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Folder ID: 1762596

Series: Central Files

Dates: 04/01/1972 - 12/31/1974

Fonds: Records of the Consultative Group on International Agricultural Research (CGIAR)

ISAD Reference Code: WB IBRD/IDA CGIAR-4177S

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RETURN TO BANK ADMIN. &

1972/74
I Regional & Nat'l Research
Vol. I



The World Bank Group
Archives
Correspondence 72/74-01



1762596
A2003-012 Other #: 176 Box # 205696B

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I suggest we check

Carlos,

Could you be good enough to check with one of our CG members to see if he has received this enclosure.

Fy to

We received the letter but no enclosure.

Materials with
Coulter
all sk
1-29-75

I'm going to Lexox and
I'll be there for a while

Thanks

G

WORLD BANK GROUP

ROUTING SLIP		DATE	
NAME		ROOM NO.	
APPROPRIATE DISPOSITION		NOTE AND RETURN	
APPROVAL		NOTE AND SEND ON	
COMMENT		PER OUR CONVERSATION	
FOR ACTION		PER YOUR REQUEST	
INFORMATION		PREPARE REPLY	
INITIAL		RECOMMENDATION	
NOTE AND FILE		SIGNATURE	
REMARKS			
<p><i>[Handwritten notes and signatures in the remarks section]</i></p>			
FROM		ROOM NO.	EXTENSION

MINISTRY OF FOREIGN AFFAIRS

PLEIN 23 - THE HAGUE - TEL. 614941

I
DEC 24 1974

Mr. M. Lejeune

Executive Secretary

Consultative Group on International
Agricultural Research

1818 H Street N.W.

Washington DC 20433 U.S.A.*gone
what has been
done with the
information enclosed?*International Technical Assistance Department¹⁾

Date: December 13th, 1974

Subject: Information on Agricultural Research
ActivitiesRef: DTH/VH Research
283622

I have pleasure in forwarding herewith information on agricultural research activities as requested in a memorandum of the Executive Secretariat dated September 12th, 1974. The information refers to research projects financed by Dutch aid funds, either in developing countries or in the Netherlands. Any research relating to the activities of the international centres financed in ways other than by aid funds is not included.

THE MINISTER FOR DEVELOPING COOPERATION
For the Minister
Head Technical Assistance Preparation Division

b.a.

cc. Members of the Consultative Group on
International Agricultural Research,
Members of the Technical Advisory
Committee, Directors of International
Agricultural Research Centres and the
Executive Secretariat of the CGIAR

¹⁾ Address: Muzenstraat 30, The Hague, Postal address: Casuariestraat 16, The Hague. Telegr. address: Celer, The Hague.

I B

W. P. Panton

November 14, 1974

John K. Coulter

Agricultural Research and Extension Project, Indonesia

David Shoemith passed me the details of the accommodation. I think that the following points could be borne in mind when considering space.

(1) Preparation rooms for soil and leaf analysis. Cheaply constructed buildings for reception, storage, preparation and storage after preparation and analysis are necessary and a generous space allowance should be made.

(2) Crop physiology and plant improvement. Again a lot of cheap space is useful for the reception, drying, grinding, and storage of samples of plant materials as part of this program. Crops like cassava and sweet potatoes take up a lot of space for weighing, sub-sampling etc., so you might check if there is enough space at the palawija crops institute.

(3) If the palawija and the vegetable institutes become involved in planting material distribution they will need extra facilities for this. Also cool storage for seeds.

(4) Greenhouses, screenhouses, etc. As far as I can judge the space seem ample. It is also useful to have a fenced, paved area with water and electricity for outdoor pot experiments. However, provision of such an area would not be expensive and could be added at a later date.

OFFICE MEMORANDUM

I

TO: Files

DATE: November 12, 1974

FROM: J.K. Coulter *J.K.C.*SUBJECT: Outreach and Off-Campus Programs of the
International Agricultural Research CentersIntroduction

1. The terms 'outreach' and 'off-campus' are sometimes used interchangeably and sometimes with different designations. Some programs, termed 'outreach', may actually take place on-campus and be funded with special funds. On the other hand some off-campus programs may be funded with core funds.
2. A good deal of discussion has taken place on these programs, on some occasions to find out what the centers are doing and on others to try and understand their interactions with national research programs. The 7th and 8th meetings of TAC, the CG meetings of 1973 and 1974, the Bellagio VI meeting, the Secretariat paper CG/74/5b, and the replies of the Centers to the Secretariat request for details of their off-campus programs have all dealt with this question. For purposes of this discussion therefore off-campus programs are defined as "those activities undertaken by or on behalf of the Centers at sites outside their administrative control or those activities at Centers funded outside the core program".
3. This paper is an attempt to analyse these programs, to classify them and to show their cost (Table 1).
 - A. On-campus bilaterally funded projects. These appear to take at least four forms:
 - (a) Specialist documentation services. Examples are the Cassava Information Center at CIAT funded by IDRC; Agricultural Economics and Development for Latin America funded by Ford Foundation. Other documentation services at CIAT are planned. Other Centers may have similar programs but no information is available.
 - (b) Special development projects such as the machinery project at IIRRI funded by AID; the grain storage project at IITA funded by FAO. The degree of Center participation in these varies from the minimum, e.g. provision of land, to close participation and proposals for eventual integration into the Center's program.
 - (c) Special research projects in which a research institute or university in a developed country sets up a research

program on the Center campus. The project provides staff (paid for directly by the sponsoring institute), equipment, etc. The Center provides space and presumably some equipment and assistant staff. The COPR program at IITA is an example of this; the Texas A & M group at CIAT is possibly on the same basis.

