of the following: (1) an awareness of quarantine pests in the exporting country; (2) a lack of awareness about risks, i.e., "when in doubt, keep it out" attitude; (3) a fear that germplasm is collected in the wilds or from farms or markets in remote areas where there are no plant pathologists or entomologists; (4) a fear that seeds or vegetative propagations may be symptomless, i.e., pests are latent and, therefore, escape detection during inspection at either the far end or near end of the pathway; and (5) a lack of awareness or understanding of safeguards practiced in the institute or research station exporting germplasm.

Table 1. Listings of groups of pests and pathogens as well as natural and man-made pathways showing relationships with seeds

PEST AND PATHOGEN GROUPS	PATHWAYS	
	Natural	Man-made
+ insects	* winds and storms	* agricultural cargo
mites	* air currents	** non-agricultural cargo
slugs	* ocean currents	** containers
snails	splashing rain	* mail
+ fungi	* surface drainage	* baggage
+ bacteria	* seed dispersal	** common carriers (including garbage)
+ nematodes	root grafting	dunnage
+ viroids	fliers (insects)	** packing materials
+ viruses	self-locomotion (spores, cells, etc.)	** soil, sand, gravel
spiroplasmas		** used vehicles
mycoplasma-like organisms	vectors (such as insects, mites, fungi, nematodes, parasitic plants, *seed dispersal)	* plants and plant parts
+ parasitic plants		pure cultures of organisms
+ noxious weeds	* other carriers such as animals including birds	* "smuggling"
protozoa		nursery practices (shipping grafted plants)
ricksettsia		** forest litter (transported)
ricksettsia-like organisms		growing media
		** manufacturing using agricultural raw materials (bi-products, waste materials, etc.)

+ = denotes groups which contain some members which are seedborne.
 * = denotes direct pathways for seeds
 ** = denotes pathways for seeds as contaminants

Concern has been expressed in regulatory and scientific circles about the potential threat posed by the plant germplasm pathway operating on a global scale with hundreds of thousands of packets of seeds or vegetative propagations exchanged each year. In 1975, the International Board of Plant Genetic Resources (IBPGR), a unit of the CGIAR network, requested FAO to study this problem area. A working party was convened and a book (2,4,5, 6) sponsored by IBPGR, was published not only discussing these problem areas but presenting recommendations to reduce pest risk. At the request of IBPGR, the author, who was a member of the working party, presented these concepts and recommendations to the Government Consultation on the International Plant Protection Convention which met in Rome in November, 1976. The Consultation approved, in principal, the recommendations of the working party and recommended to FAO that a panel of experts should be established to develop a procedural approach (2, 4).

During recent years considerable progress has been made in detection and treatment methodology providing a sound biological basis to raise the health status of germplasm and thus reduce pest risk. This new methodology includes improved methods of virus indexing, seed health testing, thermotherapy, meristem tip culture, serology and other specialized laboratory techniques, electron microscopy, and treatments.

2. THE FAO INITIATIVE:

In 1980, FAO continued its efforts to catalyze the development of an international system to accelerate the safe but timely movement of germplasm under the concept that regulatory actions should serve as a filter to allow the entry of germplasm but block the entry of quarantine pests. A meeting was held between FAO, DGISP and ICRISAT at which time it was concluded that a meeting of specialists from IARC's, DGISP, FAO, IBPGR and quarantine services be held to consider the development of a global system that would meet the needs of international institutes and quarantine services. This recommendation parallels the one made to FAO by the 1976 Consultation of Governments.(4).

To prepare for such a meeting, FAO asked the author to serve as a consultant to review the phytosanitary aspects of the global exchange of germplasm by IARC's of the CGIAR network. The Director Generals of the IARC's not only approve such a review but welcome the opportunity for discussion about safeguarding concepts and procedures.

3. FAO REVIEW OF PHYTOSANITARY ASPECTS OF GERMPLASM EXCHANGE BY IARC's:

3.1 Terms of Reference:

The author, as a FAO consultant, but in cooperation with PPQ, APHIS, was asked to review the problem areas, policies, and safeguard procedures concerning the import and export of plant germplasm by IARC's in the CGIAR network.

The FAO Terms of Reference were as followed:

1. Visit IRRI, ICRISAT, CIMMYT, CIP, CIAT and IITA to review plant quarantine practices as they relate to the safe movement of germplasm.
2. Hold discussions with the Directorate of each center on the merits of a Working Party to be assembled in the future among IARC's, FAO, IBPGR and DGISP.
3. Prepare a comprehensive analysis, pointing out existing safeguards and measures or lack of them.
4. Recommend changes, if needed, to assure conformity with IPPC.
5. Assemble any related information that might be useful to the Working Party.

3.2 Data and information sources and resources:

The consultant's review was based mostly on visits to six IARC's and the quarantine services of IARC host countries as well as a search of the scientific literature but many other resources were also used. A questionnaire was sent by the consultant to the quarantine services of 20 countries which import germplasm. Since the 1976 Consultation of Governments in Rome (see Section 1), the consultant discussed the subject with quarantine officers and scientists or made formal presentations at meetings of the InterAfrican Phytosanitary Commission, the European and Mediterranean Plant Protection Organization, the American Phytopathological Society, the U.S. National Plant Genetics Board, the 9th International Plant Protection Congress, and the Symposium on Plant Protection in the Tropics, 1980, Malaysia.

Finally, the author used his experience with the phytosanitary aspects of the international exchange of germplasm as head of the PPQ Plant Quarantine Facility, 1957-1970, 1972-1974; as Plant Quarantine Officer for the East African Community (Kenya, Uganda and Tanzania), 1970-1972 and as technical backstop 1972-1980; and as staff officer or Acting Assistant Director, Biological Assessment Support Staff (formerly Plant Importation and Technical Support Staff), PPQ, APHIS, 1974 to date. In addition, the consultant served on a short-term assignment October 16-29, 1977, to the Government of Zambia (sponsored by FAO); and the Government of Niger, May 20-June 2, 1978, (sponsored by the West African Economic Community). In both of these instances, the consultant advised on plant introduction, regulations, and staffing and procedures for plant quarantine stations.

3.3 Modus operandi:

The consultant visited the six IARC's (Table 2) and the quarantine services of the IARC host countries. However, ICARDA was not included because ICARDA's acceptance of the FAO proposal for a review was not received due to communication delays until after the consultant had obtained clearance and developed a final schedule and itinerary.

The centers visited and the dates in 1981 were as follows: (1) IITA, April 27-May 1; (2) ICRISAT, May 3-10; (3) IRRI, May 10-15; (4) CIP, June 22-25; (5) CIAT, July 2-9; and (6) CIMMYT, July 9-15. The consultant previously visited these centers: CIMMYT in December, 1979; CIP, Virus Planning Conference, April 22-26, 1980; ICRISAT, November 1980, and IITA in 1971, 1974 and 1977.

During the 1981 visits to IARC's, the consultant first discussed concepts, problem areas, and safeguards with the Director General, Deputy Director General, or Directors of Research and then held group or one-on-one discussions with plant breeders, entomologists, geneticists, or plant pathologists. At quarantine services, the consultant met with the quarantine officer and his staff

and usually toured quarantine facilities. At CIMMYT, the consultant presented a seminar to the entire technical staff and in Peru the consultant gave a seminar to quarantine officers, entomologists, and plant pathologists in the Ministry of Agriculture. In Peru, the consultant also met with officials of IICA.

The consultant fulfilled his terms of reference as follows:

1. Discussions with scientists and regulatory officials on site.
2. Discussions of items 1, 2, 3, and 5 in draft reports (see Section 3.4) submitted to IARC's and the quarantine services of their host countries. A separate report was written for each IARC.
3. Discussion of items 1, 3, 4, and 5 at the Working Party meeting held at CIAT, Cali, Colombia, June 15-17, 1982 (Section 3.6).
4. The present report which is the final report of the consultation.

3.4 Specific and general recommendations in draft reports for IARC's:

In 1981 and 1982, the consultant prepared a separate draft report for each IARC visited in partial completion of his terms of reference. Items 1, 3, and 4 in the terms of reference were addressed by specific reviews and recommendations for each major IARC crop (Table 2). Items 1-5 were addressed in general comments and recommendations which were applicable to all six IARC's.

The consultant distributed only six copies of each IARC report as follows: FAO, Rome (2 copies); the IARC (2 copies); and the quarantine service of the IARC host country (2 copies). No other distribution was made by the consultant.

The IARC's and quarantine services were each asked to return one copy with comments, suggestions, and corrections. Reviews of the drafts were returned by all six IARC's and 4 of the 6 IARC host country quarantine services. The comments received were not extensive enough to warrant typing--with the exception of ICRISAT where an exchange of information is currently underway. IARC's and host country quarantine services may adopt any specific recommendations made on the basis of the draft report so retyping does not appear necessary. Some suggestions have already been adopted by some IARC's.

Table 2. Names, acronymns, locations of international Agricultural Research Centers and 19 crops reviewed by the FAO consultant in his assessment of the policies, procedures and safeguards associated with the import and export of germplasm

NAME	ACRONYM	LOCATION	CROPS REVIEWED
Centro Internacional de Agricultura	CIAT	Cali, Colombia	beans cassava *
Centro Internacional de Mejoramiento de Maiz y Trigo	CIMMYT	Mexico City (El Batan), Mexico	maize wheat
Centro Internacional de la Papa	CIP	Lima, Peru	potato *
International Institute of Tropical Agriculture	IITA	Ibadan, Nigeria	sweet potato * cowpea cassava *
International Rice Research Institute	IRRI	Manila (Los Banos) Philippines	rice
International Crop Research Institute for the Semi-Arid Tropics	ICRISAT	Hyderabad, India	chickpea groundnut * pearl millet pigeon pea sorghum

Denotes crops review as both seed and vegetative propagations with each considered as a separate crop for the purpose of this review.

