

Item 10

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Restricted

THE CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

TECHNICAL ADVISORY COMMITTEE

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FACTOR-ORIENTED RESEARCH UNDER THE CGIAR

TAC SECRETARIAT

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

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FACTOR-ORIENTED RESEARCH UNDER THE CGIAR

1. The CGIAR has affirmed <sup>1/</sup> that the first objectives of international support to agricultural research in developing countries should be to contribute to:
  - (a) increasing the amount, quality, and stability of food supplies in the LDCs, and meeting the total world food needs;
  - (b) meeting the nutritional requirements of the less advantaged groups in the LDCs.

Further, it was stated that due account should be taken of the need to achieve an improvement in the level of income and standard of living of the less advantaged sectors of society in the developing countries (especially rural) which determine their access to food, equity in the distribution of benefits from research, and efficiency in use of agricultural resources.

2. The above objectives suggest that the primary concerns of the group relate to increased production of important food commodities. In fact, the first two IARCs created, IRRI and CIMMYT, were essentially commodity institutes and were concerned with improved production of rice, wheat, and maize in the LDCs. CIP is another commodity institute, concerned with potatoes. WARDA is a regional organization concerned with rice.
3. In addressing the problems encountered in increasing production of these commodities, these institutes examined the factors which might influence, limit, or improve production, and their research activities were built around these various factors - genetic recombination and improvement, cultural practices, climate, water, plant nutrients, plant diseases, plant pests, soil conditions, economic factors, etc. - all directed simultaneously to the specific commodity.
4. CIAT, IITA, ICRISAT and ICARDA retained a major focus on food commodities important in the regions they sought to serve and on the factors influencing their production, but were concerned with major sectors of the world's crop climate or ecology, such as lowland humid and sub-humid tropics of the Americas, African humid and sub-humid tropics, semi-arid tropics of the world and dry areas of the temperate and sub-tropical areas of the Middle East with winter rainfall patterns.
5. These latter institutes, and even IRRI, realized that, in the developing world, the crops with which they were concerned were not usually grown on farms

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<sup>1/</sup> TAC Review of Priorities for International Support to Agricultural Research  
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in mono-culture, but that each farmer would usually include several crops and even livestock in his farm operations and that manipulation of the environment would be necessary to achieve or even approach optimum production levels. This led to an increasing concern for study of cropping and farming systems. The first stripe analysis conducted by the TAC addressed farming systems research and examined these programmes in depth in four institutes - IRRI, CIAT, IITA and ICRISAT. It was recognized that other institutes such as ILCA, ICARDA and WARDA were, or would be, concerned with systems research, and they, as well as the other IARCs, were invited to participate in a workshop on the subject which was convened at the conclusion of the stripe analysis.

6. Three IARCs - ILRAD, IBPGR and IFPRI - have their programmes directed primarily at factors - animal diseases, genetic resources, and economic policy, respectively.

7. Finally, in 1979, the CGIAR made the decision to add an activity which would come in a fourth category, namely ISNAR, which might be termed as functional (organization and management of research). The above four classifications of international agricultural research were recognized in the TAC priority paper (1979).

8. In focussing attention on factor-oriented research, the question is not whether factor-oriented research under CGIAR auspices is appropriate. This has been recognized as appropriate and necessary by the commodity or commodity-cum-systems-oriented IARCs from the outset. The questions which we must address are the extent to which factor-oriented research should be handled by IARCs whose focus is primarily on commodities and the farming and cropping systems in which they are produced, and whether there are factors of major importance which cannot be handled adequately and properly by these IARCs, which have additional characteristics cutting across broad segments of international agriculture in the LDCs, and which might justify separate consideration and particularly separate institutional or other arrangements supported by the CGIAR.

9. Of the thirteen IARCs now supported by the CGIAR, nine (IRRI, CIMMYT, CIP, ICRISAT, CIAT, IITA, ILCA, WARDA and ICARDA) could be classified as being oriented toward commodities and the production systems in which they are produced. All nine are doing research on several of the factors which influence production levels. Three IARCs (IBPGR, ILRAD and IFPRI) are primarily concerned with major factors of production but have taken on phases of work which seemed beyond the scope, competence, or appropriateness of the individual commodity or production-oriented centres. They can thus be seen as complementary to these centres.

10. Within this context, let us now examine the following factors within the CGIAR context:

- Genetic resources
- Cultural practices
- Plant pests
- Plant diseases
- Plant nutrition
- Climate
- Water management
- Soils and soil management
- Tools and implements
- Economics and economic policy
- Crop processing and storage
- Animal health
- Animal nutrition
- Energy and power

Genetic resources

11. All the commodity and production-oriented IARCs dealing with crops are heavily concerned with genetic resource research. Those which take on major responsibility for a given crop assemble and maintain genetic collections of these crops and attempt to make them available to their cooperators around the world. Many of them have assumed responsibility as world centres for assembling, classifying, cataloguing, storing and making viable seed available as needed by breeding programmes in any country. The list is as follows:

IRRI	-	Rice
CIMMYT	-	Wheat
		Barley
		Maize
		Triticale
CIAT	-	Cassava
		Dry beans
IITA	-	Cowpeas
		Cassava
		Yams
ICRISAT	-	Sorghum
		Pearl millet
		Minor millets
		Groundnuts
		Pigeonpea
		Chickpea
CIP	-	Potatoes

ICARDA - Barley  
Broadbeans  
Lentils

12. The above centres also carry on extensive plant breeding programmes, bringing together germplasm from diverse sources having specific desirable characteristics, crossing them and making selections leading toward the development of varieties possessing the most favourable combinations of desired traits.