- (d) Special training courses. IDB has provided additional funds to CIAT to run special courses in animal production. Provision of funding for graduate thesis work is provided at some institutes.

B. Off-campus programs at Centers of Advanced Research in Developed Countries. This has been included in the term collaborative or cooperative research. It would appear to include

- (a) Research contracts financed by the Centers at institutes. CIP has 11 such contracts financed out of its core budget.
- (b) Research contracts at institutes financed by the government or a private agency of the host country. Rockefeller funds work at Kansas State and Oregon State of interest to CIMMYT and work at Minnesota linked to CIP. Centers appear very interested in expanding this kind of activity.

C. Off-campus programs at Research Centers in Developing Countries.

- (a) At national research centers giving general research support; an example of this is the three-man CIAT team at ICTA, Guatemala. This is the only example of this type of activity that can be located though IITA may ultimately do the same under its farming systems program. Research reports suggest that CIMMYT teams in North Africa, though designated as wheat teams, work also on wheat/legume cropping systems.
- (b) At crop research centers working on a specific crop. Teams may vary from one to several scientists. One or more man-teams are provided by IRRI, mostly in the Far East, by CIMMYT, mostly in Africa, and by IITA, all in Africa. By a strange coincidence each institute has 20 staff in this program and altogether 36 are located in Africa.
- (c) At one center but serving a region, i.e. as part of a network. CIP has developed this approach whereby the 'potato' world has been divided into seven regions: South America, Central America, Tropical Africa, Middle East and North Africa, non-Arab Muslim countries (the reason for this definition is not clear), India, and SE Asia. Only one scientist is stationed or will be stationed in each region and the program is core funded.

D. Off-campus demonstration programs. CIMMYT reports farmer demonstration plots on maize and wheat in a number of countries where it is operating. Other Centers probably do likewise without specifically reporting them.

E. Advisory Teams. Some Centers, e.g. CIAT, provide teams to act in an advisory capacity to national production programs.

Funding

4. Table 1 sets out the funding of these various programs, as far as can be discovered from the budget presentations. The greater sums of money go on type C and it appears that these are usually funded on a client/contractor/donor basis. This table shows also that nearly 70% of the cost is borne by two donors: Ford Foundation and USAID. It is not possible to find out the period of funding for any of the programs though it may be assumed that they have fixed periods. Neither is there an indication of whether the staff are regular Center staff or recruited specifically for the contract. It is possible that a high percentage of the Ford contribution is in the form of Ford staff. However, some of the IITA contracts have been filled by contract staff.

Control of the Programs

5. Each Center appears to have its own system of controlling the variously called off-campus programs. In CIMMYT the wheat and maize programs are under their respective directors of research, though there is a director of outreach as well. At IITA the director of outreach apparently has control over the program with the commodity staff participating to a greater or lesser degree.

General Observations on the Program

6. The origin of the off-campus programs may be thought of as that in C(a) whereby the Centers arranged for sites to test their materials for resistance to diseases and adverse conditions, not present in a Center's host country. From this the process seems to have been one of development into strengthening national research programs. Thus the original program was basically an extension of the core program, with the Centers gaining new information on their materials. In the enlarged programs this still occurs, but the greatly enlarged staffing is obviously designed to help the national production programs.

7. Whilst the Centers can only work in countries to which they have been invited, the distribution of staffing in the off-campus programs is not easy to understand. Thus CIMMYT has a maize breeder in Egypt where the crop is a rather minor one and only one maize agronomist in the whole of Latin America. Discussions have taken place with CIAT about their role in maize in the region but if CIAT is 'awarded' the Latin America region, then there would appear to be good reasons for IITA to deal with maize in Zaire, for example, where CIMMYT has three

staff. In the wheat program also there are similar questions. Thus Turkey with eight million hectares of wheat has two wheat specialists whilst Tunisia with one-tenth that area has four. IRRI has one rice specialist in Bangladesh and eight in Indonesia. Doubtless there are reasons - technical, economic and historical - for these arrangements but it would appear that the situation needs to be under continuous review so that the reasons for having a particular staffing program can be explained, if only to pass the lessons along to other institutes and to the donors to help them in long-term planning.

9. The TAC discussed these programs at its 7th and 8th meetings but the meetings seem to have devolved into philosophical discussions on the role of TAC rather than a critical analysis of the situation and a statement of long-term objectives.

10. Yet there are good reasons for looking critically at these programs. The Centers' mandates are clearly for research; there must come a time when the size of the off-campus program becomes so big that it has too much influence on the core programs. The Centers were not conceived as contractors in a client/contractor/donor situation; they have fallen into or taken over that role at the request of clients or donors because other agencies have failed in such a role. Nevertheless, as Table 1 shows, the donors are overwhelmingly North American. As the non-North Americans, i.e. the European and now the OPEC countries, become more prominent in the CG what will their attitude be to these programs? The Centers have the great advantage of being apolitical but once they become deeply involved in a national program they may lose that image. At the Bellagio VI meeting for example the French paper stated that the Centers should not exert moral pressures on the national programs and that they should not attempt to divert to their own programs resources which the national programs could use.

