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PESTICIDE RESIDUES RESEARCH

(Item 8)

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TAC SECRETARIAT

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

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BACKGROUND PAPER ON PESTICIDE RESIDUES RESEARCH

for the January 1973

MEETING OF THE TECHNICAL ADVISORY COMMITTEE ON INTERNATIONAL AGRICULTURAL RESEARCH

I. Introduction

Following the establishment by UNDP of its category of "global projects" in early 1970, four related proposals for projects in the pesticide field were received, namely:

- (a) "Coordinated Research Programme on the Fate and Significance of Pesticide Residues in Food and the Environment (IAEA);
- (b) Regional Centres for Research and Training in the Application of Nuclear Techniques to the study of Pesticide Residues and Pollution Problems in Developing Agriculture (IAEA);
- (c) "Pesticide Research Coordination Centre" (FAO);
- (d) "Integrated Plant Pest Control Research Centre" (FAO).

While recognizing the importance of the subject of pesticides residues research, the UNDP has a number of reservations towards the proposals made so far and wishes to have the whole question of possible international assistance in the field of pesticides residues research reviewed by the TAC.

II. UNDP Reservations towards Existing FAO and IAEA Proposals

(a) They are basically (and with partial exceptions) rather loose proposals for research funding, without specifying very clearly what research is to be undertaken or where.

(b) The relations among the proposals are not very clear. For example, IAEA has suggested combining (a) and (b), while (c) is also clearly related to (a) and (b) whereas (d) is not directly concerned with pesticide residues as such but with new methods of pest control which would obviate the need to use the broad spectrum and persistent chemical pesticides, which cause the residues.

(c) UNDP is now recommending to the Governing Council, as a global project, a programme of substantial support to the International Centre for Insect Physiology and Ecology (ICIPE) in Nairobi, Kenya, and this would be largely duplicated by the FAO proposal (d).

(d) There is a certain lack of balance in the proposals (a) and (b) which concentrate only on the, admittedly important, nuclear methods of studying pesticides residues without reference to the broad issue.

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(e) The proposals under review would commit the UNDP to a substantial financial contribution totalling \$6.6 million over five years. In view of the very limited uncommitted global projects resources over the next five years, UNDP would prefer to enter into a consortium type funding arrangement with other multilateral, bilateral, and private funding agencies in any global projects of this type.

(f) The proposals raise major questions of project management and effective project execution which they do not answer.

(g) UNDP had not wished to become prematurely committed in this field pending the outcome of the Stockholm Conference and the establishment of the Fund and Secretariat of the UN Conference on the Human Environment (UNCHE), and pending also the results of the major USAID study on pest management and its problems, which is now in progress.

III. Agency Positions

UNCHE Recommendation 21 of the Stockholm Conference, reproduced in Appendix I, is the operative recommendation on pesticide residues. It enjoins Governments, FAO, WHO, UNESCO and IAEA to cooperate on integrated pest control on the one hand, and reduction of the harmful effects of agro-chemicals on the other hand. Specifically mentioned in the context of pesticide residues are basic research on ecological effects of pesticides (Man and the Biosphere programme); use of radiation techniques to study the fate of pesticides in the environment; and international guidelines and standards on pesticide use. It is likely that pesticide residues problems of specific economic or public health concern to developing countries would be eligible for UNDP funding while more general problems of world surveillance, etc. might be eligible for funding by UNCHE.

FAO's Activities in the pesticide field may be summarized as:

(a) Regulation and use of pesticides especially by the preparation and publication of FAO specifications covering technical materials and formulations for plant protection products. Specifications for 15 of the most important of these have been published and 50 more are programmed for the future.

(b) Acute toxicological hazards especially during formulation, transport, storage, and use of pesticides. This is covered by a number of FAO/WHO technical data sheets.

(c) Pesticide Residues in human food and animal feed. FAO/WHO have jointly considered 120 pesticides and recommended 250 pesticides residue tolerance levels for adoption under the Code Alimentarius. At the present funding level no more than 150 of the 500 agricultural pesticides can be kept under review and the problem of pesticide residues in animal feed - of increasing international concern in view of animal feed exports from developing countries to western Europe - has yet to be tackled.