3.4.1 General recommendations:

The consultant's general recommendations in the draft reports to IARC's were the same in each IARC report since they applied to the network as a whole. The recommendations which are discussed in detail in Sect.7-12 were as follows--

- that FAO should establish a post of FAO plant germplasm quarantine officer to work with national quarantine services and IARC's, when so requested, to facilitate the safe but timely movement of germplasm.
- that IARC's should consider the use of a plant germplasm health statement, where applicable, to accompany, but not replace, the international phytosanitary certificate
- that IARC's establish a plant health unit, committee or post to deal specifically with the health status of its exports and imports
- that IARC's should not only develop a program to raise the health status of its exports whenever feasible but make the scientific and regulatory community more aware of programs and safeguards.

3.4.2 Specific recommendations:

The consultant's specific recommendations were presented for IARC major crops in the individual report submitted to each IARC. It is beyond the scope of the present report to present the specific recommendations for safeguards related to both the import and export of 19 crops. Nevertheless, in the consultant's opinion, it would be useful to readers of this report to have an overview of these specific recommendations. To this end, an overview is presented in tables in Appendix A. However, to enable the reader to obtain a general view without being bogged down by a multiplicity of specific technical recommendations about 19 crops, the crops are coded so that the network can be viewed as a whole. The overview breaks down the evaluation of safeguarding process to its various components and then gives a "qualitative" scoring to each.

4. INTERNATIONAL CONSULTATION ON THE SAFE AND EFFICIENT
MOVEMENT OF PLANT GERMPLASM:

4.1 Introduction:

The consultation (referred to as a Working Party in Section 3) met at CIAT at Cali, Colombia, on June 15, 1982. The provisional agenda which was circulated in advance to invited participants was followed at the meeting. The agenda and list of participants are shown on the pages which follow.

INTERNATIONAL CONSULTATION ON A SYSTEM FOR
SAFE AND EFFICIENT MOVEMENT OF MATERIALS
IN GLOBAL GERMPLASM EXCHANGE NETWORKS

to be held at
CIAT, Cali, Colombia
June 15-17, 1982
in
Cooperation with FAO and IBPGR

PROVISIONAL AGENDA

1. Presentation of FAO consultant's general report on phytosanitary activities at the International Agricultural Research Centers (IARC's).
2. Commentary from the IARC representatives on phytosanitary activities at each center in response to the consultant's general report.
3. Reports from representatives of the national plant protection services of the host country of each of the IARC's and others from countries having close association with the work of the IARC's.
4. Presentation by the Danish Government Institute of Seed Pathology on their methods of seed health testing.
5. Discussion of proposals put forward by FAO through its consultant, with respect to the safe and efficient movement of germplasm at the international level.
6. Formulation of recommendations to be taken into consideration by the respective parties involved in international germplasm exchange.

INTERNATIONAL CONSULTATION ON A SYSTEM FOR
SAFE AND EFFICIENT MOVEMENT OF
PLANT GERMPLASM

CIAT, 15-17 June 1982

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4.2 Report and recommendations:

The participants at the consultation requested that the proposals developed at the meeting accompany the general report of the consultant. Consequently, the consultant includes as Appendix B: a copy of the document that was (1) developed at the consultation, (2) agreed to by a majority of the participants, and (3) circulated to each participant prior to adjournment. Where there was some disagreement on the part of two IARC's, the minority viewpoint was included (see Appendix B, sections 1.1 and 2.1).

The proposals were developed by participants listed in Section 4.1. The group included representatives from FAO, TAC, six IARC's, four quarantine services of IARC host countries, INIA, IICA and DGISP. However, the representative from the quarantine service of Mexico and the regional representative of IBPCR did not participate in voting although they did so in technical discussions.

4.3 Consultant's assessment of the consultation proceedings:

In the consultant's opinion, all participants understood before the proposals were developed that they were expressing viewpoints as participants in a workshop. There was an understanding that endorsing or not endorsing proposals did not necessarily represent the official position or policy of an IARC or quarantine service. The official response to the consultant's general report and the consultation proposals will come directly from Director Generals of IARC, Directors of plant quarantine services of IARC host countries, TAC, CGIAR, FAO and IBPCR after the present report is submitted.

Within the above mentioned context, the consultant observed the following trends concerning two of the principal general recommendations. (1) Proposed FAO plant germplasm quarantine officer. Three of the 3 participants representing quarantine services of the host country were in favor of the concept. A fourth country's representative (Mexico) did not vote. India and the Philippines were absent--however, the quarantine officer of the Philippines, Sr. Mereno, told the consultant at briefing in the consultant's office in late June, 1982, that he favored the concept.

Participants from 4 of the 6 IARC's endorsed the concept, whereas 2 (ICRISAT and CIMMYT) did not do so. ICRISAT had not taken a full consensus of the scientists in five crop areas and is currently re-considering. (2) Optional plant germplasm health statement. The opinions expressed followed the same lines of thought as described under (1). Mr. Merino of the Philippines also endorsed this concept during his meeting with the consultant.

5. LIBERAL AND CONSERVATIVE ATTITUDES ABOUT ENTRY OF GERMPLASM:

Modern plant breeding and crop improvement or diversification programs place a heavy demand on the plant breeder to produce new genotypes which not only must meet requirements for increased yield and higher quality but must also incorporate entirely new plant characteristics. These include raising protein levels, shortening stem length, developing tolerance to stresses such as drought, flooding, alkalinity, fertilizer imbalance and pest and pathogens. In some cases, there is a need to extend the ecological range of the crop species or to change plant growth habits to accommodate either primitive or mechanized agriculture.

In order for these genetic building blocks to be useful in restructuring varieties, IARC scientists must assemble the plant materials--and, in doing so, the plant materials must in a quarantine sense "make entry" into the IARC host country. Similarly, in order for the genetic stocks or breeding lines developed at an IARC to be used elsewhere, they must be exported and again, in a quarantine sense, they must "make entry" in other countries.

The manner by which quarantine officers view the importation of plants (or any article) is often termed "entry status." Entry status is a term used to cover the policies, rules, regulations, guidelines or decisions that determine firstly whether the germplasm (or any article) is enterable based on pest risk; and, secondly, if enterable, under what safeguards. Pest risk is based on the calculated, estimated, or perceived chances of inadvertently introducing hazardous pests and pathogens in, or, with germplasm. Safeguards are precautions or actions taken by man to either block the pathway or to reduce the chances that the germplasm pathway will serve as a means of entry for pests of quarantine significance.

Attitudes towards "entry status" may range from liberal to conservative. Attitudes may be considered to be biologically based if they match pest risk (9) Thus, when the pest risk is high, entry status should be conservative. Similarly, when pest risk is low, entry status should be liberal.

In the consultant's judgment, the attitude of most, but not all, plant breeders is generally liberal, whereas the attitude of most, but not all, quarantine officials is generally conservative. Breeders and quarantine officers, in supporting these entry status attitudes, are motivated by the same goal--namely, to increase agricultural production. The breeder's approach is to bring in the "good genes" of germplasm and in doing so regards quarantine actions as an obstacle in reaching the common goal. The quarantine officer approach is to keep out the "bad genes" of pests and in doing so regards large numbers of accessions from diverse exotic sources entering without safeguards as an obstacle in reaching the common goal.

Entry status for a given genus or species of germplasm should be based on the summation of all the crop/pest interactions. The pest risk situation of each interaction would vary so that some combinations would rate "high pest risk" and, therefore, would warrant conservative entry status whereas others would rate "low pest risk" and, therefore, liberal entry status. Using this approach, neither the conservative quarantine officer who is consistently conservative nor the breeder who is consistently liberal are operating on a sound biological platform.

The thrust of this report is (1) to show how a conservative quarantine officer can safely become less conservative when warranted by a biologically based pest risk analysis if safeguards are provided so that germplasm can flow in a timely fashion; and (2) to show when a liberal breeder should become more conservative and accept safeguarding principles to lower pest risk when warranted by a biologically sound pest risk analysis.

6. SOME PROBLEM AREAS IN THE INTERNATIONAL EXCHANGE OF PLANT GERMPLASM:

A number of specific and general problem areas were identified by the consultant in reviewing the IARC's and quarantine service's roles in the international exchange of germplasm. Some specific problem areas were identified and discussed in the consultant's draft report for each IARC. The general problem areas are summarized in this section but discussion and suggested solutions are beyond the scope of this report. Such problems should be addressed by the proposed FAO plant germplasm quarantine officer.

6.1 Problems from the IARC point of view:

1. Quarantine regulations of some IARC host countries require that germplasm pass through quarantine greenhouses or screenhouses before release to the IARC. In at least one case, the quarantine service does not have enough space; consequently, processing germplasm is delayed. In another case, there is no greenhouse space so the germplasm enters only for quarantine seed storage. In a third case, the IARC furnished quarantine greenhouses to the quarantine service.
2. The consensus in quarantine circles is that each quarantine service has the responsibility for protecting its country from the entry of exotic pests. To do so, quarantine services set up procedures, regulations, and safeguards. In some IARC/quarantine service interactions, the responsibility for protection along the germplasm pathway has been delegated to the IARC. In such cases, the quarantine service lacks trained personnel. Some IARC's have taken up the slack so that the germplasm can safely move; but in doing so, its funds are diverted. When additional safeguards are required, the IARC must consider cost/benefits as well as priorities which often places the IARC in a difficult position when there are budget limitations.
3. Seed health testing is required by the quarantine services of some IARC countries. In some cases, only small amounts of seeds are actually released which is a disadvantage for lines that are not homozygous, i.e., when genes are segregating.