11. IRRI has drawn attention to the difficulty of staffing off-campus programs with high calibre staff because they cannot offer career appointments. IITA has something of the same program, whereas CIMMYT, perhaps because it has relied on Foundation staff, seems to have had few problems. However if the new institutes follow this pattern they too are likely to encounter just as many problems as have the donors and the international agencies in recruiting high quality staff.

12. This review is an attempt to analyse the problem using not very satisfactory data. However, visits to the Centers can be used for updating information and for getting a clearer understanding of the operation of the system.

cc: Messrs Lejeune
Graves
Cheek
Fransen

JKCoulter:jf

Special Funded Outreach (Off-Campus) Programs, 1974 Budget

Donor	Institute	1 CIAT	2 CIMMYT	3 CIP**	4 ICRISAT***	5 IITA	6 IRRI	7 WARDA	8	9 Total	10 % of total	11	12	13
Ford Foundation		59,000	800,000	**	***	-	963,000	-		1,823,000	34.1			
IBRD		-	-	"	"	35,000	275,000	-		310,000	5.8			
IDB		102,000	-	-	-	-	-	-		102,000	1.9			
IDRC		214,000	-	-	-	-	36,000	Refused		250,000	4.7			
Rockefeller Foundati		102,000	150,000	"	"	-	93,000	-		345,000	6.5			
UNDP (FAO)		-	-	-	-	172,000	Refused	-		172,000	3.2			
Netherlands		-	-	"	"	-	135,000	75,000		210,000	3.9			
U S		190,000	50,000	-	-	690,000	792,000	58,000		1,780,000	33.5			
U. K		49,000	-	-	-	-	-	100,000		149,000	2.8			
Zaire		-	100,000	-	-	90,000	-	-		190,000	3.6			
Others*		23,000	150,000	-	-	-	-	-		5,321,000				

* Presumably means not yet funded

** Outreach program supported by core funds (533,000)

*** Not shown in 1974 or 75 budget presentations

The Agricultural Development Council, Inc.

UNIVERSITY OF THE PHILIPPINES — LOS BAÑOS

I

ROBERT E. EVENSON
ASSOCIATEBOX 365
COLLEGE, LAGUNA
Philippines
November 3, 1974

Montague Yudelman
Consultative Group on International Agricultural Research
1818 H. St., N. W.
Washington, D. C. 20433
U. S. A.

Dear Monty,

Bruce Cheek was good enough to send on to me the comments on my paper for CGIAR by the UK "authorities." I appreciated the work put in by the UK authors and I can only really quarrel with them on relatively minor matters of emphasis.

One of the main points of their comments is essentially that the data base is weak and that they are skeptical of the use of publications. My reaction is two-fold.

First, very few people have addressed the problem of developing adequate measures of scientific activity. We are rather like the historians who devise indexes of prices or other activity based on the skimpiest of evidence. Critics should undertake some effort to appraise the difficulties of measuring research activity. The fact that the Kislev-Evenson series is the only international series available should indicate that this is not a simple task. Critics of publications data are usually criticizing the "publish or perish" business and haven't really thought about the measurement problem.

Nonetheless, I don't think that my UK critics are off-base. We do in fact need to upgrade the data on expenditures and other measures of research activities. I suspect, however, that a major improvement over the Kislev-Evenson measures, if undertaken by FAO or IBRD, could easily require several hundred thousand dollars and two years.

You may recall about a year ago that I broached the possibility of a few thousand dollars in support for such an effort by myself and a very skilled young man named James Boyce. You were not interested but I managed to ~~gather~~ scrape together enough funding to get the study done. Boyce and I are now compiling the new data.

NOV 18 1974

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RECEIVED

1974 NOV 18 PM 3:48

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Best regards,

A. S. V.
Management, D. C. 20433
1818 N. St., N. W.
Commercial Bank on International Development
Washington, D.C.

ASSOCIATE
ROBERT E. ELENSON

NOVEMBER 18 1974
LITTLE ROCK
CORRECTIONAL INSTITUTION
BOX 382

UNIVERSITY OF THE PHOENIX - LOS ANGELES
The Agricultural Development Council, Inc.

V/D/C

Handwritten signature

The Agricultural Development Council, Inc.

UNIVERSITY OF THE PHILIPPINES — LOS BAÑOS

ROBERT E. EVENSON
ASSOCIATE

BOX 365
COLLEGE, LAGUNA

I can report that our efforts have resulted in a major upgrading of the data on expenditures and scientific effort. We have revised and improved most of the earlier data and brought it up to date (1973-74). In the past, I was unwilling to claim that the Kislev-Evenson data really could be considered superior to the publications data. I consider the new Boyce-Evenson series to be definitely superior in most regards.

We are pressing forward with the writing now and should have a draft of a short (100 pages or so) manuscript ready in six weeks or so. I no longer am looking for funding of the work, but frankly, I would like to see the series published in some form. I have talked briefly to Vern Ruttan about A/D/C's interest in this, but have not gotten a very definite response. I do not expect one until the draft is available for review. It occurs to me that the Consultative Group might possibly have an interest in seeing the material published. In any case, I shall be sending the manuscript upon completion.