(d) Insufficiency of scientific data on certain pesticides. This is closely related to the last point and is the subject of one of FAO's two project proposals. Concern is centered on pesticides no longer protected by patents or having

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specialized and limited market possibilities so that manufacturing companies have no incentive to undertake needed testing.

(e) Pest resistance to pesticides.

(f) Unintended environmental consequences of pesticides. On this subject, FAO has prepared a technically informative monograph submitted as an annex to its background paper.

(g) Development and integration of alternative pest control methods.

(h) Cost and availability of pesticides, especially technical assistance in local formulation of imported technical grade materials into usable agricultural products near the end use point.

WHO Supports FAO on its points (b) (c) and (d) in which areas the two organizations collaborate closely. WHO also stresses the importance of pesticides residue monitoring in air and water.

IAEA Emphasizes the importance of nuclear techniques especially radioactive isotope tracer studies of pathways of pesticides and their breakdown products through the environment. The joint FAO/IAEA division has a current programme of 29 investigations in 18 different countries concerning pesticide residues and similar contaminant problems most of them being investigated under "cost-free" research agreements. It also has a series of one month training courses in Vienna financed under the IAEA/SIDA cooperative programme. The two IAEA project proposals are outgrowths of these two existing programmes.

UNESCO The Man and the Biosphere (MAB) programme includes as proposed Project 9, the "Ecological Assessment of Pest Management and Fertilizer Use on Terrestrial and Aquatic Ecosystems," which project includes as a possible field of action, collection and analysis for pesticide residues of soil, water, air and biota samples.

UNIDO Has indicated its willingness to assist, where invited, in advising pesticide manufacturing facilities, including pesticide formulation plants, on environmental hazards resulting from their operation.

ILO FAO and ILO are proceeding jointly on the production of a "Code of Practice in the Use of Pesticides" covering acute hazards in their production and use.

IV. Classification of Pesticide Problems

In effect, the problem of pesticide residues breaks down into the following fields:

(a) Acute hazards arising from the production, storage, transport and use of pesticides;

(b) Pesticide residues in soil, air, water and biota and their unintended ecological consequences;

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- (c) Pesticide residues in human food and animal feeds; and
- (d) Integrated pest control methods and alternatives to chemical pesticides.

Additionally, the following distinct activities may be distinguished:

- (A) Legal and Regulatory, including
 - (i) Pesticide manufacture - occupational hazards;
 - (ii) Pesticide marketing - certification, labelling, and quality control;
 - (iii) Pesticide use - restrictions on use and methods of application;
 - (iv) Pesticide residue tolerances in food - acceptable daily intakes (expressed in mg. residue intake per kg. body weight) and residue tolerances on specific crops (in parts per million by weight).
- (B) Training and Information, including
 - (i) In safety procedures for farmers and other users of pesticides;
 - (ii) For scientists and technicians in instrumental techniques of analysis, such as gas chromatography and in research methods such as those involving radioactive tracers.
- (C) Surveillance and Research, including
 - (i) Monitoring of residues in the environment;
 - (ii) Research on the distribution, metabolism, persistence and final degradation of pesticides;
 - (iii) Evaluation of hazards, ecological effects, and unintended consequences of the use of pesticides on the basis of the information of (i) and (ii).
- (D) Research and Development of new methods of pest control.

V. FAO and IAEA Project Objectives

(a) Pesticide Research Coordination Centre.

This would set up an ad hoc group of experts on pesticides in the environment paralleling the existing ad hoc group of experts on pesticide residues in food and, on the recommendation of these expert groups, subcontract research problems to established research institutes, which would normally be in developed countries.

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The studies would be principally relating to the effect of particular pesticides in food and in the environment with a view to drawing up acceptable daily intakes and residue tolerances on some of the 350 or so pesticides not yet covered by the Codex Alimentarius. In particular, this would include some pesticides of importance to developing countries for which data is not likely to be obtained by existing regulatory bodies or by manufacturers e.g. because patents have expired or there are limited markets in developed countries for the pesticides in question.

Integrated Plant Pest Control Research Centre

This proposal parallels in many ways the ICIPE global project which UNDP is supporting, except that it envisages an existing centre in a developed country coordinating field projects in each of four geographical regions.

