

THE CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

TECHNICAL ADVISORY COMMITTEE

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PLANT BREEDERS' RIGHTS

DRAFT DISCUSSION PAPER

(Agenda Item 8)

Proposed objectives of the discussion ^{1/}

The attached draft was distributed to TAC Members and Centre Directors. It will be discussed concurrently with the Progress Report on the same subject (AGD/TAC:IAR/81/22) with a view to:

- (i) commenting on the format and contents of the attached draft;*
- (ii) making suggestions for its finalization in the light of the terms of reference and list of questions attached to the Progress Report.*

1/ Joint session with Centre Directors.

TAC SECRETARIAT

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

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Confidential draft. For discussion only.
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PLANT BREEDING RIGHTS, SEED LEGISLATION AND THE
INTERNATIONAL CENTERS OF AGRICULTURAL RESEARCH
SOME ISSUES AND VIEWS

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Wageningen, May 10, 1981

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Preamble

The present paper was prepared on request of the secretariat of the Technical Advisory Committee of the CGIAR. The primary objective is to highlight some aspects in the organisation of plant breeding and seed production. The issue of plant breeding rights, receiving considerable public and political attention lately, is dealt with in some detail.

The request to prepare the present paper was accepted on the following conditions :

- i - The paper is meant as a basis for discussion in TAC followed by a workshop.
- ii - The paper is not meant to provide final solutions, represent corporate views or take side in any argument.
- iii - The paper would be prepared in a very short time and the resulting consequences for its quality are accepted. The responsibility for preparing a more thoughtful document will lay with a workshop to be organised by TAC.

The present paper resulted from a few discussions in which participated a number of knowledgeable people in the Netherlands Ministry of Agriculture, but in a personal capacity.

The major informants were Ir R. Duyvendak and Ir H. Vos of the Government Institute for Research on Varieties of Cultivated Plants (RIVRO), Ir M. Heuver, director of the research station for arable and vegetable crops (PAGV) and chairman of the Board of Plant breeders Rights.

Responsability for the writing and consequently for any mistakes and errors of judgement lies squarely with J.J. Hardon of the Directorate of Agricultural Research.

J.J. Hardon

May 10, 1981

1. Definitions and concepts

Key words in a discussion of plant breeders rights are :

Plant breeding, seed production, genetic resources, gene banks, plant breeding rights, seed legislation and seed certification.

Agreement on the meaning of these words within the context of the issues presented is required. Following are brief descriptions of terms.

1.1. Plant breeding :

Plant breeding is in generally the development of new varieties of plants that are useful or desired for some purpose.

Plant breeding makes use of available genetic variability to create "varieties" which are superior to the original material in certain identified characteristics (yield, disease, resistance, quality, specific adaptation, etc.). Many bred varieties have a narrower genetic base than their source populations or than open pollinated traditional planting material (f.i. land races). Genetic variability can be increased by widening the range of suitable varieties. (Hence "populations" store variability within, varieties store variability between)

1.2. Seed production

New varieties have to be multiplied in quantities that meet the demand.

The ease with which seeds can be multiplied varies with the type of crop and the type of variety.

Hybrid varieties can only be multiplied by the owner of the parental lines.

Seed multiplication by farmers (for own use) is in practice difficult in crops of which the seeds are not the harvested product (such as many vegetables, fodder crops).

Open pollinated varieties of seed-crops can in principle be multiplied by farmers. Some complicating factors are however accumulation of seed-borne disease (f.i. viruses in legumes) and loss of quality (germinability) and purity (contamination with weeds). Cross fertilizing species sometimes exhibit some genetic drift if multiplied in small quantities. Furthermore it is often difficult to avoid out-crossing. Vegetatively reproduced crops, such as potatoes (tubers), cassava (roots), sugar cane (cuttings) can also in theory be multiplied by the farmers, but are often particularly sensitive to infection by pathogens that are transmitted with the planting material.