4. It is alleged that germplasm imported by national institutes of the IARC host country enters under a lower set of phytosanitary standards or less restriction than germplasm of the same species imported by the IARC. In essence, it is alleged that there is a double standard whereby IARC germplasm is delayed by quarantine restrictions more than national institute germplasm.
5. In times of famine or drought (and it is alleged "when the price is right") some countries import large amounts of IARC crops enterable for consumption while still imposing quarantine restrictions on the IARC germplasm--yet it is alleged that some of the imports are diverted to planting. The question posed is why should IARC's be subject to restriction which delay imports?
6. Many of the quarantine services that impose quarantine restrictions on imports of IARC germplasm do not have enough staff to man the border, seaports and airports. Consequently, these same crop species may be entering without quarantine restrictions at those points of entry, whereas IARC germplasm is delayed.
7. Quarantine services tend to impose the same quarantine restrictions on material entering from adjacent countries as they do for the same material entering from distant countries. Pests can move naturally from adjacent countries but these same pests may not move as readily from distant countries. IARC's believe that germplasm imported from adjacent countries should be subject to less restriction--particularly since farmers and travellers can move the crop readily whether or not there are border stations. The argument is based on the assumption that adjacent countries have more or less the same spectrum of pests.
3. It has been alleged that during periods when large numbers of accessions are handled by quarantine services that processing is delayed, labels lost, or shipments delayed because of paper work. Also, prolonged testing by quarantine services delays importation excessively according to some IARC scientists. Not all delays at quarantine services are biological in nature--it has been alleged.

9. It is alleged that national institutes use the diplomatic pouch to escape quarantine restrictions. Such material enters more readily than the same species imported by an IARC.
10. When IARC's import germplasm of cross-pollinated crops or hybrids, some genetic integrity is lost when seeds are planted in quarantine greenhouses to produce plants from which second generation seed is produced for release to the IARC.
11. When rare germplasm represented by a few seeds is processed through quarantine, not much material is left by the time the detection and treatment procedures are completed.
12. There is a tendency when a new pest or disease breaks out in a country to associate its occurrence with an IARC when national institutes are also importing the same crop species. Also, the pest or disease could have entered along a natural pathway or other man-made pathways. Usually it is not possible to determine the exact pathway for the entry of a given organism.
13. Some IARC's have sent out multiple trials for planting at different locations in the same country. Some quarantine services allow only one planting and expect seed harvested from this planting to be used the following year. This is not meaningful for cross-pollinated crops and F₁ Hybrids.
14. IARC scientists, visiting foreign countries, are alleged to have brought back pests after walking in farms and experiment stations. However, scientists from national institutes also visit foreign countries. It may be assumed that scientists in general take proper precautions. However, tourists, businessmen such as in agribusiness, and farmers also visit these same locations.
15. Quarantine services generally distrust scientists as a group. However, IARC scientists work under policies or guidelines whereby they are not allowed to bring in unauthorized materials-- but knowing the risk they would not do so even without such guidelines.

16. Some quarantine services regulate against pests and pathogens already widespread in their country.
17. IARC's do not have, in general, up-to-date information about the quarantine requirements of the importing country. This information should be available at the IARC host quarantine service; but, in some cases the information is not current.

6.2. Problems from the quarantine point of view:

A number of problem areas were discussed by quarantine officers in connection with the international exchange of germplasm. Examples of these problem areas are as follows:

1. When IARC's import large numbers of accessions of a given crop, quarantine services had difficulty in processing, in a timely fashion, those crops which must pass through quarantine. Quarantine officers would find it easier to process small numbers of packets over a longer period of time.
2. Quarantine officers prefer to take the risk only once in order to obtain the benefits. They are willing to take the risk in order to benefit, but they question the need to take the risk more than once. In a replicated trial of four replications, for example, quarantine officers who subscribe to this concept would prefer that one trial be planted and that seed produced in this single trial be used the following year for multiple trials. They could then concentrate safeguarding in a single location. (Of course, this presents a problem to the breeder when the crop is cross pollinated or an F_1 hybrid.)
3. Some IARC's treat seed so heavily that not only is it difficult, if not impossible, to inspect dry seeds or conduct a seed health test, but also there is some hazard to the inspector or seed analyst.
4. Some quarantine services have had "unfortunate" experience with a scientist attempting to circumvent quarantine. Growers, farmers, and business persons are also sometimes included in the category of alleged smugglers.
5. Some scientists and agencies have used the diplomatic pouch to circumvent safeguards.
6. Quarantine officers do not have an awareness of safeguard procedures at distant IARC's. If quarantine officers have a zero tolerance for an exotic pest, they have problems in accepting a phytosanitary certificate as the sole safeguard.
7. Quarantine officers do not have ready access to data about exotic organisms and pest risks.

8. Quarantine services of many countries which import germplasm do not have greenhouses for safeguarding and technically trained personnel for inspection and detection.
9. Quarantine officers are concerned about exotic races or strains of pests even though the pathogen or pest species is already in their countries. Exotic strains may attack different varieties of the crop than do the domestic strains, or they have different host ranges or different ecological adaptation.
10. Quarantine services of IARC host countries process germplasm not only for an IARC but for national research institutes, private research organizations, and, in some cases, specialized grower associations. IARC tend to require such a large proportion of the facilities that release of germplasm for other interests may be delayed.
11. Quarantine services need training for inspectors, supervisors, and mid-level administrators. In some cases, the train-the-trainer type instructor is desired. If quarantine services had more trained personnel, they could participate in IARC safeguarding.
12. At IARC, short-term research projects (e.g., visiting scientists) often require large amounts of imported germplasm for use in a specific project--but it is alleged that many of the lines are not important to the IARC program but are needed so that a specific problem may be completed in a short time frame. Quarantine officers would prefer that smaller amounts enter each year than having to handle large amounts in a single year.
13. From some quarantine officers point of view, IARC's are "associated" with new but inadvertent introductions of pests.
14. Quarantine officers worry more about IARC collections from exotic places than they do about national institute collections because IARC's collect from a wider spectrum of locations, particularly the wilds which have not been studied by entomologists or plant pathologists.

15. There are a great number of diseases of unknown ecology. Since the life cycle is unknown, it may be difficult to determine man-made or natural pathways. Therefore, some crops are regarded as higher risk than others. Quarantine officers tend to be conservative about high risk germplasm importations. They regard such importations as potential problem areas.
16. Quarantine services are concerned that even when an IARC administers a wide spectrum insecticide and fungicide that the products may not be effective against all seed-borne pests of quarantine significance.
17. Quarantine officers are concerned that many organisms of quarantine significance may be latent and thus be difficult to detect by inspection alone.
18. Quarantine officers who have a zero tolerance for an exotic pest which is not known to occur in their countries, do not believe they can rely on the phytosanitary certificate as the only safeguard--since the certificate only states "apparently free" of pests.
19. Quarantine officers, operating on limited budgets, have problems providing safeguards for large amounts of germplasm. Funds are sometimes not available to purchase library reference materials including journals.

7.0. The proposed FAO Plant Quarantine Officer:

The consultant recommends that FAO establish the post of plant germplasm health officer--by whatever funding procedure is appropriate and feasible. It is logical for FAO to be the sponsoring agency because the post is closely related to the phytosanitary certificate. The phytosanitary certificate was established by the International Plant Protection Convention of 1951 (also known as the Rome Convention). As of this writing, the following concepts, functions, or responsibilities relate to the position:

1. The officer would work with IARC's and quarantine services, when requested by either or both, to facilitate the safe and timely export and import of plant germplasm. In doing so, the officer would work with IBPGR, TAC, and other agencies or institutes, such as third-country quarantine centers, the Danish Government Institute of Seed Pathology, the Interamerican Institute of Agricultural Science, (IICA) and various regional plant protection organizations.
2. The officer would serve only in an advisory capacity at the request of the IARC's and/or national plant quarantine services. Since the officer could have no regulatory authority (such authority lies within the national quarantine services), the officer would serve as consultant on pest risk analyses, procedures, safeguards, and other related topics.
3. The officer would provide the biologic basis to solve problems and to penetrate impasses created by the excessively conservative attitude of some scientists. In the consultant's judgment, in any instance, both the excessively liberal and conservative attitudes cannot be biologically sound when viewed in the light of risks versus benefits, costs versus benefits, and recent advances in safeguard procedures. Upon request, the FAO health officer would suggest a biologically based compromise based on the particular pest-host interaction, geographic distribution of the pest, damage potential, probability of establishment, and other factors. It might be expected that the analyses on one occasion might favor a more liberal policy on entry status while on another it might justify a more conservative policy or merely to maintain the status quo.

4. The FAO officer would work with quarantine services and IARC's to develop lists of quarantine and/or economically significant pests and pathogens. He would then provide a data base to include host range, symptoms, geographic distributions, strains, life cycle, and diagnoses to be used in pest risk and pathway analyses. Profiles, which would be useful to scientists as well as regulatory officers, would be developed for pests.
5. The FAO officer would locate or recommend training related to the phytosanitary aspects of germplasm exchange at a level and for persons nominated by IARC's or the IARC host country quarantine services.
6. The officer would organize workshops to assemble experts in problem areas identified by IARC's or quarantine services. Among the topics already suggested are workshops to recommend procedures for detection and identification of pests of Cassava, Solanum, and legumes.
7. The officer would work with the IARC's and quarantine services to develop brochures or other public relations projects so as to inform the scientific public about quarantine problems, procedures, and risks.