Regional Centres for Research and Training in the Application of Nuclear Techniques

Proposes to establish up to five small training and research centres at existing institutes for nuclear research in developing countries. As already noted, this appears to be too one sided in its approach to the problem of training scientists and technicians. Moreover, the proposed approach falls more appropriately into the scope of a series of purely Regional Projects.

Research on Fate and Significance of Pesticide Residues in Food and the Environment

Envisages some twelve small research contracts to developing country centres for research on problems of interest to developing countries. This proposal lists some 20 research topics each with a proposed institute, see Appendix II. While it is a concrete proposal, there is little evidence on which to judge the validity of the problems chosen, especially as compared to possible other problems not chosen because isotope techniques might not be relevant.

VI. Activities Outside of the Scope of the Present Brief.

UNDP suggests that the following types of activity should not be considered by TAC as being within the scope of a UNDP global project in pesticide residues:

(a) Integrated Pest Control.

This raises broader questions as the field is already largely covered by the ICIPE project. Supplementary recommendations e.g. to strengthen ICIPE on the ecology side might be considered, however, particularly as Ecology is recognized by ICIPE in name only at present. In any event there will be a need in future to programme more technical assistance into integrated control approaches which is a question related, though not directly, to pesticides residues research.

(b) Basically Training Programmes.

These are excluded by the terms of reference for global projects which should be research oriented, although training activities may be acceptable as a necessary part of a research project.

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(c) General Surveillance and Base-line Monitoring.

Activities to determine world levels of pesticides residues in air, water, soil and biota without reference to specific development problems will presumably be eligible for financing by UNCHE.

(d) Legal and Regulatory Recommendations.

These are already being handled by FAO, WHO, and ILO committees and expert groups. However, research on the fate and significance of residues in the environment, and on toxicity testing to acquire data on which recommendations may be based would be eligible for consideration in cases where such research activities have a special significance for developing countries.

VII. Activities Within the Scope of the Present Brief.

UNDP suggests that the following types of activity may be considered within the scope of a possible UNDP global project in pesticide residues:

(a) Fate and Significance of Pesticides in the Environment.

Projects, such as those listed in Appendix II, may be considered if they involve problems of potential economic and/or public health significance to developing countries taking account also of export requirements for human foods and animal feeds, with preference for problems which can be tackled by existing institutes in developing countries.

(b) Pesticide Residues in Human Foods and Animal Feeds.

This is closely related to the last topic and the same considerations apply, except that animal feeding trials, (on which recommendations for acceptable daily intakes and residue tolerances on crops might be based), could be included where they involve special problems of importance to developing countries, even though they would probably need to be undertaken in developed country laboratories.

VIII. Questions to be Resolved

Finally, the TAC may wish to make recommendations on the following:

(a) Whether there are problems of pesticide residues in the environment or in food which, taken either individually or collectively, are of high economic and/or public health significance to developing countries, and which might be solved through a global project based in some developing country. In particular, it may wish to consider whether there are research problems appropriate to a global approach concerning the export of agricultural products and ensuring that these exports meet the rigid standards for pesticide residues now being established by the developed countries. UNDP is already supporting national projects of this type in Poland, Egypt, Brazil, and Thailand.

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(b) If there are such significant problems which might justify a UNDP global project, it is then necessary to determine the next steps in its elaboration as a project.

(c) A possible course of action would be to request the IAEA/FAO division to collaborate with FAO and with WHO in the preparation of a detailed project proposal.

This might take the form of a list of identified projects and established laboratories, preferably in developing countries, where each might be executed. The list of Appendix II might be a starting point but other proposed projects could be added including perhaps one or two programmes of toxicity testing. For each research project, it would then be necessary to establish:

- (i) Description and objectives;
- (ii) Expected economic and health benefits;
- (iii) Research methodology which should correspond to the merits of the problem whether it involve nuclear or any other techniques;
- (iv) Expected manpower, equipment, and other inputs, duration and timing, and budget requirements;
- (v) Proposals for monitoring project;
- (vi) Proposals for follow-up actions to ensure effective utilization of research results.

It would further be necessary to identify an established research institute, probably in a developed country, to undertake under sub-contract, management and coordination of the research programme. Finally, an overall project proposal and budget should be prepared.