13 The Board for Plant Genetic Resources does not attempt to duplicate the work of these commodity centres. While it does not carry on research on its own, it does commission and provide financial support to a number of institutions for research on identified gaps necessary to meet its objectives. It attempts to formulate policies and recommend action to meet the following objectives:

- To identify needs for exploration, collection, evaluation and conservation of plant genetic resources with particular reference to species of major economic importance and their wild and cultivated relatives; to determine priorities among them; and to ensure to the fullest possible extent that the materials conserved are made available for plant breeding and other scientific activities as required.
- To establish standards, methods and procedures for exploration and evaluation and to determine minimum standards for conservation of stocks of both seeds and vegetative material.
- To arrange for replicated storage of seed and vegetative stocks.
- To develop a worldwide network of institutions, organizations and programmes able and willing to contribute to the above objectives.
- To promote the dissemination of information and material among centres and institutions, and to encourage, within existing resources and possibilities, the establishment of inventories of collections.
- To make appropriate recommendations with respect to computerized information storage and retrieval systems, taking into account their suitability for an effective international genetic resources network, and their compatibility with existing systems already in operation at some regional and national centres.

14. The IARCs are concerned with only a portion of the plant species which are useful to man. The IBPGR seeks to establish standards and guidelines which will improve the quality, uniformity of approach, and effectiveness of the IARCs genetic resource programmes, and to encourage them to fill out existing gaps

in the global coverage for the crops with which they are concerned. It also extends its efforts to encourage other organizations and groups to fulfill a similar role with useful crop species not covered by the IARCs and to maintain and manage duplicate collections of all such species to assure continued and uninterrupted access to them in the event of accidental loss or inaccessibility at any given location.

15. This is a field in which the need for factor-oriented research beyond that which could be handled by the commodity and production-oriented centres has been recognized. TAC agrees that the action of the CGIAR to create a special institutional mechanism for this purpose was appropriate and amply justified.

#### Animal Health

16. Two very serious bovine diseases - trypanosomiasis and theileriosis - for which there are no known effective methods for immunization, prevention, treatment or control, have placed very severe limitations on the introduction and utilization of cattle in the equatorial zone of East Africa. These diseases were considered by the CGIAR as placing sufficiently severe limitations on the economic development of this portion of the African continent to justify support for a long-term, intensive effort to find means for their control. The International Laboratory for Research on Animal Diseases (ILRAD) has been established for this purpose.

17. Early progress resulting from this intensive effort by an internationally supported team of able scientists has been encouraging.

18. The TAC has made no comprehensive assessment of other animal diseases in Africa or other parts of the developing world which may possibly, in the future, merit similar consideration.

#### Economics and Economic Policy

19. Production economics studies, market problems, and research on the constraints to adoption of improved technology are integral parts of the research programmes of the IARCs which are oriented primarily to commodity and production systems research. However, research on most of the macro-economic problems such as global, regional or national food policies, overall projections of food requirements, etc., have not been considered appropriate or feasible for such institutes either individually or collectively. However, the identification and analysis of alternative national and international strategies and policies for meeting the food needs of the world, with particular emphasis on low-income countries and on the poorer groups in these countries has appeared to be essential to meeting the objectives of the group. The International Food Policy Research Institute (IFPRI) organized in 1974 under the initial sponsorship of three members of the Group has now been accepted by the CGIAR as a whole to address this recognized need.

### Water Management

20. Water supply to crops, its amount, quality, timing of availability and overall management is a factor which almost universally determines the limits on production and the extent to which other factors can be manipulated to optimize crop production. The TAC has placed a high priority on research on this factor.

21. Several of the existing IARCs (IRRI, ICRISAT, ICARDA, for example) have been addressing some of the facets of the water management problems and the crop production programmes of several other centres recognize this as an important factor. The subject has been discussed by the TAC on numerous occasions. The 14th TAC meeting concluded that this subject should be addressed by intensification of water management research in the existing IARCs. Considerable doubt as to the validity and adequacy of this conclusion has been repeatedly raised at the 15th and subsequent TAC meetings. In 1977 the IDRC commissioned a team under the leadership of Sir Charles Pereira to re-examine this question. The report of this team and several other relevant documents have been studied by the TAC. A working group composed of some TAC members and a few consultants with specialized experience in irrigation water management will be meeting just prior to the 23rd TAC meeting and hopefully may have further suggestions for TAC consideration at its forthcoming session.