Sincerely yours,



Robert Evenson

cc. Bruce Cheek
Vernon Ruttan

① SIC of
- see memo
of 2/75 -

10/30/74

② File - I

For Sir John Crawford
From OADAA

Information on bilateral aid programs involving assistance for agricultural ~~reser~~ research activities in developing countries requested by the Secretariat will be despatched shortly.

Information on research projects (whether in the donor country or elsewhere) the results of which would be broadly applicable to developing areas will take longer time to compile. This will be supplied as soon as possible.

Bruce
For your information

As dictated over the telephone by the secretary of the : Office of the Minister Commercial, Australian Embassy

J.T. Smith

I ~~E~~ ~~H~~

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

1818 H St., N.W. Washington, D.C. 20433 U.S.A.
Telephone (Area Code 202) 477-3592
Cable Address - INTBAFRAD

October 17, 1974

TO: Members of the Consultative Group

FROM: Executive Secretariat

SUBJECT: Documents for Meeting of October 30-31, 1974

1. Attached is a short paper provided by the Ministry of Overseas Development of the United Kingdom: "Comments on 'Investment in Agricultural Research' - a Survey Paper by R. E. Evenson".

2. Professor Evenson's paper was prepared for the Consultative Group's discussion in November 1973 on 'Data Requirements of the CGIAR'. The attached paper comments on the main points raised by Professor Evenson and a technical annex deals with some of the methods used in his paper.

3. It is proposed that any discussion of the subject be taken up under Item 8 "Other" of the Provisional Agenda for the October 30-31 sessions.

Attachment

COMMENTS ON "INVESTMENT IN AGRICULTURAL RESEARCH" --
A SURVEY PAPER BY R E EVENSON

(Prof. Evenson's paper was presented to the
Consultative Group in Washington in November 1973)

Professor Evenson's paper prepared for the Consultative Group on International Agricultural Research is addressed to three topics. Part I surveys data regarding investment in agricultural research and extension; Part II considers studies of the contribution of research activity to agricultural development; and Part III discusses the prospects and problems of improving the information resources related to the international research system.

Part I - Investment in Research and Extension

In Part I Professor Evenson considers the data at present available in making an attempt to answer four questions:

- (1) How much investment in agricultural research has been undertaken in national research systems in the post-World War II period?
- (2) How does investment in research compare with investment in extension? What are the relative "prices" of research and extension resources throughout the world?
- (3) How can "quality" standardisation be achieved?
- (4) How have international aid donor flows influenced investment decisions by less developed countries? What is the net effect of the shift of donor flows from support of national systems to support of international centres on national investment?

The answers to questions (1) and (2) require fairly comprehensive and comparable data on agricultural research and extension for all countries of the world. Evenson and Kisler¹ have attempted to compile such data using both published information and direct survey. Although they have made every effort to achieve comparability they recognise that the results are subject to error resulting from variation in coverage and differences in definitions particularly of scientist/technicians and research/extension. Secondly inter-country or inter-region and inter-temporal comparisons require that financial data is converted to common units - in this case 1970 US\$. The methods used to convert the data to 1970 real prices is not stated but the results will differ according to the method used and the basis chosen. The conversion to US\$ has been made on the basis of official exchange rates and as Professor Evenson recognises this may lead to some errors. We believe that these errors may be considerable. In a recent study by the World Bank² Professor Kravis has shown that very different results are obtained for inter-country comparisons depending upon whether official exchange rates or purchasing power parities are used.

Because of the doubtful quality of some of the basic data and the errors that may have arisen in conversion to 1970 US\$ we suspect that the picture provided by the results in Tables 1 and 2 of the paper is likely to give a distorted answer to questions such as (1) and (2) above.

In Section 1.2 of Professor Evenson's paper the share of agricultural product spent on research and extension is used to compare investment levels in different regions in 1965, for which year rather more reliable data were collected by Evenson and Kisler. If the quality of the basic data can be improved to the extent where local differences of coverage and concept are of insignificant importance, then a measure

of this nature, independent of the problems of exchange rates, could be useful for inter-country comparisons. Because of the problem of aggregating across countries within a region this measure would not provide useful inter-region comparisons. They would have little purpose in decision-making however unless they could be compared with some norm or target. We are not aware that such norms have been determined for developing countries and we do not believe that the use of norms such as the share of agricultural product spent on research and extension in developed countries are necessarily relevant to developing countries.

It is not clear whether the figures used by Professor Evenson for agricultural output are those for gross output or not but we believe they are. If so we are of the opinion that value added by the agricultural sector rather than gross output would provide a more meaningful comparison between countries with such dissimilar types of agricultural industries and at such very different stages of economic development. It is the value added component which is the measure of the contribution to the gross domestic product by the agricultural industry and it is to the increase of this that research and extension is directed.

Professor Evenson discusses the various ways of measuring the output of research activities, and the difficulties of taking into account the differences between countries and between different types of research. Expenditure on research is rejected as a measure of output because of the different rates at which scientists of a similar level are paid in different countries. Number of scientists or scientific man-years is rejected because of the difficulty of setting a suitable standard for the quality of scientists themselves. The measure Professor Evenson prefers is the number of research publications which meet the standards of certain international abstracting journals and this is the measure used in the research studies referred to in Part II. We do not believe that there is sufficient evidence at present to support this measure for inter-country comparisons of output. On the contrary we believe that the measure could as well reflect the differences in institutional arrangements for research and publication as it could differences in quantity or quality of output. We would wish to see evidence on the relative ease or difficulty with which a research scientist from a developing country can get his work published in comparison with similar quality work by a scientist from a developed country. Secondly we believe that it is possible that the institutional arrangements for agricultural research work in many developing countries, particularly in Africa, are such that the results of their work are to a much greater extent embodied in internal memoranda, departmental reports and in their own extension activities than in the case in developed countries.