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APPENDIX I

Recommendation 21

It is recommended that Governments, the Food and Agriculture Organization of the United Nations and the World Health Organization, in co-operation with the United Nations Educational, Scientific and Cultural Organization and the International Atomic Energy Agency, strengthen and co-ordinate international programmes for integrated pest control and reduction of the harmful effects of agro-chemicals:

(a) Existing international activities for the exchange of information and co-operative research and technical assistance to developing countries should be strengthened to support the national programmes described above, with particular reference to:

- (i) Basic research on ecological effects of pesticides and fertilizers (MAB);
- (ii) Use of radio-isotope and radiation techniques in studying the fate of pesticides in the environment (joint IAEA/FAO Division);
- (iii) Evaluation of the possibility of using pesticides of biological origin in substitution for certain chemical insecticides which cause serious disturbances in the environment;
- (iv) Dose and timing of fertilizers' application and their effects on soil productivity and the environment (Food and Agriculture Organization of the United Nations);
- (v) Management practices and techniques for integrated pest control, including biological control (Food and Agriculture Organization of the United Nations and World Health Organization);
- (vi) Establishment and/or strengthening of national and regional centres for integrated pest control, particularly in developing countries (Food and Agriculture Organization of the United Nations and World Health Organization);

(b) Existing expert committees of the Food and Agriculture Organization of the United Nations and the World Health Organization on various aspects of pest control should be convened periodically:

- (i) To assess recent advances in the relevant fields of research mentioned above;
- (ii) To review and further develop international guidelines and standards with special reference to national and ecological conditions in relation to the use of chlorinated hydrocarbons, pesticides containing heavy metals and the use and experimentation of biological controls;

(c) In addition, ad hoc panels of experts should be convened, by the Food and Agriculture Organization of the United Nations, the World Health Organization and, where appropriate, the International Atomic Energy Agency, in order to study specific problems, and facilitate the work of the above-mentioned committees.

APPENDIX II

<u>Investigation</u>	<u>Location</u>
(1) Fate and significance of insecticides and fungicides in soil of cocoa farms	Cocoa Research Institute of Ghana Tafa, <u>Ghana</u>
(2) Fate and significance of residues from insecticides used in rice cultivation with particular reference to environmental contamination i.e. residues in vegetables and paddy fish	International Rice Research Institute in collaboration with the College of Agriculture, Laguna, <u>Philippines</u>
(3) Fate and significance of acaricide residues in tea	Tea Research Institute of Ceylon St. Coombs, Talawakelle, <u>Ceylon</u>
(4) Fate and significance of halogenated hydrocarbon fumigant residues in cereals following treatment at farmer level	The Hebrew University of Jerusalem, Faculty of Agriculture, <u>Israel</u>
(5) Fate and significance of organophosphorus residues as a result of endo- and ecto-parasite control in cattle	Higher Institute of Veterinary Medical Science, Sofia <u>Bulgaria</u>
(6) Persistence of insecticidal residues as a result of locust control operations with particular reference to alternatives to dieldrin	Desert Locust Control Headquarters Asmara, <u>Ethiopia</u>
(7) Fate and significance of pesticide residues in cereal crops (especially rice) under Pakistan conditions	Department of Plant Protection Karachi, <u>Pakistan</u>
(8) Fate and significance of pesticide residues on tropical fruits for export	National Agricultural Institute Chapingo, in collaboration with the National Atomic Energy Commission Laboratory, <u>Mexico</u>
(9) Fate of pesticide residues arising in dates for export as a result of chemical control measures	College of Agriculture, Bagdad, in collaboration with the Nuclear Research Institute, <u>Iraq</u>
(10) Fate and significance of fungicide residues on bananas for export as a result of crown rot control	National Taiwan University Roosevelt Road, Taipei, <u>Taiwan</u>