The terms of reference developed by the Work Party discussed in Section 3 are included in Appendix B.

8. PROPOSED PLANT GERMPLASM HEALTH STATEMENT:

The plant germplasm health statement is a proposed document to be issued by an IARC to accompany a phytosanitary certificate issued by the plant quarantine service of the IARC host country. The health statement is not meant to replace or substitute for the international phytosanitary certificate but rather it constitutes a second document to provide specific information about the health status of germplasm. The phytosanitary certificate addressed to the plant protection service of the importing country and issued by the plant protection service of the exporting country is the legal document used for planting materials transferred under the terms of the International Plant Protection Convention (IPPC) of 1951 (i.e. "the Rome Convention").

The plant germplasm health statement provides a conservative quarantine officer a "second opinion" as to health status. The statement would be based on internationally approved methodology as developed by the scientific community and as monitored by the FAO plant germplasm health officer. Many quarantine officers believe that although the phytosanitary certificate is a useful and necessary document in regulatory circles, it does not give conservative quarantine officers enough "protection" in the case of high risk plant importations.

The concept of a plant germplasm health statement was presented by the consultant in 1975 to the IBPGR Working Party, to IPPC in 1976, and to the IARC's by IBPGR in 1976 (see Section 1). However, a germplasm project was not initiated at that time. Recently, CIP instituted a plant health statement as part of its export procedures (Figure 1).

The consultant recommends that other IARC's consider the use of the statement for their exports. The statement may be more useful for vegetatively propagated crops than for seed crops. Within crops propagated by seeds, the statement may be more useful for crops that are not legumes than for legumes where the incidence of seedborne virus and bacteria may be high. The consultant's proposal calls for the statement to be implemented entirely on a voluntary basis.

The IARC should work with the quarantine service of its host country and the proposed FAO quarantine officer in developing and implementing a statement so that the statement will have as much credibility as possible in international plant quarantine circles. The FAO officer would work with the IARC's and the international scientific community to recommend detection testing standards and procedures. Perhaps a workshop or conference could be convened for this purpose when the selection of methods or phytosanitary standards are controversial.



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PHYTOSANITARY STATEMENT

This is to certify that the tubers, true seed, *in vitro*, tissue cultures or cuttings, or representative samples of them, were thoroughly examined on (date of dispatch): _____
by (name): _____
a Senior Scientist of the International Potato Center; and that the consignment is believed to conform to the declaration below.

ADDITIONAL DECLARATION

CHECK APPLICABLE STATEMENT(S) / CROSS OUT NON APPLICABLE STATEMENTS

- The vegetative plant parts were indexed and found to be negative for viruses: A, M, S, T, X, Y, potato leaf roll, andean potato latent, andean potato mottle, tomato black ring and tobacco ring spot viruses by symptoms, indicator host inoculations, by latex or ELISA serologic techniques and electron microscopy. Mother plants were examined during the growing season and found to be free of leaf roll virus symptoms. Potato spindle tuber viroid (PSTV) was negative by the Yang and Hooker tomato test and by electrophoresis.
- True seed was harvested from pathogen-tested parents which tested negatively for PSTV, andean potato latent virus and potato virus T.
- True seed from parents of unknown health status grown under greenhouse conditions. A 10 percent sample of seed has been tested and found to be negative for PSTV, andean potato latent virus and potato virus T.

FUMIGATION AND DISINFECTION TREATMENT

DATE	TREATMENT

CHEMICAL, CONCENTRATION AND DURATION OF EXPOSURE

Figure 1 - Copy of a Plant Germplasm Health Statement used by CIP, (June 1982)

DESCRIPTION OF THE CONSIGNMENT

EXPORTER'S NAME AND ADDRESS		CONSIGNEE'S NAME AND ADDRESS	
NUMBER AND DESCRIPTION OF PACKAGES		PHYTOSANITARY STATEMENT No. _____ PERU PHYTOSANITARY CERTIFICATE No. _____	
ORIGIN	MEANS OF TRANSPORT	POINT OF ENTRY	
QUANTITY AND BOTANICAL NAME OF PRODUCT			

S P E C I M E N

In the best of our knowledge this plant material was free of disease and pests at point of dispatch. No liability shall attach to the International Potato Center, or any of its officers or representative with respect to this statement.

DATE	PLACE	SIGNATURE
------	-------	-----------

If a statement is not used in the sense that the consultant has recommended, the consultant then recommends as an alternative that the IARC develop a brochure or other publication that describes in general but technical terms the safeguarding procedures. The FAO quarantine officer could help in the development of such brochure. However, the brochure, in the consultant's opinion, would not have as much phytosanitary clout as a letterhead statement developed in cooperation with quarantine officers. Brochures or statements should accompany each qualifying shipment if an IARC decides to implement either proposal.

9. PROPOSED PLANT HEALTH UNIT OR OFFICER AT EACH IARC:

The consultant also recommends that each IARC establish a plant germplasm health officer, unit, or committee to deal specifically with the health status of exports and imports. The officer should be a trained employee of the national quarantine service. However, if not feasible, the officer could be an employee of an IARC who would interface with the national quarantine service and the FAO plant germplasm health officer. If a national or IARC officer is not available, an IARC could establish a committee for this purpose. A quarantine office or unit could also be established by an IARC as at ICRISAT.

In any event, the officer, unit, or committee should have the responsibility for developing procedures and recommending policy. The officers or committee should report to an IARC Director of Research or other management official. The Chairman of the committee, leader of a quarantine unit, or an individual health officer should be a plant pathologist in the consultant's judgment. If a committee is set up, and it is not feasible for the Chairman to be a plant pathologist, then the committee should have as a member a plant pathologist who should be responsible for approving the health status of exports. The emphasis on plant pathology is warranted because most of the obscure or latent pests are pathogens. The importing country usually cannot detect such pests by inspection. Consequently, these officers regard latent or obscure pests as high risk--and consequently they tend to be conservative. Conservative officers would regard an IARC having a plant pathologist as a "chaperone" as a safeguard.

10. IARC IMAGE FOR PLANT HEALTH:

The consultant recommends that each IARC raise "plant health to a position of prominence in the organization of the IARC--if they have not already done so. In doing so, the IARC will develop a positive image about plant health.

The consultant is of the opinion that some IARC's regard the publicizing of health or sanitation activities as a negative factor because this "admits" there may be some problem area. To the contrary, the consultant views the "awareness of health" as a positive factor. By elevating health to a more significant administrative and scientific level, the IARC can make an asset of plant health.

Conservative quarantine officers of importing countries may be more inclined to move to a more liberal posture if they know the IARC has a positive plant health attitude and program. Quarantine is just as much a control method as is breeding for resistance or application of chemicals. Each control measure, including quarantine, has a role in integrated pest management.

The plant health unit, committee, or officer should be listed in the IARC directories and annual reports where the organization and staffing are published. Correspondence should be signed over a signature block showing the plant health unit, committee or title.

Management and scientists at IARC's as well as officials of national quarantine services are aware that pests and disease agents of economic and/or quarantine significance can be moved in, on, or with the seeds and vegetative propagations. Imports are often collected in the centers of diversity of the crop species. These same centers are often the centers of diversity for the organisms which attack the crop. Thus, in collecting the "good genes" of the germplasm, "bad genes" of the pathogens must be filtered-out by blocking the pathogens.

This filtering-out process not only protects the host country from the entry and establishment of organisms, but protects the IARC genetic stocks. Exports, whether seeds or propagations, are produced on mother plants at IARC's. Exotic and domestic pests and disease agents must be filtered-out also so that these exports do not serve as a pathway for the entry of harmful organisms.

The quarantine officials of IARC host countries as well as countries which import germplasm have the overall responsibility of blocking the most significant man-made pathways. These officials regard germplasm, and rightly so,

as a high risk pathway that lead to the entry and establishment of economically important pests and disease agents. Consequently, these officials are often conservative about the entry of germplasm. It is difficult for them to be aware of the filtering-out methodology practiced thousands of miles away.

The phytosanitary certificate (in accordance with the FAO Plant Protection Convention of 1951) is one of the available safeguards that the quarantine official can use in determining the entry status of high risk plant germplasm. However, when the phytosanitary certificate stands alone as the only safeguard for high risk germplasm, it may be considered as less than acceptable--particularly when zero tolerances against exotic pests or agents are involved.

The consultant raises the question as to how will the conservative quarantine officer of the importing country who may have set up barriers or restrictions know about the safeguarding or filtering-out process if an IARC maintains a low profile? Should not an IARC elevate plant health to a more visible notch so that quarantine officers know that centers have an awareness of the pest risk problems of the importing country and have recognized the potential threat by countering with a distinct plant health program?

By developing a strong plant health program an IARC provides the first line of defense for the importing country which is exclusion. By inspecting and treating at origin (=an IARC), the IARC gives the importing country more protection and reduces the chances of exporting the "harmful" genes of pathogens along with the "beneficial" genes of plant improvement programs.

Since the concept of "exclusion" is always foremost in quarantine circles, quarantine officials look with favor on actions taken to improve health status at origin.

11. TRAINING:

The consultant recommends that the FAO plant germplasm officer work with the IARC's and host country quarantine services, when so requested, to arrange for training at the level requested for IARC and/or quarantine service personnel. It is beyond the scope of this report to present specific training needs because the consultant did not discuss this aspect in detail during his review. However, based on his observations, training is needed at some centers and by some quarantine services.