Should further examination show that publications are an appropriate measure, we consider that the methods of selection and allocation of publications would need to be reviewed. We would need to be sure that the editorial staff of international abstracting journals are able to make a uniform world-wide choice and also that the choice, which must be subjective, is also consistent between journals and over time. Secondly we would need to be sure that the allocation of papers geographically was realistic. For example we are well aware that a considerable amount of research work in developing countries is carried out by UK expatriate staff. The results of this work, which will have been included in expenditure on research by developing countries, are often published after the scientist's return to the UK or for some other reason his address is given as that of his parent UK organisation. This practice obviously increases the number of papers allocated to the UK and reduces those allocated to the developing country.

Professor Evenson attempts to answer question (4) in Section 1.4 of the paper and again admits that reliable data, this time in respect of donor contributions to

agricultural research in developing countries, are not generally available. We are not entirely clear if Professor Evenson is considering only multilateral aid to research or total aid including bilateral assistance. Since he makes specific reference to AID programmes we assume that he is considering total aid and consider this is logical since multilateral and bilateral programmes must be intended to reinforce each other. We suspect that Professor Evenson is under-estimating support to national systems and have doubts as to whether "support for the International Centres now dominates the aid flow to agricultural research" or that "the direct financial support for national systems from the international aid agencies is not going to be very large in most countries in the next ten or so years". As far as the UK is concerned the contribution to the work of International Centres is small in relation to our total assistance for agricultural research and will probably continue to be so. We do not at present have regular data from which the proportions can be determined but from a special exercise on UK aid to research in 1972/73 it can be calculated that about 14% of our total aid to agricultural research was allocated to the International Centres. We do not have information on other donors activities in such detail but have no reason to think that they devote more of their aid to the International Centres than to national systems.

Part II - The Pay-off to Investment in Research

In Part II of his paper Professor Evenson considers the pay-off to investment in research. After a brief discussion of rates of return he reviews the two approaches that have been used in attempting to evaluate the return on investment on research; the transfer of knowledge from one country to another; and the possible differences in returns between the more applied and the more fundamental agricultural sciences.

Based on his review Professor Evenson puts forward the following statements:

- (a) The pay-off to research investment in the LDC regions of the world is extraordinarily high;
- (b) At least twice, perhaps three times as much growth, is purchased with the research dollar, than with the extension and other programme dollars;
- (c) There are no good substitutes for high-quality research systems;
- (d) Technology transfer is a function of national research capability;
- (e) The highest rates of return might well be realised in the more basic research programmes.

With the exception of statement (b) for which we can see no justification, we would accept all these statements although with a certain amount of reservation.

We have concentrated our review primarily on the commodity studies and to a lesser extent on the regression methods of the aggregate productivity based studies. We are critical of some of the assumption and underlying theory of many of the individual commodity studies and our criticisms are set out in a separate more technical paper. (See Annex) We are however of the opinion that it is theoretically possible and, in many cases, practical using data related to individual commodities to estimate the benefit arising from an innovation derived from a successful piece of research. Furthermore, we believe that our criticism of the theoretical approach and assumptions of these studies, if accepted, will not make very significant differences to the results which would still indicate a high rate of return for these particular innovations. We do not believe, however, that it is possible by

these methods to separate the benefits arising from the research from the benefits arising from the use of other resources employed in bringing about the innovation. We do not believe that all benefits resulting from an innovation, less other implementation costs, can be considered as arising from the research which led to the innovation. This we believe must have been the reasoning behind Griliches' method of calculating the benefit to cost ratio in his study of hybrid maize.³ It no doubt can be argued that without the research there would be no results to implement and thus no innovation and that therefore all net benefits flow from the research. We believe that it can equally well be argued that without the use of resources to implement the results of the research, no benefit to the economy would accrue from the research.

Studies of the benefits arising from particular research based innovation have all been based on successful research, and that which led to innovation. All research however does not lead to innovation, either because the research itself is unsuccessful or inconclusive or, although the research is successful in a technical sense, because of uneconomic implementation costs or some other reasons beyond the control of the research worker. The benefits from successful research will have to cover the costs of the unsuccessful which will, to a certain extent, reduce the high rates of return calculated for individual successful innovations. The cost of implementation on an industry wide scale for agriculture is often very great in relation to the cost of the underlying research. Although there is little evidence available we think that the total cost of research, both successful and unsuccessful, will still be relatively small in relation to the cost of implementation and total benefits of successful innovations. Providing this is so then the effect of allowing for unsuccessful research on the rate of returns on research investment may not be as great as might have been expected from the ratio of successful to unsuccessful research. For example, assume a successful innovation with benefits of 350, research cost of 3 and implementation cost of 97. The benefit cost ratio is 3.5. Let us assume that only 5% of research leads to innovation which would imply that this innovation had to carry the burden of unsuccessful research of 57. This would reduce the benefit cost ratio only to 2.2.