- (11) Persistence of pesticide residues in the environment following chemical control of tsetse flies
Makerere University College
P.O.B. 2062, Kampala
Uganda
- (12) Fate and significance of residues arising from the use of fungicidal cereal seed dressings on wheat
Agricultural Research Institute
Delhi, India
- (13) Concentration by edible marine organisms of pesticide residues in estuary waters arising from agricultural run-off, etc.
IAEA Marine Laboratory
Monaco
- (14) Soil persistence and plant absorption of newer herbicides e.g. of the bipyrilium series
Agricultural Research Institute
Nicosia, Cyprus
- (15) Residues in harvested crops following use of the newer systemic fungicides such as Milstem and Benlate
Pesticides Department
Faculty of Agriculture
University of Libya
Libya
- (16) Persistence and significance of fungicide residues on citrus fruits for export
Department of Plant Protection
Ministry of Agriculture, Jaffa,
Israel
- (17) Uptake and persistence of systemic O.P. insecticides in cocoa beans
University of Ghana
Legon, Ghana
- (18) Effect of different types of formulation (e.g. high volume or ultra low volume) on persistence of surface residues
Instituto Biologico, Sao Paulo
Brazil
- (19) Fate of pesticides in cotton seed oil following cotton pest control
Central Agricultural Pesticides Laboratory, Ministry of Agriculture in collaboration with Middle Eastern Radioisotope Centre, U.A.R.
- (20) Fate and significance of pesticide residues in olive and olive products
Institute Phytopathologique Benaki Athens, in collaboration with Democritus Nuclear Research Centre Attica, Greece

PESTICIDE RESIDUES RESEARCHComments and Suggestions on UNDP "Background Paper"General Comments

The proposals outlined under I were prepared independently and we accept that the relationship between them, particularly between (a), (b) and (c) has not been adequately developed. We also accept that the proposals have been rather loosely presented. This was largely because a fair amount of work would be required to present detailed proposals and it seemed desirable to obtain UNDP reactions in the first instance.

We have been in contact with appropriate officers of WHO and of the IAEA/FAO Joint Division and have assurances of their willingness to collaborate in the preparation of a more detailed proposal. The interests and responsibilities of FAO in this field are broader than those of the Joint Division. The proposal originally submitted by FAO also was very broad. It is therefore proposed that Rome should act as the coordinating centre in any re-drafting and submission of proposals. Proposals included in any redraft would be primarily justified on a basis of dealing with known problems, not to develop the use of particular techniques and the IAEA draft proposals would be absorbed into the main background on these lines.

We do not accept the references to ICIPE (pages 1 and 5 of the "Background Paper") as grounds for dropping the proposal "Integrated Plant Pest Control Research Centre". A separate paper on this subject has been prepared.

We agree that it would be best to consider "Pesticide Residues Research" and "Integrated Plant Pest Control Research" as separate items. This is because the main specialisations needed for research in the two fields are different, as are the locations in which they are best undertaken. Nevertheless, any general discussions about future research in the plant protection area should take cognisance of the need for both lines of work.

We accept the idea included in II(c) that a consortium type funding should be envisaged if this kind of operation is to develop. Nevertheless, it would be helpful to provide support even on a limited scale for a few problems straight-away. This would have the advantage that a start could be made and some procedural lines could be established along which future operations might be directed and administered.

Subject to further reactions from recipients of these comments, we would be willing to attempt to redraft proposals on the above lines.

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Observations on Specific Points in UNDP Draft "Background Paper"

Re item II(f): The management difficulties seem to have been over-emphasized. It seems to us that the only available alternatives are (i) support on a small scale, for items such as those prepared in Vienna and listed in Appendix II of the paper, or (ii) a larger scale research programme with a number of distinct problems being investigated in different laboratories.

The first of these, viz. (i), could be handled under existing arrangements for execution by the Agencies; whereas the second would call for some kind of a coordinating centre. The original FAO proposal included suggestions for setting up such a centre to be staffed by a director and one or two professionals who would be responsible for liaison with the individual laboratories who were candidates for, or who have undertaken research tasks under the scheme. This centre might be situated in an existing well-established laboratory on the lines of the final paragraph (page 7) of the "Background Paper".

Re item III, "FAO's Activities": Bearing in mind that the research subject under consideration specifically relates to "Pesticide Residues" we suggest a change of emphasis, including the deletion of points not directly relating to the particular aspect. This could be done by replacing the present by the following text:

"FAO's pesticides programme is largely aimed at promoting effective and safe practices. Various groups of experts are responsible for appraisals of information and for providing practical advice. So far as residues are concerned the main activities are:

- (a) Advice and assistance to governments in controlling introduction distribution and use. This activity is pursued by way of publications on methods of running official control schemes, providing technical backing for these schemes. On occasion, consultants are sent to developing countries. Although this is not specifically a research item, it is relevant since user practices obviously are important in determining the presence of residues.
- (b) Appraisal of data and recommending acceptable levels for residues in food. This is undertaken by experts at annual meetings organized jointly with WHO. Acceptable residue limits (i.e. tolerances) are recommended for foods going into international commerce. So far, some 120 pesticides and a wide range of commodities have been covered. Most of the items considered by this joint meeting are nominated by governments and the recommendations are taken up by the Codex Alimentarius Commission with a view to their acceptance by governments. This is important to developing countries particularly if they export foods.
- (c) Research concerning Residues in Foods. Each joint meeting report (see(b)) includes a list of items on which the data are held to be insufficient. Dates for reviewing new information are also given. The deficiencies range over toxicology, occurrence of residues in particular commodities and techniques for detecting and measuring particular residues.

Where the deficiencies relate to compounds on which particular companies have exclusive rights, data from further work are usually available by the time of the review. Similarly data sometimes also become available from unsponsored scientific work and/or government research stations. With some

items however, it has been found that no further work has been undertaken and no further data are available for our evaluation. This particularly applies to well established pesticides manufactured by a number of independent producers in various places. Some of them relate to compounds which are widely used in developing countries.

Parathion-methyl is an example that can be cited from the 1972 meeting. Although various research requirements had been outlined in 1968, virtually no research work on the compounds had been done since that time. The compound is being manufactured and used particularly in developed countries where it is sometimes being used as a substitute for DDT. It is a very inexpensive compound and is manufactured by a number of companies. (The original FAO world project proposal was aimed at supporting research on such items largely on the grounds that commercial incentives could hardly be expected to engender the research needed).

(d) Residues in the environment other than food

The heaviest usage of pesticides is in agriculture. Therefore FAO clearly has a major interest in this subject. At the UN Conference on the Human Environment, a position paper on "Pesticides in the Environment" was presented together with a critical technical monograph. Amongst other things, these papers call for the critical assessment of scientific data and for basing advice on assessments of gains and losses. It was suggested that the appraisal work might be done by a group of experts in the subject on the lines of the existing Joint FAO/WHO Meeting on Pesticide Residues.

In the light of the broadening of interest in the environment, the global project proposal on pesticide residues was amended to allow work on environmental problems to be covered. FAO had in view that problems for funding would in the first instance be vetted by the particular relevant expert group.

(e) Development Projects on Pesticide Residues

A number of projects involving support for work on the determination of pesticide residues are currently being undertaken in various countries (for example, Egypt, Brazil, Thailand, Korea, Poland). These were firstly set up to determine residues in food, but some work has been undertaken on general environmental residues".

Under "WHO" read "supports FAO on its points (b) and (c) in which areas the two organizations collaborate closely. WHO also stresses the importance of pesticide residue monitoring in air and water."

Item V(a): The above new draft under "FAO activities" provides a better background for V(a). We suggest that the following be inserted in place of the text at the two paragraphs at the bottom of p. 4 and top of page 5:

"(a) Pesticide Research Coordination Centre

This would be responsible for the technical, secretarial and administrative work necessary to enable sub-contracts to be entered into and administered for research work on selected problems. The problems for first priority would be those that are currently known to cause difficulties. Advice on the suitability of problems for support would be provided by expert groups on residues in food or in the environment. Consultants might also be needed.

Emphasis would be placed on studying residue problems of importance to developing countries and to problems on which progress otherwise seems unlikely, because of expiration of patents or for similar reasons."

Item VIII on p. 7: It seems to us that the questions posed need some re-phrasing for example, we suggest that (a) ends with the words "developing countries" in the 3rd line.

The 4th and 5th lines might then be posed as a separate question or questions. In the latter connection, because of the wide range of subjects that might be covered, we are very doubtful whether there is any hope of dealing with them "in some developing country". Instead, we should be thinking of "a project or projects, preferably involving some work in developing countries".

Item VIII(c): As mentioned in our "General Comments" we would be prepared to elaborate with the Joint Division and WHO in the preparation of more detailed proposals. It would however take a little time to link identified problems with established laboratories and to outline all the criteria as suggested in the draft. In the first instance we would appreciate the receipt of a general reaction to the present paper.

Item VIII(c) Final Paragraph: See our comment under II(f) above.