### Plant Nutrition

22. This factor is being addressed in the crop production research programmes of all the IARCs which are devoted to crop production and farming systems. It is one of the factors which received special attention in the TAC priority paper (1979).

23. It is recognized that food requirements of the next generation will necessitate considerably increased attention to the improvement and adequacy of plant nutrition and that very greatly increased amounts of chemical fertilizers will have to be utilized. There are problems in providing fertilizer supplies in the quantities and in the locations in which they are most acutely needed in the LDCs. Further, the efficiency with which chemical fertilizers, especially nitrogen and phosphorus sources, applied to the soil are utilized by crops.

24. In 1974, the USA established the International Fertilizer Development Center for the purpose of addressing some of these problems. Among other purposes, the IFDC has been attempting to develop methods of processing fertilizer raw materials of various kinds found in LDCs which might increase the availability of indigenous fertilizers and to develop fertilizer compounds or physical forms of fertilizers which would make them more suitable and improve their effectiveness under tropical conditions.

25. The IFDC has applied for inclusion in the group of international centres supported financially by the CGIAR. This application has not been approved but the CGIAR has indicated that it wishes the TAC to prepare for its consideration a special paper giving a more comprehensive analysis of plant nutrients as a factor in the food production of the LDCs. The TAC is commissioning the preparation of such a paper for its consideration at the 24th TAC meeting. The topic will be treated more fully as a special item in the agenda for this 23rd meeting.

#### Plant Pests and Diseases

26. Research on plant pest and disease physiology, ecology, management and control has been accorded high priority by the TAC. This is a major factor under intensive consideration by all the IARCs concerned with crop production. ICIPE, concerned with fundamental aspects of insect physiology and ecology, has applied for inclusion within the CGIAR and this has been referred to TAC for advice. As will be considered under a separate agenda item, TAC proposes to send a team to ICIPE in April 1980 to examine this question. Terms of reference and a tentative list of questions for the team to consider have been drafted. The respective roles and relative complementarity of ICIPE and of the other crop-oriented IARCs will need to be examined. The team's findings will be on the agenda for TAC consideration at its 24th meeting.

27. The TAC has not, as yet, considered whether or not there are specific phases of disease physiology, ecology, management and control beyond those being addressed, or appropriate for attention by existing IARCs which would justify additional attention by the CGIAR.

#### Soils and Soil Management

28. This topic may perhaps best be handled by existing IARCs, or may be combined with water management, or perhaps the present group making a feasibility study with respect to some sort of coordinating mechanism for international soils research may provide useful inputs. The benchmark soils project (Uehara, Hawaii) and the USAID-supported studies on tropical soils (Sanchez, North Carolina) may also be pertinent.

#### Tools and Implements

29. This would seem to fit more closely with the mandates of existing IARCs. It is addressed in the TAC priority paper under the subject of mechanization.



Crop Processing and Storage

30. This would seem to relate most closely to the individual commodities. It is referred to in the TAC priority paper under post-harvest technology. The IDRC and FAO have had considerable interest in this field. Some meetings on the subject were convened around some of the earlier CGIAR meetings. The TAC does not propose to give special consideration to this topic in the immediate future.

Animal Nutrition

31. This has been of some concern to ILCA. It was one of the major items of concern with the water buffalo project proposal.

Cultural Practices

32. This would seem to relate to specific commodities and cropping patterns and farming systems. It would seem to be definitely appropriate to the existing IARCs and TAC does not see an additional role of international dimensions meriting specific CGIAR consideration.

Energy and Power

33. This is a growing concern for agriculture generally. Much of the LDC part of the world relies heavily on human and animal power. Mechanical power based on fossil fuels is becoming much more costly and scarce. Fuel for food preparation is also a consideration here. This does not, however, appear to be a high priority area for present CGIAR consideration.

Climate

34. Virmani's studies under the farming system programme of ICRISAT are pertinent. Also publications of Dagg, Kassam and others at IAR, Samaru, Nigeria, and FAO/UNDP/WMO studies might be consulted. For the immediate future, TAC suggests that CGIAR consideration of this topic be confined to efforts of existing IARCs.

SUMMARY

35. The TAC recognizes that the existing IARCs are heavily engaged in research on the various factors which influence the production of major food commodities. At the same time, it recognizes that some of these factors have important aspects of broad significance and scope which cannot be addressed adequately by the existing IARCs individually or collectively. The establishment by the CGIAR of separate institutional mechanisms to be concerned with such additional aspects as genetic resources (IBPGR), animal health (ILRAD), and economic

considerations (IFPRI) are considered to have been appropriate.

36. The TAC has identified water management, and plant pest and disease physiology, ecology, management and control as high priority areas for consideration of possible new institutional arrangements under CGIAR auspices. Plant nutrition will also be the subject of an analytical paper to be commissioned by the TAC.