On the evidence of the cost benefit studies based on individual commodities, we believe that the rates of return to research are high, although perhaps not so high as some findings would suggest. This is reinforced by the results of other studies based on regression methods which Professor Evenson has called "aggregate productivity based studies". We agree with him that regression methods which may be regarded as more objective could provide stronger evidence than cost benefit studies of the contribution of research separately from implementation of the results. In practice, however, the studies that we have been able to review are subject to a number of defects related to the choice and specification of variables. The most important of these is the inability in our opinion to find a variable which can be considered as a reliable or accurate measure of the knowledge or the dissemination of knowledge arising from research. The use of expenditure on research as a measure of its value may be regarded as begging the question and cannot reflect quality differences. Attempts to overcome this have as far as we know been related to the use of publications as a measure. We have already argued in Part I above that we are far from satisfied with this as a measure of research.

Since we are agreed on the evidence that the internal rate of return or the benefit to cost ratio of investment research is high, we believe it is reasonable to assume that there is justification for further investment to the point where the internal rate is equal to the current price of capital or the benefit cost ratio is equal to unity. With limited funds it may however not be possible to take up all investment projects which satisfy the above criterion. Cost benefit techniques can however be applied to rank projects and this ranking together with assumptions about the risks in undertaking the various projects, should enable those faced with the decisions

about additional research investments to choose a rational portfolio. We therefore believe that there is sufficient justification for the development of the cost benefit commodity studies since they have a number of applications.

If we are to use these studies in determining future programmes of research involving the ranking of projects, this has some relevance to the discussion of rates of return. Professor Evenson has expressed a preference for the use of internal rates of return, but, although these are commonly used for assessment of investment projects, we would prefer net present value or benefits to cost ratio for this purpose as it is generally accepted that net present value methods provide a better method for ranking projects than do internal rates of return.

Finally we think it is important that it should be recognised that the benefits from research based innovations are not the only pay-off to investment in research. The other benefits arising from research are, however, even more difficult if not impossible to quantify. From agricultural research there will be a certain spin-off of knowledge which will not immediately be incorporated into an innovation but at a later date will benefit, and thus reduce the costs of, some other development. Research programmes also provide facilities for the training of the senior scientists of the future and may provide the only environment in which the scientist can develop his ability for scientific enquiry. These are also benefits which cannot be assessed and normally only arise at a much later date. Professor Evenson has produced evidence which suggests that only trained scientific staff in a research environment are really capable of assimilating scientific knowledge from outside their field of work and adapting it to their own particular needs. If a country or region neglects its own scientific research capability it will not find it possible to fully compensate by making use of technology transfers from elsewhere. It is clear that these other benefits although they cannot be measured, all tend to reinforce the general conclusions reached by Professor Evenson.

Part III - Information Resources for Policy

In Part III of his paper, Professor Evenson comments briefly on the information required for policy decisions by aid donors, both bilateral and multilateral, in connection with their assistance to agricultural research in developing countries. He proposes an information system which would provide answers to the problems of how research is to be developed and how it is to be aided. He also discusses alternative methods of achieving this. We agree for the need for such a system but believe that consideration should be given even initially to something more comprehensive. As we have said in Part II we believe that cost benefit studies could have an important role to play in the management of research programmes provided the necessary information is available. We believe that the information system should include this data. Much of it will be outside the field of agricultural research being a part of the development of general agricultural statistics and agricultural economic analysis. There is however a need for more and better information on the research activities themselves. Particularly information is needed on the costs of unsuccessful research including that which is technically successful but does not lead to any innovation. Further information is also needed on comparisons between experimental results and those obtained by the farmer and also on the patterns and costs of implementation.

We believe that an information system which provides for all these needs will enable the better management of research programmes. This should result in the selection of research projects with a greater probability of success and with a greater probability of implementation which in its turn should result in greater social and economic benefits. This must surely be one of the primary aims of all aid donors as well as international and national research organisations.

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September 1974

A NOTE ON THE USE OF COMMODITY BASED STUDIES IN ESTIMATING THE PAY OFF TO INVESTMENT IN RESEARCH

Introduction

Professor Evenson's Survey Paper brings together the results of a number of studies of the benefits of agricultural research and on the evidence he concludes that there have been substantial returns to investment in such research. Since his paper does not present a critical evaluation of this evidence, we have made our own evaluation and in general we agree with his conclusions. Nevertheless we feel that it is worth pointing out what we see as flaws or limitations in the methods used in some of the commodity based studies he cites. We feel there is room for further work to improve the methods used in studies of this kind.

1. The use of Supply and Demand Analysis

Most of the studies base their measure of social benefit from research in agriculture on supply and demand curves estimated for the crop under review. Ayer's paper⁽¹⁾ clearly defines the "benefit area" as that enclosed by the demand curve and the with-innovation and without-innovation supply curves. The other papers seem to us to have used effectively the same definition, which rests on the welfare proposition that an innovation which gives a society the ability to produce more is beneficial. Most people would assent to this proposition, but it must be stated that it ignores the income distribution effects of an innovation. Also ignored are the levels of and effects on employment. Today in developing countries in particular, distribution and employment effects are considered to be of the first importance. It is therefore for discussion whether the "benefit area" type of measure can be suitably adapted to take them into account. This however is not taken up in this paper.