The desirability of specialised seed production programmes varies with crops and requires special consideration independent of the origin or ownership of varieties. Good seed production depends on high standards of agricultural practices while threshing, drying and conditions of storage further effect the quality of the seed. Improving seed quality, even without plant breeding, can already have significant effects on agricultural production.

1.3. Genetic resources

Genetic resources are the result of the accumulation of mutations whereby gene frequencies within populations largely reflect processes of selection. For most plant species centers of genetic diversity can be recognised. In addition to plants growing in nature, old areas of cultivation may harbour considerable genetic variability in local domesticated material (land races). Natural populations are threatened by the opening up of new land for cultivation or more intensive land utilization.

Land races and old varieties are progressively being lost by the introduction of modern varieties or changes in cropping patterns.

Genetic conservation is a major area of concern receiving so far totally inadequate attention and funds.

A "gene-bank" is a collection of materials, sampling (part of the) available genetic resources. Seeds of such collections are stored under conditions maximising longevity. Material in this bank is generally made available on request for plant breeding purposes. If and when germination capacity starts declining, seeds are supposed to be multiplied to maintain the identity of the collection.

Materials in the bank are usually catalogued (origin, species and others).

A limited number of gene-banks exists for the major food crops. For most minor crops, vegetables and fruits there are no gene-banks.

Most plant breeding programmes usually store some genetic material, however often of a limited range heavily biased towards materials of direct use to the breeding programmes.

1.4. Plant breeders Rights

In most countries government research organisations are involved in plant breeding. In many developed countries with a market economy, private industry has become involved as well, obtaining their revenue from the sale of seeds.

A number of countries have enacted legislation providing some form of legal ownership to the originator of new plant varieties comparable to patent rights for other inventions.

The major objective of adopting Plant breeders Rights generally is to stimulate long-term private investment in plant breeding. Varietal protection is seen as a necessary condition to insure rewards to plant breeders commensurate to the usefulness of the product.

Hence the first issue relevant to Plant breeding Rights is not its legislative nature, but whether private industry should be actively stimulated to participate in plant breeding. This is a political and economic decision for which national governments are solely responsible.

It is not the objective of this paper to address this issue. However it is clearly relevant to the overall problem and in discussing the consequences of P.B.R. on the work of the International Centers will it be touched upon.

The first legal protection of the results of plant breeding was the Plant Patent Act of 1930 in the USA. It only gave protection for new varieties of plants propagated vegetatively. The Netherlands came second with the "Plant breeders decree" of 1941. Gradually other European countries followed suit.

A major development was the signing of an International Convention in 1961 in Paris and the establishment of the "International Union for the Protection of New Varieties" (UPOV). This has set a general pattern for varietal protection legislation. The original contents of the convention were summarized as follows (UPOV Newsletter no. 1, May 1975).

"The Convention requires member States to grant to breeders of new plant varieties an exclusive right with respect to the production, offering for sale or marketing of propagating material of their new varieties. Member States can grant either a special title of protection -- as all present member States do -- or a patent. Protection must be granted for new varieties of plants which are

distinct, homogeneous and stable and have been given a variety denomination. The Convention also specifies the minimum period of protection of new plant varieties : 18 years for some plants and 15 years for others. Member States may apply the Convention to all botanical genera and species, and must apply it to the 13 genera and species listed in the Annex to the Convention within eight years after its entry into force in their territory. The Convention also requires member States to conduct an official examination before granting protection for a new plant variety. Finally, the Convention contains rules on a priority right, on the nullity and forfeiture of the right, on the variety denomination which has to be given to each new variety and on the relation of variety denominations to trademarks."

"Organs of the Union. The Union has two permanent organs : The Council and the Office of UPOV. The Council consists of representatives of member States. It elects from among its members a President and at least one Vice-President. The Office of UPOV is under the direction of the Secretary-General, who is the Director General of the World Intellectual Property Organization (WIPO) in Geneva, a specialized agency of the United Nations."

Amendments to the Convention were introduced in 1972 and 1978, relaxing entry requirements and thus to make it possible for other countries to join UPOV.

The above statements represent minimum requirements for membership of UPOV. Actual plant variety protection remains the exclusive responsibility of national government organisations and national laws.