For IARC and/or quarantine service personnel, the following types of training are suggested at a level to meet the background of the trainee:

- (1) New quarantine officer training at the beginning or basic level; or train-the-trainer type of quarantine training (United States, Nigeria, Australia, IICA, FAO, etc.).
- (2) Advanced or supervisory quarantine officer training with emphasis on the phytosanitary aspects of the exchange of germplasm. (At the home-base of the IARC employee, at sister IARC's, at quarantine stations, academic courses, etc.).
- (3) Training in growing season inspection (at IARC's or in various countries with well developed domestic or export certification systems for IARC crops).
- (4) Seed health testing at the Danish Government Institute of Seed Pathology.
- (5) Laboratory procedures for IARC and quarantine personnel (on-the-job training or at various domestic or foreign locations).
- (6) Safeguard principles and pest risk analysis.
- (7) Understanding regulations of other countries.
- (8) Background training for laboratory personnel in the general aspects of quarantine principles and for quarantine inspectors in general aspects of laboratory pest detection such as serology, indexing, tissue culture, etc.
- (9) Treatment and fumigation training and safety.
- (10) Survey and detection training.

Many countries having active training programs such as Nigeria, Australia, the United States, Netherlands, perhaps France, and others. In addition, IICA and FAO provide courses in Spanish. The United States may develop courses or assist in courses in Spanish and French.

1970-1971

12. THIRD-COUNTRY QUARANTINE AND RESEARCH

The consultant has previously reviewed the use of third-country quarantine for germplasm (3) . The concept is that if there is a risk in moving germplasm from Country A to Country C because Country A has a quarantine pest that does not occur in Country C, then the germplasm should pass through quarantine or isolation in Country B provided the host is not grown there as a crop and Country B is not concerned about the risk. The system is particularly useful for moving tropical or subtropical crops through temperate countries. In this manner, coffee, tea, rubber, banana, and cacao germplasm has moved through the continental United States in Federal quarantine stations located in Maryland and Florida. Kew Gardens in the United Kingdom, the Tropical Crops Institute in the Netherlands, and certain institutes in Montpellier, France, have served or are serving in this capacity for tropical crops. DGISP has also handled some germplasm as seeds.

Some IARC's are already applying this concept. Vegetative propagations of Arachnis collected in the wilds and assembled in the United States are passed through quarantine at the University of Reading in the United Kingdom before going to ICRISAT in India. CIP moves potatoes after quarantine and testing in the Netherlands and Australia. CIAT may use the Netherlands as a type of third-country isolation for beans.

The consultant recommends strongly that IARC's consider a more extensive use of this procedure, particularly for vegetatively propagated crops, but also selected seed crops not moved as a large number of accessions. For example, vegetatively propagative sweet potato and other tropical root crops could be moved, for quarantine and testing, through north temperate countries in the northern hemisphere or south temperate countries in the southern hemisphere. Cassava seeds could be passed through DGISP for bacterial testing and treatment and for testing of samples by growing-on tests.

In addition, IARC's should consider sending or receiving materials from recognized quarantine stations. CIP already distributes potato in East Africa after growing out and increase in the quarantine station in Kenya (located outside of commercial potato growing areas).

IARC's may also wish to consider the use of a sister IARC station to serve as a small scale third-country quarantine using personnel of the sister IARC for detection and treatment. Perhaps reciprocal arrangements could be made.

Universities or private research organizations working with their own national quarantine services may also be in a position to provide quarantine services.

In addition to quarantine services, countries, stations, or institutes may be able to conduct research on the detection or treatment of organisms. They are often in a position to assemble isolates from different geographic areas and to conduct tests, subject, of course, to local quarantine restrictions. For example, various strains of fungi, bacteria or viruses could be collected at a point to work out seed treatment, serology and indexing, as the case may be. Comparisons could be made of viruses from different geographic locations which incite the same symptoms. If identities could be clarified, quarantine restrictions might be lowered; thus, facilitating the movement of germplasm.

For quarantine services, most stations, universities, and institutes might require financial support. Often donor agencies such as ODA (UK), USAID (US), CIDA (Canada), and others are willing to furnish funds, particularly if the work is done by the donor country. In some instances, particularly for research, IARC's may be expected to provide funds. On the other hand, many IARC problems would provide the basis for a M.S. or PhD. thesis research.

The proposed FAO germplasm quarantine officer, when so requested by an IARC or quarantine service, could provide input along quarantine and pest risk assessment lines for problems and projects proposed by an IARC to be conducted at various locations with domestic and/or exotic pests (including isolates and strains).

13. TECHNICAL SUPPORT, INFORMATION RETRIEVAL AND BIOLOGICAL DATA BASES:

The consultant has emphasized in the present report and in the special reports covering the individual IARC reviews which were part of the consultant's assignment that two of the limiting factors in facilitating the safe but rapid international exchange of germplasm are --

- (1) the all too conservative attitude of some but not all quarantine officers about the risks of importing and exporting germplasm
- (2) the all too liberal attitude of some but not all scientists about the risks of importing and exporting germplasm.

One approach to counteract the limits placed on the "rapid" and "safe" aspects of germplasm transfer is to make readily available biological data about pests of quarantine and/or economic significance on IARC major and minor crops. Data is needed on --

- (1) host range and symptoms
- (2) geographic distribution
- (3) life cycle
- (4) economic damage (actual or estimated)
- (5) ecological range of pest compared to the ecological range of the host or hosts
- (6) hitchhiking ability, ease of entry, colonization ability and probability of establishment of pests
- (7) strain identification as well as relationships and significance
- (8) natural and man-made pathways (Table 1)
- (9) methodology of detection, identification, and characterization
- (10) treatment effectiveness
- (11) pest risk analysis

The IARC's and some quarantine services have already begun to accumulate data. IARC data tends to relate to life cycle, field inspection, and, in some cases, general geographic distribution of important pests. Quarantine service data collection is usually limited to detailed information about those exotic pests of quarantine significance to their own countries. International plant protection agencies such as the European and Mediterranean Plant Protection Organization (EPPO) has published (3) pamphlets about pests on the EPPO A1 and A2 lists but most of the organisms are not found on IARC crops. However, the publications do contain information in an abbreviated format of interest both to scientists and regulatory officers. Other countries such as the U.S., U.K., and Australia and many State quarantine such as California (1) extension services have also published information in some of the categories listed above for some pests. The vast body of the scientific literature, of course, contains the needed information.

However, the information in all these sources is not centralized and not retrievable using computer technology.

The consultant proposes that the FAO quarantine officer in concert with others develop a system, perhaps a minicomputer that will retrieve information of use to an IARC scientist or administrator as well as a quarantine officer. The system should retrieve on all hosts of a given pest species; all pests of a given crop; or, either of these for a specific country or region. One should be able to retrieve on the words "seed transmission" of a given crop including both internal and external seed-borne organisms. A full explanation or listing of the type of inquiries that could be made is beyond the scope of this report.

It is true that there are a number of information retrieval systems now available to access the scientific literature such as that of the USDA National Agricultural Library using its own and other data bases such as the Lockheed base. These include data on the tapes actually used to print abstracting journals. However, these cover only the past 10 to 12 years of the scientific literature. Manual searches must be employed for publications prior to the starting of these systems. However, much of the useful information that is required for the topics listed above is not ferreted out by the key word system. For example, if a paper or monograph lists all the agricultural pests of Sudan and 500 are listed, the key word system will not pick out these pests if queried by name although the entire list could be obtained with key words of pests and/or pathogens (or insects and disease agents) of Sudan. However, someone would have to manually add Sudan to the distribution under each pathogen.

The consultant suggests that the system developed by the FAO officer should end up with a program with the capability to receive data which is to be obtained by manual retrieval--and then be able to produce the data by computerized search. The system should meet the needs of both scientists and quarantine officers so that some limiting factors could be removed or diminished so the movement of germ-plasm is accelerated but pest risk is concurrently decreased--all based on the best biological data available rather than on what scientists or quarantine officers perceive, often based on little or no biological data, what the risk is. Quarantine officers necessarily respond with "when in doubt, keep it out" when dealing with pests for which they have a zero tolerance.

14. SCOPE OF THE PROPOSED FAO PLANT GERMPLASM PROJECT AND
OPTIONS FOR IARC PARTICIPATION:

The consultant recommends that the proposed project be budgeted for 3 years under FAO as mentioned in Section 7. In order for the project to be meaningful on a cost/benefit relationship, in the consultant's judgment at least four of the six IARC's which the consultant visited (Section 3.3) should participate. If ICARDA (which the consultant did not visit) participates, than four of the seven should be active in the project.

Participation is defined herein as either full involvement in all the general recommendations or partial involvement with one or more of the general recommendations. For example, an IARC could support the concept of the FAO germplasm quarantine officer and of training but not the plant health statement. An IARC may wish to include all crops or only selected crops. The IARC may wish to initiate a plant health statement for one crop but not for another.

The keystone to the support of the proposed project is that an IARC or quarantine service may participate or not as they see fit--the project should be set up as voluntary and flexible. An IARC may support any or all portions of the general recommendations and still deal directly on a one-on-one basis with an importing country without going through the FAO officer.

At a later date, perhaps during the second year, and depending on the progress made up to that point, consideration should be given to including other international germplasm organizations such as Asian Vegetable Development and Research Center (represented at the Consultation in Colombia, June 15, 1982) and Intsoy whose Director has indicated he would like to be informed on developments with IARC's.

15. LITERATURE CITED

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APPENDIX A

The Consultant's overview of the safeguarding procedures in place for the export and import of plant germplasm by the International Agricultural Research Centers of the CGIAR network in cooperation with the national quarantine services.

(See: section 3.4.2)

Appendix A consists of eight tables indentified as Tables 2 through 9.