We have investigated some of the theoretical properties of the benefit area as defined by Ayer. The area is fixed by the intersection of the two long-run supply curves with a single demand curve. We are therefore comparing two long-run equilibrium positions on the same demand curve, and hence are assuming that tastes and incomes of consumers and all the other variables which together fix the position of the demand curve are the same in the two situations. Many of the innovation studies have taken years to implement, and this assumption would clearly be unjustified if attempts were made to draw curves reflecting the actual conditions before and after the innovation. We feel that the right approach is to estimate the demand curve existing after the innovation has been implemented and the long-run supply curve existing at the same time, and then to draw a second hypothetical supply curve reflecting what the supply situation would be at that time if the innovation had not taken place. This seems to us to have been the approach used in several of the historical studies.

To apply similar analysis to the potential benefits of proposed research we would start from projections of demand and supply for the period after the results were implemented.

2. Specification of the Supply Curve Shift

We think there have been mistakes in all the studies we have seen in drawing the hypothetical "without-innovation" supply curve. The exact nature of the shift which "loss" of the innovation would induce in the supply curve depends of course on the nature of the innovation itself. Griliches in his study of hybrid corn in the USA⁽²⁾

assumes that this particular innovation could be represented as an overall percentage increase in yield. Provided the increase is approximately the same for all producers in the industry, it seems a reasonable assumption and one which would be applicable to most if not all innovations in agriculture. If the increase were not approximately the same for all producers then the "without-innovation" supply curve could have a very different shape, and the assumption would in consequence be inappropriate. Our major concern, however, is that in specifying the supply curve shift, all the authors we have studied have neglected to take into account the effect of the innovation on the willingness to use resources which would previously have been more profitably employed elsewhere, or not employed at all. For ease of exposition at this stage it is better to work forward from the without-innovation supply curve to the with-innovation curve. All the points on the without-innovation curve which have a price coordinate above the equilibrium price represent production which would be called forth by a long run price increase. But this is exactly what an increase in yield for the same resources expended represents to the farmers and the effect is to shift the supply curve as conventionally drawn downwards (see Appendix I). At the same time, all the resources in the industry will be able to produce $(100x)$ percent more, where $(1+x)$ is the factor by which yields have changed. Thus if the original supply function were $q = f(p)$, then we would maintain that the with-innovation function, given the above assumptions, is $q_s = (1+x)f\sqrt{(1+x)p}$ and not $q_s = (1+x)f(p)$ as implied by the authors cited by Professor Evenson.

3. Properties of the Benefit Area

Now we come to the effect that different supply and demand elasticities have on the size of the benefit area. The problem of measuring the elasticity of supply and the size of the shift was given considerable attention in the papers by Ayer and Ardito-Barletta³, Griliches² on the other hand chose what he regarded as a minimum percentage for the shift and then examined the effect of supply elasticity, again choosing that which he thought would give the minimum benefit from the innovation. To a large extent the availability of data will decide which of these approaches is adopted in a particular study and on occasions it will be worth trying both. We were surprised to find however that these different approaches led both Griliches and Ayer to the conclusion that minimum benefit accrues to society for any given demand elasticity when the supply is perfectly elastic and maximum benefit when supply is perfectly inelastic. Economic theory led us to the opposite general conclusion. Our own mathematical analysis supported this and we believe that Griliches and Ayer reached their result through the application of an approximate elasticity formula in a situation where the supply elasticity made very little difference to the size of the benefit area. In the event their approximation was sufficiently inaccurate to reverse the correct result.

Consider first the economic theory in the case discussed by Griliches. If supply is perfectly inelastic (ie resources do not enter or leave the industry in response to price movements) then society must take the whole benefit of the innovation in terms of additional corn. Given the relatively inelastic demand for corn which Griliches postulates, the valuation placed by society on this additional corn is also relatively low. But if supply is elastic in the same demand conditions, the long run price fall induced by the innovation will encourage some resources to leave the corn industry and produce other goods. In a competitive economy these goods must be valued at least as highly as further additional corn at its new equilibrium price, which with inelastic demand will be higher the more elastic his supply. A similar argument to show that elastic supply involves greater social benefit from technical change can be constructed for the case where demand is relatively elastic. In brief

the principle is that innovations release resources and where supply conditions are perfectly elastic these can be reallocated with maximum social benefit.

It is awkward to prove this result mathematically with complete generality, but we have proved it for supply and demand curves which have constant elasticity throughout the relative ranges, and for those represented by straight lines. The formal analysis of these cases is presented below. From it we derived certain other properties of benefit area which we have also tested graphically for other cases. Firstly, when the elasticity of demand is unity, the benefit area is constant with respect to the elasticity of supply. If the elasticity of demand is close to unity, supply elasticity does not make much difference. From numerical examples in the constant elasticity case we have shown that for values of the elasticity of demand* between figures - 0.5 and - 1.85 the difference between the maximum and minimum benefit areas will be less than 5% from an innovation equivalent to a 25% increase in yield. Secondly, as the demand elasticity increases the importance of the elasticity of supply increases rapidly. If the elasticity of demand is - 5 then the benefit from a 25% increase in yield will differ between maximum and minimum by 150%. This is clearly of importance when the approach favoured by Griliches is used in studying a crop which has a high elasticity demand, although it does not seriously affect his results for hybrid corn.