The founding members of UPOV are Belgium, France, Federal Republic of Germany, Italy and the Netherlands. In 1980 membership stood at twelve including : Denmark, Sweden, Switzerland, United Kingdom, South Africa, Israel and Spain.

In addition to members of UPOV, a number of States have expressed consent to be bound by the Convention while proposing adjustments to their own legal protection system to bring it in line with the UPOV-requirements. These States are Canada, Ireland, Japan, Mexico, New Zealand and the USA. Countries that have expressed an interest in UPOV and have sent observers to UPOV-meetings are Algeria, Austria, Brasil, Chili, Iraq, Marocco, Norway, Poland and the USSR.

1.5. Seed Legislation

Whereas P.B.R. primarily protects the interests of the plant breeder, additional forms of legislation have been developed protecting the farmer who buys the seed.

The farmer, when given a choice between different varieties, requires reliable information on what are the most suitable varieties for his conditions. When he buys seed of a particular variety, he wants to be confident that he gets the variety he asked for, that the seed is of good physical purity (without unacceptable numbers of weed seeds) and satisfies certain standards of germination capacity. This has led to systems of variety testing leading up to national lists of recommended varieties and seed certification.

For instance, within the European Economic Community, member States are required to establish national lists of varieties of agricultural crops whereby acceptance depends both on satisfying the standards of distinctness, uniformity and stability as well as on meeting tests of agricultural value and use.

P.B.R. for a certain variety in this system only becomes meaningful when the variety has passed extensive (often 3 years) field tests on agricultural value (including yield, resistance to pests and diseases, quality, etc.).

In some states, like in the Netherlands and Germany, testing for entry in the list of recommended varieties and the grant of legal protection is executed by the same (government) institution and usually at the same time.

1.6. Seed Certification

The biological concepts of populations and land races gradually changing to meet the requirements of production systems and environments have been replaced by more legalistic concepts that view a variety as a stable and fixed end product with a specific identity. Change in the latter situation means replacement by an other entity, recognizably different from the previous. Whereas P.B.R. and seed legislation provide the legal framework regulating ownership and trade of varieties, actual control is generally enforced through Seed Certification Schemes.

Major aspects of Seed Certification Schemes are:

- (i) Regulations controlling the movement of varieties in the seed trade
- (ii) Standard systems to check on variety identity and purity by field tests and laboratory tests
- (iii) A legally identified owner of the variety responsible for maintaining the variety in its described form

Generally plant breeders or plant breeding departments/divisions are responsible for maintaining a basic stock of seeds of their varieties satisfying DUS standards (Breeder's seed). Breeder's seed is multiplied to pre-basic seed and handed over to organizations responsible for further multiplication. Pre-basic seed is multiplied to basic seed from which seed will be produced that is distributed to farmers. The latter, under the OECD rules (perhaps characteristically the most elaborate) are generally referred to as "certified seeds". Depending on the multiplication rate of the species, each step may consist of more than one generation. Critical steps in the process are the multiplication

from pre-basic seed (responsability of the plant breeder) to basic seed (responsability of the distributor) and of course the production of material offered for sale to farmers. Tests can be done in the field (habitus, varietal characteristics, standard of production, weeds etc.), on trial fields (comparing a sample with a standard sample of the original breeders seed) and in the laboratory (purity). Usually it is a mix with growing emphasis on tests in trial fields against a standard sample. It is clear that through a Seed Certification Scheme governments can largely regulate seed distribution to farmers and provide consumer protection. It is not dependent on P.B.R.

2. General statements related to issues to be considered for discussion by TAC and IARC's

2.1. Plant breeding, in general, results in narrowing the genetic variability within varieties compared with land races and most traditional varieties. Genetic variation can be widened by increasing the available range of varieties.

2.2. Plant breeding and improved varieties are essential components of modern agriculture and the ability to feed the world. There is no realistic way back to the pre-Mendelian era.