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Table 2. Scoring of quarantine procedures and regulations as they relate to the importation of germplasm by International Agricultural Research Centers (IARC)

FACTOR	IDEAL SCORE	Reference number of IARQ crops ^{1/} and scores ^{2/}																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
REGULATIONS PROMULGATED FOR CROP OR GENUS	10	10	10	10	(7)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
PERMIT REQUIRED	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
PHYTOSANITARY CERTIFICATE REQUIRED	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
ADDED DECLARATIONS ^{3/} REQUIRED	NA		+	+			+	+	+	+	+			+							
FLOW OF GERMPLASM THROUGH QUARANTINE SERVICE	10	10	5	10	10	10	(6)	10	10	10	8	6	6	10	7	10	10	10	7	10	

^{1/} 19 crops from 6 IARC's (see Table 1), plus 1 fictitious crop.

^{2/} Scores: Scale of 1 to 10 with 10 as highest and below 6 as less than acceptable.
() = Estimated score

^{3/} Added declarations are optional safeguards. If required, they may be considered as assets and are designated as "+". However, scores are not assigned.

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Table 3. Scoring of treatments administered for germplasm imports by the International Agricultural Research Centers (IARC) and/or the national quarantine service (QS) of the IARC host country

RESPONSIBILITY ^{1/} FOR ADMINISTERING TREATMENT	IDEAL SCORE	Reference number of IARQ crops ^{1/} and scores ^{2/}																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
QS	10	NS	NS	9	6	X	9	6	9	9	9	(6)	(6)	X	X	6	X	X	X	X	X
IARC		NS	NS	X	X	6	X	X	X	X	X	DN	6	6	7	6	8	6	6	9	9
HIGHEST SCORE OF EITHER QS OR IARC	10	NS	NS	9	6	6	9	6	9	9	9	(6)	6	6	7	6	8	6	6	9	9

- 1/ Ideally, treatments should be administered by the QS; however, the QS may delegate this activity to the IARC.
- 2/ 19 crops from 6 IARC's (see Table 1), plus 1 fictitious crop.
- 3/ Scores: Scale of 1 to 10 with 10 as highest and below 6 as less than acceptable.

() = Estimated score
 DN = Data not available
 NS = Not scored usually because effective treatment is not known
 X = Treatment not administered

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Table 4. Scoring of first generation growing sites and/or safeguards for importations of germplasm by International Agricultural Research Centers (IARC)

FIRST GENERATION IARC OR QS GROWING SITE AND SEED HEALTH	IDEAL SCORE	Reference number of IARC crops ^{1/} and scoring ^{2/}																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Third country quarantine					+									+			+				
Quarantine greenhouse or screenhouse			+		+			+					+		+			+			
Quarantine - field isolation			+	+	+		+	+	+	+											
Non-quarantine greenhouse		+	+					+				+	+	+	+						
Field plots at IARC ^{3/}						+							+			+	+		+	+	
Seed health testing mandatory for samples of each accession				+			+	+	+	+											
Imported as tissue cultures			+											+		+					+
CONSULTANT OVERALL ASSESSMENT OF SAFEGUARDING ^{2/}	10	7	7	9	8	5	9	9	9	9	9	7	7	6	8	5	6	7	6	7	7

1/ 19 crops from 6 IARC's (see Table 1), plus 1 fictitious crop.

2/ Scores: Scale of 1 to 10 with 10 as highest, and below 6 as less than acceptable.

3/ Often the IARC crop is grown during a different season than the local crop.

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Table 5. Scoring on extent to which International Agricultural Research Centers (IARC) and/or national quarantine service (QS) conduct detection tests for latent or obscure pathogens in or on importations of germplasm

RESPONSIBILITY FOR DETECTION ^{1/}	IDEAL SCORE	Reference number of IARQ crops ^{2/} and scores ^{3/}																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
QS alone	10	X	NS	7	X	X	8	6	8	6	6	X	(6)	X	X	X	X	X	X	X	X
IARC/QS ^{4/}	10	X	NS	X	5	X	X	(6)	X	6	6	7	7	X	X	6	X	7	X	7	7
IARC alone	10	X	NS	X	X	X	X	X	X	X	X	X	X	7	8	X	X	X	X	X	X
HIGHEST SCORE OF QS, IARC/QS OR IARC	10	5	NS	7	5	5	8	6	8	6	6	7	7	7	8	6	5	7	5	7	7

APPENDIX A Table 5

^{1/} Detection of obscure, latent or resident pathogens (does not include observations) for signs or symptoms.

^{2/} 19 crops from 6 IARC's (see Table 1), plus 1 fictitious crop.

^{3/} Scores: Scale of 1 to 10 with 10 as highest, and scores below 6 as less than acceptable.

NS = Not scored

() = Tentative score

X = No detection testing

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Table 7. Scoring of involvement of International Agricultural Research Centers (IARC) and national quarantine services (QS) in the inspection of exports of germplasm

INSPECTION AND CERTIFICATION	IDEAL SCORE	Reference number of IARO crops ^{1/} and scores ^{2/}																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
GROWING SEASON INSPECTION																					
IARC	+	+	+	+	NS	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
QS	+	+	+	+	NS	-	+	+	+	+	+	+	-	-	-	-	+	-	+	+	+
INSPECTION AT TIME OF EXPORT																					
IARC	+	+	+	+	NS	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
QS	+	+	+	+	NS	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
CERTIFICATION																					
IARC = PLANT HEALTH STATEMENT	+	-	-	-	NS	-	-	-	-	-	-	+	+	+	+	-	-	-	-	-	-
QS = PHYTOSANITARY CERTIFICATE	+	+	+	+	NS	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
IARC INVOLVEMENT = SCORE	10	8	8	8	NS	7	8	8	8	8	8	7	8	8	7	6	8	7	8	8	8
QS INVOLVEMENT = SCORE	10	8	8	8	NS	5	8	8	8	8	8	7	5	5	6	5	8	5	8	8	8

1/ 19 crops from 6 IARC's (see Table 1), plus 1 fictitious crop.

2/ Scores: Scale of 1 to 10 with 10 as highest and scores below 6 as less than acceptable.

+ = Responsibility of IARC and/or QS
NS = Not scored

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APPENDIX A Table 7

REVISED JULY 1, 1982

Table 8. Scoring of treatments administered by International Agricultural Research Centers (IARC) and/or national quarantine services (QS) for exports of germplasm

TREATMENTS, IF AVAILABLE AND NECESSARY, ADMINISTERED BY IARC OR QS	IDEAL SCORE	Reference number of IARC crops																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
QS	10	NS	NS	X	NS	X	X	X	X	X	X	X	NS	X	NS	X	X	X	X	X	X
IARC		NS	NS	8	NS	6-	8	6	8	8	8	6	NS	(6)	7	6	6	7	6	7	7
HIGHEST SCORE OF EITHER IARC OR QS	10	NS	NS	8	NS	6-	8	6	8	8	8	6	NS	(6)	7	6	6	7	6	7	7

APPENDIX A Table 8

1/ 19 crops from 6 IARC's (see Table 1), plus 1 fictitious crop.

2/ Scores: Scale of 1-10 with 10 as highest and scores below 6 as less than acceptable.

() = Tentative score

NS = Not scored

X = No treatment administered

6- = Treatments administered as wide spectrum fungicide and insecticide without direct knowledge of what seedborne pathogens are present.

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Table 9. Scoring of involvement in detecting latent, resident or obscure pests and pathogens by International Agricultural Research Centers (IARC) and/or national quarantine services (QS) for exports of germplasm

IARC OR QS INVOLVEMENT IN DETECTION TESTS ^{1/}	IDEAL SCORE	Reference number of IARQ crops ^{2/} and scores ^{3/}																				
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
QS	10	X	6	X	NS	X	X	(6	X	X	X	X	NS	X	X	X	X	X	X	X	X	
IARC as monitored by QS		X	9	7	NS	X	8	8	8	7	7	7	7	-	-	6	X	7	X	7	7	
or	10																					
IARC alone		X	-	-	NS	X	-	-	-	-	-	-	NS	7	8	-	X	-	X	-	-	
HIGHEST SCORE OF EITHER IARC OR QS		5	9	7	NS	5	8	8	8	7	7	7	7	7	7	8	6	5	7	5	7	7

^{1/} Includes testing for internally seedborne organisms, viruses, bacteria, nematodes, etc.

^{2/} 19 crops from 6 IARC's (see Table 1), plus 1 fictitious crop.

^{3/} Scores: Scale of 1 to 10 with 10 as highest and scores below 6 less than acceptable.

() = Tentative scoring

NS = Not scored

X = No involvement in testing, equivalent to a score of 1 on highest score rating

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APPENDIX B

Recommendations, including the proposed terms of reference for a FAO plant germplasm quarantine officer, developed by the Working Party which met at CIAT, Cali, Colombia, on June 15-17, 1982 to consider the safe but rapid exchange of plant germplasm on an international basis.

Section 1: Report and Recommendations

Section 2: Terms of reference, proposed by Working Party.

INTERNATIONAL CONSULTATION ON A SYSTEM
FOR SAFE AND EFFICIENT MOVEMENT OF GERMPLASM

held at

CIAT - Cali, Colombia

June 15-17, 1982

PREAMBLE

The Consultation sponsored by FAO and hosted by CIAT emanated from the general awareness that safe plant health measures are essential to effective plant germplasm exchanges, although the IARCs and many cooperating national centers are already performing varying levels of phytosanitary measures most of which provide satisfactory safeguards. The Consultation focused its discussions on a study of the current phytosanitary measures being adopted at IARCs and the plant quarantine services of their respective host countries. It was also recognized by the Consultation that the 1951 International Plant Protection Convention which was revised in 1979 is being widely observed by institutions concerned.