2.3. Essential components of plant improvement and seed supply are :

i - Conservation

Conservation of genetic resources and germ-plasm collection (reservoirs or reservates).

ii - Innovation

Plant breeding and selection.

iii - Evaluation

Testing the results of plant breeding and their value to agriculture.

iv - Multiplication

Seed production and distribution.

Each of the four components are independent (in organisation and execution), but related spheres of activities.

2.4. Plant breeding programmes generally use limited genetic materials and cannot and should not be made responsible for genetic conservation.

Gene conservation is a public responsibility. Loss of genetic resources is increasingly taking place and national and international activities to halt this process are

still totally inadequate.

The CGIAR should promote the establishment of a "World Gene Fund" (in analogy to the World Wild Life Fund) to be financed outside the Group.

- 2.5. Large centralised breeding operations can lead to excessive uniformity of the available planting material. The work of the IARC's illustrates the dangers inherent to such an approach. Any legislative measures should be compatible with stimulating a decentralised approach to variety development and production of a wide range of different materials.
- 2.6. The effects of plant breeding on originally available planting material are largely independent of whether carried out by private- or public institutions.
- 2.7. The adoption of some form of legal varietal protection reflects primarily the political and economic decision to stimulate private investment in plant breeding. It has no specific consequences to genetic resources other than those of plant breeding in general.
- 2.8. Seed legislation, lists of recommended varieties, certification of seeds and quality control function independent of P.B.R.

While P.B.R. protects the interests of the plant breeders, seed control systems are designed to protect the consumer (the farmer). Strong extension services and mandatory lists of varieties can effect the survival of traditional varieties. Consequences of seed control systems on traditional material, specifically in centers of diversity, need careful consideration.

Most centers of diversity ("Vavilov Centers") of major crop species are in the Third World making those areas much more sensitive to genetic erosion than the Western World.

2.9. In most developing countries plant breeding is as yet not well developed and is mainly carried out in public institutions.

The question is germane how plant breeding should be stimulated. The present trend is to actively strengthen public supported plant breeding. Private plant breeding has become so far only an issue in more advanced countries of South America, and such countries as India and Pakistan. There are various alternatives possible in private industry participation. Certainly in the early stages of development strong public supported plant breeding seems important to regulate activities of private organisations, provide competition and offer protection to the consumer from possible oligopolistic attitudes of larger companies. The appropriate combinations of private and public activities requires consideration in the planning of agricultural development.

2.10. The Consultative Group on International Agricultural Research (CGIAR) operates a network of international institutes serving developing countries. Combined it constitutes the largest breeding organisation in the world covering all major food crops. It is supported by international public funds. The IARC's do not necessarily breed varieties, but make early and advanced breeding lines available free of charge to national programmes.

2.11. A first logical consequence of the CGIAR appears to be the development of national public institutions of plant breeding and issuing of varieties by government bodies. This system does not require plant breeding rights.

2.12. Seed production and distribution should be treated as a separate issue. It may well be possible to combine public plant breeding with private seed production and distribution.

- 2.13. The results of plant breeding have social and economic implications that reach beyond seed trade and production systems. Certainly in most developing countries, specifically those with a food deficit, public investment in plant breeding would seem required to safeguard public and national interest. Stimulation of private industry participation requires public control over varietal testing and seed quality.
- 2.14. Administration of seed regulations, including varietal evaluation, seed certification, controlled varietal lists and legal varietal protection requires efficient, competent and impartial government agencies.
- 2.15 Possible advantages of some form of varietal protection:
- (i) Increase in investment in plant breeding with private funds;
 - (ii) Control mechanisms to insure quality and nature of marketed seed;
 - (iii) Competition - private industry tends to be much more efficient than government organisations.
- 2.16 Possible disadvantages of some form of varietal protection:
- (i) Bureaucracy and testing procedures may delay availability of new varieties and new concepts in plant breeding;
 - (ii) Breeding for "uniqueness" complicates development of new varieties without it being important for its agricultural value;
 - (iii) The requirement for "uniformity" makes little biological sense for cross breeding species;
 - (iv) Plant breeding for profit will limit the exchange of breeding material and of technical information.

3. P.B.R. and seed control systems in agricultural development

P.B.R. and seed control systems are national responsibilities, and there appears to be considerable variation in the organisation and execution.

There still are many agricultural communities untouched by institutional agriculture. First contacts are generally realised via extension services and often introduction of new varieties of the major food crops is one of the first developments. Hopefully such action is based on comparative trials of traditional varieties with modern varieties and this constitutes the most simple system regulating planting material.

A second stage is official testing in representative areas of a range of varieties leading up to lists of recommended varieties. These varieties can either be developed by government institutions or by private industry (national or abroad). Recommended varieties are multiplied by state farms or in some cases by private industry on a contract or license basis and made available. There often is no varietal protection. In fact in the case of a restrictive list of varieties and a closed certification system where only certified seeds are allowed on the market, there is no need for specific patent rights.

Generally increased involvement of private industry in seed production however is accompanied by more extensive seed control mechanisms, including the DUS Standards (Distinctness, Uniformity, Stability) and tests of value for cultivation and use - VCU - (including yield, quality and resistance to biotic and abiotic factors).

P.B.R. becomes an issue, of advantage is seen in actively stimulating private industry to invest in plant breeding. (In many countries government breeding and private breeding operate side by side)

Varietal protection is issuing patent rights on the basis of set of criteria (such as the DUS Standards).

In the USA there is no official government field testing and legal rights are issued on the basis of examination of information supplied by the originator of the variety.

In the european UPOV-countries government organisations test new varieties for "DUS"-criteria in field tests.

P.B.R. generally function independent of seed control mechanisms and recommended lists of varieties. Seed control mechanisms are essentially forms of consumer protection while lists of recommended varieties are a form of agricultural extension.

The range of crops in any of these systems varies. For instance varieties may be on the national lists without having P.B.R.

P.B.R. have become synonymous with UPOV. This has to a large extent confused the discussion. It is clear that requirements for legislation are very much dependent on the agricultural situation as well as on the development plans for the future. Generalisations are therefore dangerous.

In considering legislation, careful study should be made of the objectives of such legislation and the various alternatives available.

The introduction of seed control systems and P.B.R. have become issues of considerable public and political dialogue. The concern is justified, but has so far not led to a very constructive debate. Opponents to any form of private industry involvement in plant breeding and seed production have been spear-headed lately by groups who link P.B.R. with genetic erosion and exploitation of the Third World allegedly robbing it of its genetic resources.

The arguments have become largely political and, as is often the case, express rather biased if not confused views on causes and results. On the other hand, proponents of P.B.R., notably representatives of the seed industry and the official network have so far only presented highly uncritical

views, stressing benefits without much attempt to analyse the real issues and relate it to different agricultural situations.

Both camps appear to be in the trenches and are unlikely to come out of them very soon. The CGIAR should not take part in this debate, but make an effort to analyse situations in a more realistic manner as they effect plant breeding and seed supply in developing countries.

4. Some issues related to the possible consequences of P.B.R. - seed control systems

4.1. Genetic resources

Plant breeding programmes generally use limited genetic materials. Resource collections of most commercial breeding operations are therefore relatively small and contain primarily material of direct short term use for breeding programmes.

Hence plant breeding programmes are not normally concerned with broad aspects of genetic conservation and germ-plasm collection. P.B.R. has so far not resulted in private monopolies over germ-plasm even if private plant breeders generally keep parental sources well protected and do not easily exchange breeding materials.

Conservation of genetic resources is a public responsibility. It is not threatened by private industry, but by plant breeding in general, agricultural development and the lack of funds made available from public sources for preservation.

Even within publicly financed institutions, such as those of the CGIAR, germ-plasm collection should in our view be done independently of breeding programmes. The main objective is not short term support of variety development, however valuable, but long term preservation of as many and variable genes as possible. Short of becoming dogmatic, one can almost say that plant breeding and genetic conservation are not compatible.