Consultation Proposals

The participants at the Consultation present the following proposals to accompany the corresponding general report by Dr. Robert P. Kahn, FAO Consultant, for consideration by the IARC Center Directors Meeting, by the CGLAR and TAC, by the national quarantine authorities of the host countries of the IARCs and by FAO.

The following proposals by the Consultation are made with respect to the specific recommendations by Dr. Kahn contained in the General Report. The participants at the Consultation (list attached) included representatives of FAO, IARCs, national quarantine services of the host countries, and other national and regional institutions.

1. Creation of a new position for a Plant Germplasm Quarantine Officer (PGQO) within FAO.
 - 1.1 The majority of participants at the consultation endorse the concept of creating a PGQO position with FAO. CIMMYT and ICRISAT indicated that the national quarantine programs particularly those of their respective host countries provide a satisfactory service and therefore did not endorse the creation of the position of Plant Germplasm Quarantine Officer.
 - 1.2 The consultation endorses the draft terms of reference for the new position which are attached to this report.
 - 1.3 The Consultation endorses the proposal for an initial three-year appointment to this position with a review to be held in the middle of the third year.
 - 1.4 The Consultation recommends that the person appointed as FAO/PGQO should have a balanced view of international plant health matters which takes into account not only the risks of transmitting diseases and pests in international germplasm exchange but also the considerable economic benefits to be gained from improved germplasm.

- 1.5 If the appointment is to be continued beyond the initial three years then the Consultation recommends that full consultation by FAO with IARCs and IARC host country national quarantine services should be carried out to ensure that future appointees to the position will continue to have a balanced view on quarantine matters.
- 1.6 The Consultation endorses the proposal of FAO to locate the PGQO in Washington, D.C.
2. The issuing of Plant Germplasm Health Statements (PGHS) by institutions involved in coordinating international germplasm exchange.
 - 2.1 The participants at the Consultation generally endorse the concept of a PGHS being issued by institutions involved in coordinating international germplasm exchange networks. CIMMYT and ICRISAT indicated that they considered that the Phytosanitary Certificate (PC) satisfactorily covers the movement of germplasm. Both institutes recognized that there may be a need for a statement of additional assurance for high risk crops.
 - 2.2 The Consultation wishes to clarify that the PGHS in no way replaces a Phytosanitary Certificate, the issuing of which remains the exclusive right of each national quarantine service. Any such PGHS should clearly indicate that the document is not an alternative to internationally recognized phytosanitary certificates.

- 2.3 The Consultation recommends that the issuing of a PGHS remains entirely voluntary and that each issuing institution will decide independently, based on health risk analysis, whether a statement is necessary and what form the statement would take. Each PGHS will be appropriate to the needs of the particular center but should include a listing of all safeguards which had been utilized to ensure the health of the germplasm included in the germplasm exchange under consideration.
 - 2.4 The Consultation recommends that a PGHS be issued to accompany only germplasm which has passed phytosanitary procedures which would be specified in the PGHS.
 - 2.5 The Consultation recommends that the PGHS in all cases be identified with an accompanying PC from the national quarantine service of the host country of the institution shipping the germplasm materials.
3. Phytosanitary activities of International Agricultural Research Centers and other institutions involved in international germplasm exchange.
 - 3.1 The Consultation recommends that consideration be given by each institution to the formation of an internal multi-disciplinary committee of scientists which is charged with overseeing the application of phytosanitary standards as they are applied to germplasm destined for international networks.

- 3.2 The Consultation recommends that, where possible, and where necessary, international institutions would institute seed health testing and other safeguards including growth inspections, to monitor plant materials destined for export in order to ensure that economically important disease and/or pest organisms are not present in the material.

4. Phytosanitary activities of host country national quarantine services in relation to the germplasm exchange activities of LARCs.
 - 4.1 The participants at the Consultation recognize the heavy work load being imposed on host country national quarantine services due to the presence of the LARC in that country. For this reason the participants support the general concept of strengthening these particular national quarantine services through bilateral and multilateral assistance programs and by the assignment of a higher priority by host governments to plant quarantine services. The relationship and extent of support from the LARCs should be worked out between each international center and the host country quarantine authorities.

 - 4.2 The participants at the Consultation recommend that FAO should expand logistic support to these particular host country national quarantine services especially on matters relating to interchange of information, exchange of journals

which provide information on diseases and pests and in looking at ways to provide fellowships and other training opportunities and in other means of support where appropriate.

5. General Conclusions of the Consultation.

In addition to the above more specific proposals the participants at the Consultation would like to express some general concerns related to the topic of the meeting.

- 5.1 The participants deplore the practice of shipping germ-plasm through the diplomatic pouch when this material is then not subsequently submitted to national plant quarantine authorities for official clearance.
- 5.2 The participants also deplore the practice of some institutions which continue to import seed of many species from other countries, to then repackage this seed without further safeguards, and to subsequently redistribute these materials internationally utilizing a PC issued by the national quarantine service of the country in which the institution is based.
- 5.3 The participants would like to express particular concern at the lack of effective plant quarantine controls by some national quarantine services with respect to large food and commercial seed importations without adequate safeguards while at the same time placing excessive emphasis and restrictions on the import of relatively small quantities of germplasm materials. Under these circumstances many of the

safeguards being developed for safe germplasm exchange are being nullified by the pest risks involved in these large importations.

- 5.4 The participants at the Consultation express regret that the IBPGR was not able to make the expected input to the proceedings.
- 5.5 The participants at the Consultation encourage governments to conduct effective pest surveys to generate a meaningful data base that can be used to assess the quarantine risks of specific pests.
- 5.6 The participants at the Consultation encourage the development of third country plant quarantine activities to facilitate the international movement of germplasm, particularly original germplasm collections. In this regard, the collaboration of institutions such as the Danish Government Institute of Seed Pathology and IPO at Wageningen in the Netherlands could be particularly effective along with other organizations already engaged in this activity worldwide.

TERMS OF REFERENCE

FAO PLANT GERMAPLASM QUARANTINE OFFICER

In order to facilitate the rapid and safe transfer of plant germplasm as imports and exports, and, to prevent, or at least significantly reduce the chances of, germplasm imports and exports from serving as a pathway for the transfer of pests and pathogens of quarantine significance and/or importance, the FAO Plant Germplasm Quarantine Officer:

Under the overall supervision of the Chief of the Plant Protection Service AGP, FAO and the guidance of the Plant Quarantine Officer of the Plant Quarantine Section and in cooperation with IARCs (including related organizations) of the CGIAR network, National quarantine services, IBPGR, Regional plant protection and quarantine organizations, other agencies or institutions, and the scientific community, the incumbent shall carry out the following responsibilities:

1. Recommend, at the request of any of the above organizations, safeguards, procedures, methodology or phytosanitary standards related to the safe transfer of germplasm.
2. Act, at the request of the above organizations in a liaison or consultant capacity to provide biologically-based solutions or options to solve problems which relate to the timely but safe flow of germplasm.
3. Provide, locate or recommend, at the request of the above organizations training related to the phytosanitary aspects of the international transfer of germplasm at a level and for personnel nominated by the above organizations.

4. Develop lists of pests and pathogens of quarantine and/or economic importance for major world crops in collaboration with the above organizations.
5. Provide a data base for the most important organisms of these lists as determined by criteria and concensus. The data would include life cycle, host range, diagnosis, geographic distribution and other factors for use in pest risk analysis, pathway analysis and developing profiles of these pests so that the above organizations may be in a better position to develop biologically sound programmes or regulatory decisions.
6. Any other duties that the FAO Plant Quarantine Officer may assign.

APPENDIX C : Reports or excerpts of reports submitted
by IARC or quarantine services at the
Working Party meeting CIAT, Cali, Colombia,
June 15-17, 1982.

Section 1. Recommendations from Dr. M. Aluko, Project
Director, Nigeria, Plant Quarantine Service,
Moor Plantation, Ibadan, Nigeria.

Section 2. Report of Dr. Elkin Bustamente, Plant Health
Director, ICA, Colombia.

Section 3. Comments on FAO Consultant's Report for IITA
presented by Dr. J. M. Fajemisin.

Section 4. Excerpts from report of Dr. O. Page, CIP.

APPENDIX C

Section 1: Recommendations from Dr. M. Aluko, Project Director, Nigeria Plant Quarantine Service, Moor Plantation, Ibadan, Nigeria

"RECOMMENDATIONS AND TECHNICAL/FINANCIAL SUPPORT TO THE QUARANTINE PROGRAMMES OF HOST COUNTRIES

The necessity for some type of Technical and financial support by the IARC's to the National Plant Quarantine programmes of their host countries has been made obvious from the fact that almost 75 percent of the imports and over 50 percent of the export processing workload of the Nigeria Plant Quarantine Authorities emanate from the IARC's. It has also been shown that West African Rice Development Association, which is a Regional Organization whose contribution to the workload of the Nigeria Plant Quarantine Authorities amounts to only about 17.6 percent of that emanating from the IARC's (Tables I & II) has arranged and executes a concrete quarantine programme on accord with the Nigeria Plant Quarantine Service. It also goes without saying that inadequacy of quarantine facilities will very adversely affect the progress of work of the IARC's. In view of these, it is recommended that:

"1. Support by the IARC's:

Each of the IARC's should incorporate a Plant Quarantine Project into its programme of activities and by which each should commit both Technical and financial support for the Plant Quarantine Authorities of their host countries. Such programmes should include the provision of some essential plant processing installations (e.g. glasshouses), equipments (e.g. for plant treatments) as well as an annual financial subvention towards the running costs of the Quarantine Stations.