Hence IARC's should perhaps primarily establish good reference collection for plant breeding. The IBPGR should insure preservation of genetic material regardless of subjective values.

Generally in field crops, adoption of new varieties, if proven to be superior to existing material, is quite rapid.

The adoption rate of IRRI and CIMMYT varieties in many developing countries is a point in case. The logical conclusion is, and one already acted upon to some extent, that introduction of new varieties should be preceded by adequate collection of the traditional material. Such activities should be part of overall agricultural development plans - and be carried out by official organisations. It should not be left to plant breeders alone whereas it would seem totally unrealistic and undesirable to charge private industry with such a responsibility.

Whereas it is difficult to visualize how varietal protection by itself could have a significant effect on rate of adoption of a variety, P.B.R. is often accompanied by additional measures regulating seed distribution.

In Europe testing of varieties on their value for cultivation and use has culminated in national lists of varieties permitted for sale. The primary objective of these lists is to protect farmers against unsuitable varieties. Such lists may however remove traditional varieties, or varieties with localised appeal, from trade.

For instance, it has been suggested that introduction of the E.E.C. common catalogue, being the sum total of all E.E.C. national lists, has led to the disappearance of many traditional vegetable varieties in Europe, even if some of them were synonyms.

In the United States registration of a variety is not a prerequisite for marketing. Hence registration is voluntary and may be opted for as an added protection

for the breeder and assurance to the buyer. In this system, there is no legal barrier to the sale of traditional varieties. It is doubtful however whether this greater flexibility over the European system has had much impact on the maintenance of genetic crop resources.

The causes of genetic erosion are insufficient knowledge of planners of agricultural development of the value of traditional materials and centers of genetic diversity, the failure of plant breeders and plant breeding institutes to indicate the importance of conserving original material and developing strategies regulating the introduction of new and hopefully improved varieties.

For crops like rice and wheat, the CGIAR system has developed a reasonable system of collection in cooperation with national institutes. For most other crops there is reason to doubt whether the present effort is anything near adequate.

Most centers of diversity are in developing countries. This genetic diversity consists of both wild populations and locally domesticated materials.

Governments and international agencies should accept full responsibility for this preservation as an essential source for future development. The CGIAR promotes internationalisation of effective utilisation.

Some governments appear to be aware of the value of genetic material and view it as a national property. In countries like Brasil and Ethiopia for instance germ-plasm collection, notably of agricultural crops, has to be authorised by the Government. This official recognition is encouraging. However national boundaries have no biological meaning, and agriculture and the farmers would ultimately suffer from restrictions on the exchange of genetic materials.

The CGIAR promotes internationalisation of genetic resources. International agreements are required to regulate the flow of genetic material and insure effective utilisation. Such agreements should include safeguards against misuse and monopoly situation of both national organisations and private industry.

4.2. IARC's, P.B.R., private industry and the release of breeding stocks

The general policy of IARC's has been to supply germ-plasm and breeding material to anyone who asked for it.

An important argument in favour of such a liberal attitude is the following. The main objective of IARC's is that better varieties are bred (from such materials) and whether a government institution or a private organisation does so, is irrelevant to the farmer. A major strength of the CGIAR-system is undoubtedly the free flow of genetic material and information between collaborators throughout the world.

The present organisation of breeding and testing programmes of the IARC's is focussed totally on cooperation with national institutes in developing countries. Introduction of P.B.R. and the development of a private sector involvement in plant breeding will have consequences which require consideration. So far the debate on this issue seems to have been dominated by ideological beliefs on the one hand and overly defensive attitudes of the private sector on the other.

Private industry differ from national organisations in their objectives and motivation. This has implications for their role as a partner in breeding without necessarily attaching any moral or other values to it.

Apologising for the oversimplification, a few general statements seem required for the argument.

The main objective of private industry is to maximise financial rewards on the goods and services provided. This is neither unreasonable nor amoral.

Investment in the means to produce these goods or in the production processes is mainly determined by the requirements and characteristics of the market, i.e. the competition by other organisations or the possibilities of substitution of the goods or services by the consumer.