"2. Support by International Organizations:

International organizations like the FAO should initiate and execute a Plant Quarantine programme to make available to the Plant Quarantine Authorities of IARC's host countries such logistic support as:

- (i) Free and regular supply of information on pest/disease situation in various parts of the world.
- (ii) Free and regular supply of journals, abstracts, etc., that provide information on pests and diseases on the advances made in their diagnosis, bionomics and control.

APPENDIC C; Section 1: Dr. Aluko

- (iii) Award of fellowships for short in-service training to staff of IARC host country Quarantine Stations to better equip them with specialized techniques as needed.
- (iv) Provide any other support in other areas as may be found necessary.

"3. Establishment of a Plant Health Unit by the FAO:

As a matter of fact, an FAO Plant Quarantine Unit should be established under the control of the FAO Plant Quarantine Officer to maintain regular contact with each of the IARC host country Quarantine Authorities not only to monitor their activities but also to know their problems and offer advice or assistance as may become necessary. It should also have responsibility for the worldwide collection of information on plant health for dissemination to the Plant Quarantine Services as well as accept responsibility for the implementation of FAO's logistic support as earlier enumerated."

APPENDIX C Section 2

COLOMBIAN PLANT QUARANTINE ACTIVITIES AND IARCS

Elkin Bustamante*

The Colombian plant quarantine activities have been pursuing on their main goal of allowing the use of germplasm in plant breeding programs or in the multiplication of plant material for field crops, while avoiding the introduction of major economic exotic pests. At the present time, we have four groups of entities that normally introduce germplasm to the country.

1. Government institutions devoted to plant breeding, especially the Colombian Agricultural Institute (ICA), and universities.
2. Private institutions that deal with plant breeding or seed production. For instance: Coffee Growers Federation, Sugarcane Growers Association, and Seed Producers.
3. Private institutions that import plant material to be used directly in the field or as 'mother plants'. In this group the Colombian Flower Growers Association and the Horticulture Growers are very important.
4. The International Agricultural Research Centers, especially CIAT and CIP.

Besides these four groups it is necessary to keep in mind also the handling of plant materials used in human consumption.

To deal with this complex situation the Colombian plant health organization has had since 1938 several legal acts, such as laws and decrees

* Colombian Plant Health Director.

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that establish a general framework of obligations and responsibilities for importers and plant protection officers. However, the law enforcement and the development of plant quarantine activities is something that is just coming true in the last three or four years.

A clear indication of this phytosanitary concern is a plant quarantine agreement with the sugarcane growers, effective in 1980 through which ICA is conducting post-entry closed quarantine to the sugarcane germplasm introductions to Colombia.

ICA officials also have signed with CIAT an agreement on quarantine procedures called "Carta de Entendimiento No. 6A". This agreement includes the procedures, quarantine regulations and safeguards for handling germplasm introductions to the country for beans, cassava, and tropical pasture crops. The agreement includes the procedures and safeguards for bean and cassava germplasm material produced in Colombia and exported to other countries.

Seed of beans and tropical pastures is regarded as a high risk for introducing into Colombia plant diseases of economic importance. Its handling, has been the main subject of discussion between CIAT and ICA officials. Out of the 123 plant pathogens that are known to affect Phaseolus vulgaris, 39% are exotic to the country and more than half can be transmitted by seed. Besides many of them have several races or strains.

Five of those should be considered as economically important seed-borne pathogens, namely, Bean Rugose Mosaic Virus, Corynebacterium faccumfaciens, Cowpea Mild Mottled Virus, Pseudomonas syringae, and Tobacco Streak Virus.

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The bean germplasm has been classified in five groups according to level of risk. The low risk materials can be planted directly in the field; the high risk ones must go to glasshouse where it is possible to establish a phytosanitary control. By contrast, the knowledgement of pest and diseases on tropical pastures is far from complete.

In regard to bean and tropical pastures germplasm the agreement needs to be implemented with an infrastructure that allows a post-entry closed quarantine of field collection materials to keep the plant breeding programs fed with some important genetic materials.

Why does the Colombian quarantine program need to work close to CIAT and ICA plant breeding programs? We do that because we consider crop protection an essential part of the agricultural technology system. And also because both the government and the International Agricultural Research Centers have biological and political responsibilities of demonstrating beyond any doubt that the germplasm has been handled in the safest feasible phytosanitary way.

In 1980 we had a report on the presence of Phakopsora sp. affecting one CIAT bean collection. Since this pathogen is not seedborne, the ICA crop protection group made a survey on weeds growing in the neighborhood of the affected bean plants. ICA rust taxonomists concluded that at least two native weeds were attacked by Phakopsora sp.

On potato diseases we need to have a survey to update our records since we do not have current information on some important pathogens. We hope to have CIP cooperation in this endeavour, especially for bacteria and virus detection.

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These experiences indicate the insufficient information on pest distribution in Colombia and suggest the necessity of a strong national program on pest survey besides the quarantine. Such a program would need an infrastructure for seed pathology and mass indexing testing. These procedures also should be applied to plant quarantine, and in seed certification activities.

Also, we need to keep our concern on the activities that go only to National and International Research Centers, since quarantine is an integrated activity that benefits all of us. At this time we arrive to the main constraint for dealing with germplasm transfer: the lack of enough economical support for quarantine activities. We had in these years the support of international entities like DANIDA, and we hope this cooperation for training will be increased in the future.

We have also the cooperation of the European Economic Community to study the feasibility of establishing regional quarantine in the Andean Pact countries, (Bolivia, Colombia, Ecuador, Venezuela).

Finally, I should stress that people working in plant quarantine and those devoted to research activities are not different from each other from the technical point of view, but the same one with different responsibilities and the same goal.

APPENDIX C: Section 3

Section 3. Comments on the FAO Consultant's Report
Dr. J. M. Fajemisin, IITA.

"IITA welcomes the consultation and complements its initiatives in coming up with suggestions to improve the working relationship between Quarantine authorities and research through better collaboration in complementary facilities to satisfy each others mandate effectively and efficiently. This meeting is, however, not the ideal time to discuss the details of the Consultant's recommendations since many of these points are specific to our current and/or working environment. We are particularly impressed with his recommendation that some of the processes, especially post-entry type being exclusively carried out by the facilities of the host country quarantine, be delegated to the Centers out leaving the final decision making authority entirely to the Plant Quarantine. We intend to sit down with our Plant Quarantine colleagues soon to appraise all the points raised by the Consultant and evolve a document on a working relationship.

"4.2. Plant Health Unit:

IITA welcomes the suggestion for the appointment of a Plant Health Unit by each IARC and it is already in the direction of doing so. Already most of the components of this Unit are already in operation; for instance there is a Virology Unit with two full time scientists and the equipment for assessing the health status of our quarantine materials. There is also a Tissue Culture laboratory generating disease-free materials. Furthermore, a plan by the institute to build closed quarantine as a component (part) of our "Plant Health Laboratory" lack of fund has not permitted the execution of this plan. The establishment of this facility (closed quarantine greenhouse) and the attendant expertise, e.g. in handling quarantine materials, is in agreement with the authorities of our host country quarantine. We will continue to give due considerations to pursuing research into evolved biologically proven techniques to be used as safe and safe exchange of germplasm in global networks.

"4.3. Plant Health Statement:

IITA supports this recommendation because it has the potential of hastening the exchange of germplasm because a reciprocal implementation of both ends (import and export) will increase (trust perceived by the Quarantine officers as a way of providing safeguards and thus facilitate faster release at the importing end.

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"4.4. FAO Plant Quarantine Officer:

Since IITA welcomes any intervention that improve our working relationship with our host quarantine, the Center supports the duties proposed for this post which are primarily:

- (i) serving in an advisory role to reconcile IITA and IARC on problem areas in germplasm exchange using biological reasons and proven facilities at the disposal of IITA.
- (ii) improving the capabilities of host country quarantine services for (a) training and (b) provision of technical support, e.g., information on quarantine regulations in light of available techniques/facilities.

"5. Points for Consideration/Discussion:

5.1 Contiguous countries: It is being proposed at this meeting suggests a consideration for the relaxation or modification of plant quarantine regulations in those areas where there are contiguous countries which belong to a regional socio-economic or political entity. A good example point is in the West African region where (ECCOWAS - Economic Community of West African States) guarantees a free movement of men and materials between countries in the region.

5.2. Sampling of plant materials: The matter of using sampling methods rather than testing entire plant material be considered on the individual crop/pest or pest species merit based on proven safeguarding measures like therapeutic treatments."

APPENDIC C: Section 4

Section 4: Excerpts from the report of Dr. O. T. F

Dr. O. T. Page presented a commentary developed for the CIP Maintenance and Germplasm Distribution Committee in response to the Consultant's draft special report covering his review at CIP in June, 1981. Dr. Page made comparisons between the CIP listing of pests and the consultant's list which was still in the stage of being developed in preparation for pest risk analysis. The report discussed in detail the selection of vi indicator plants. The report is not included here since the comments, while very useful, are beyond the scope of this general report.

Dr. Page distributed the CIP draft Plant Germ Health Statement which contained some minor changes suggested by the Consultant. The Statement is included in the present report in Section 3. The use of this statement by CIP constitutes an endorsement by CIP of the concept in the Consultant's judgement.

The following is a quotation from the report submitted by Dr. Page:

"The draft of the Kahn Report has been reviewed at CIP and several minor changes suggested to Dr. CIP appreciates the constructive nature of the Report and finds the recommendations well within the capability of CIP to adhere to in both the export and import propagative material.