In many developing countries providing sufficient food for the population is a major development goal of the government. Plant breeding and seed production is an important component in such a development. It is legitimate, in fact necessary, for governments to consider what kind of organisation is the most appropriate for the existing situation. Various organisational models can be visualised ranging from total government control to various degrees of private industry participation with adequate consumer protection. It is not the objective of this paper to elaborate on this issue.

Introduction of P.B.R. reflects a political and economic decision by a government to stimulate private investments in plant breeding. It is suggested that, in Europe and North America, P.B.R. indeed resulted in an increase in number of companies involved in plant breeding and a subsequent broadening of the range of available varieties. However, in recent years, a few large international companies have taken an interest in plant breeding and by take overs now dominate commercial plant breeding.

Introduction of P.B.R. and/or seed legislation may well attract in first instance these large international conglomerates. Because of know-how and a back-up organisation these companies are likely to establish an

immediate lead and in that way discourage any participation of locally financed and staffed small enterprises. Accepting this prediction, an important part of the issue under discussion is, how the IARC's should relate to international breeding companies.

As stated before the present organisation of breeding and testing programmes of the IARC's is focussed totally on cooperation with national institutes in developing countries.

There are no restrictions to the use of the material distributed and the IARC's do not claim any legal ownership of any of such materials. It would seem that the actual situation at present is that it is left to national government what use is made of it at the national level. Hence if a national government decides that private industry should play a major role in plant breeding and seed production of the major food crops, it is free to hand over whatever material is obtained from the IARC's.

Handing over de-facto ownership of IARC' genetic material at the national level to respective governments, would seem to carry with it the consequence that presence or absence of any system of P.B.R. regulating legal ownership of varieties is of no concern to the CGIAR.

The argument in favour of such an approach is, that the ultimate objective of the IARC's is to get better varieties to the farmer. Whether this is realised through government institutions or private industry is of little consequence. In fact private industry might very well be more efficient.

Such a "laissez faire" attitude however has a number of serious consequences that warrants attention. Some are indicated below :

- It takes time to build up a private industry with adequate levels of competition (to avoid monopoly situations), satisfying the needs of a country. In the interim period public institutions will have to exhibit a strong presence.
- Most developing countries may not want to be solely dependent on private industry for the supply of seeds to small subsistence farmers.
- If breeding material in advanced stages of development (as are now produced by IARC's) are freely available to private industry, it is unlikely that extensive extra investments are realised in plant breeding.

(Put forth as one of the major advantages of P.B.R.)

A solution could seem to make available only segregating populations in early generations. However IARC's supply a range materials to many different countries, some requiring even finished varieties. It is in practice impossible to protect such materials.

- The presence of P.B.R. would allow an unprincipled (or pragmatic?) company to obtain experimental IARC varieties and after selection submit the best ones for varietal protection.

On the basis of "distinctness" it might in addition block the acceptance of other varieties selected from the same stock by others (including the IARC's themselves and national institutes).

Reciprocal rights in other countries would aggravate the problem.

Obviously, the issue under discussion has no simple solution. Essentially the IARC's form a natural symbiotic complex with national institutes, without special provisions envisaged for different kinds of relationships with other organisations.

Handling P.B.R.-legislation and seed control requires effective and impartial government institutions. The most logical development model, indicated in chapter 3, would seem the development first of strong national breeding programmes in cooperation with IARC's gradually developing the institutional framework. If or when national institutions are fully developed, stimulation of private industry might be considered.

Special provisions might be made for certain crops to have access to commercial varieties from other sources. P.B.R. is only one of a number of measures that can be adopted to reward originators of varieties for their products. Measures considered should be compatible with actual circumstances which in general not resemble those in Europe.

The CGIAR has developed into the largest breeding organisation in the world. This carries with it the dangers of monopolistic attitudes. As it is involved in the development of national plant breeding, it requires to develop specialised expertise on institutional and legal aspects of the organisation of plant breeding in order to be able to offer objective advice. There are different alternatives. Any system however should safeguard genetic resources and protect the interests of the farmers.