*The elasticity of demand k is defined as

$$k = \frac{p}{q} \cdot \frac{dq}{dp}$$

4. Analysis of the Benefit Area Assuming Constant Elasticities of Supply and Demand

We start from a given equilibrium price and quantity combination, where price = a and quantity = b. So that our analysis will correspond with conventionally drawn supply and demand charts, which show quantity on the horizontal axis normally used in mathematics for the independent variable, we have written the supply and demand functions unconventionally with price as a function of quantity. The three functions required are

The demand curve $P_D = a \left(\frac{q}{b} \right)^{\frac{1}{k}}$, $k < 0$, where k is elasticity of demand

The without - innovation supply curve $P_S = a \left(\frac{q}{b} \right)^{\frac{1}{w}}$ $w > 0$, where w is elasticity of supply

The with - innovation supply curve $P_{S1} = ab^{-\frac{1}{w}} (1+x)^{-\frac{w+1}{w}} q^{\frac{1}{w}}$, $x > 0$.

The initial equilibrium, E_1 , is where

$$P_D = P_S$$

i.e. where $p = a$ and $q = b$ as previously defined. The new equilibrium is E_2 where

$$P_D = P_{S1}$$

i.e. where $q = b (1+x)^{-\frac{k(w+1)}{w-k}}$

We do not need the value of p at this point. The area we require to evaluate is that enclosed by the two supply curves and the demand curve. Let this be A then

$$A = \int_0^{E_1} (P_S - P_{S1}) dq + \int_{E_1}^{E_2} (P_D - P_{S1}) dq.$$

On integration we get

$$A = ab \left[\frac{w}{w+1} - \frac{k}{k+1} \right] \left[1 - (1+x)^{-\frac{(w+1)(k+1)}{w-k}} \right] \text{ if } k \neq -1$$

or

$$A = ab \log (1+x) \text{ if } k = -1.$$

The result for $k = -1$ shows that the benefit area A is independent of the value of the elasticity of supply w. For any fixed value of $k \neq -1$ the value of A will vary with w, and we must now seek that value of w for which A is minimised for a given k. We find that the derivative dA/dw is

$$\frac{dA}{dw} = \frac{ab}{(w+1)^2} \left[1 - (1+x)^{-\frac{(w+1)(k+1)}{w-k}} - \frac{(w+1)(k+1)}{w-k} \cdot (1+x)^{-\frac{(w+1)(k+1)}{w-k}} \log_e (1+x) \right]$$

Consider $\frac{dA}{dw}$ for values of k such that $0 > k > -1$. Then if we write

$$u = \frac{(w+1)(k+1)}{w-k} \text{ then } u > 0.$$

Substituting, we have

$$\frac{dA}{dw} = \frac{ab}{(w+1)^2} \left[1 - (1+x)^{-u} - u(1+x)^{-u} \log_e (1+x) \right].$$

$$\text{write } y = (1+x)^u$$

$$\text{then } u \log_e (1+x) = \log_e y$$

now $y - \log_e y > 1$ since it can easily be proved by differentiation that $y - \log_e y$ has a minimum value of 1 when $y = 1$.

$$\text{Therefore } (1+x)^u - u \log_e (1+x) > 1$$

$$(1+x)^u - 1 > u \log_e (1+x)$$

$$\text{or } 1 - (1+x)^{-u} > u(1+x)^{-u} \log_e (1+x).$$

$$\text{Therefore since } \frac{ab}{(w+1)^2} > 0, \frac{dA}{dw} > 0.$$

Now consider $\frac{dA}{dw}$ for values of k such that $k < -1$. Then if we write

$$v = -\frac{(w+1)(k+1)}{w-k} \text{ then } v > 0.$$

Substituting, we have

$$\frac{dA}{dw} = \frac{ab}{(w+1)^2} \left[1 - (1+x)^v + v(1+x)^v \log_e (1+x) \right].$$

$$\text{write } z = (1+x)^v$$

$$\text{then } v \log_e (1+x) = \log_e z$$

now $z - z \log_e z \leq 1$ since it can easily be proved by differentiation that $z - z \log_e z$ has a maximum value of 1 when $z = 1$.

$$\text{Therefore } (1+x)^v - v(1+x)^v \log_e (1+x) \leq 1.$$

$$1 - (1+x)^v + v(1+x)^v \log_e (1+x) > 0.$$

$$\text{Therefore since } \frac{ab}{(w+1)^2} \geq 0, \frac{dA}{dw} > 0.$$

Since we have already shown that for $k = -1$ this benefit area is independent of w , we have now shown that for all values of k the derivative dA/dw exists for all w in the range $0 < w < \infty$ and is positive or zero. Hence the benefit area A is a monotonic increasing function of w . Minimum benefit occurs when $w = 0$ and similarly maximum benefit when $w = \infty$.

5. Analysis of the Benefit Area Concerning Elasticities of Supply and Demand Represented by Straight Lines

Again we start from a given equilibrium price and quantity combination, where price = a and quantity = b . The three functions required in this case are

The demand curve, assumed to be downward sloping

$$P_D = -mq + (a + mb), \quad m > 0.$$

The without - innovation supply curve, assumed upward sloping or horizontal

$$P_s = nq + (a - nb), n \geq 0.$$

The with - innovation supply curve

$$P_{s1} = \frac{nq}{(1+x)^2} + \frac{a - nb}{1+x}, x > 0, n \geq 0.$$

The initial equilibrium, E_1 , is where

$$P_D = P_s$$

i.e. where $p = a$ and $q = b$ as previously defined. The new equilibrium is E_2 where

$$P_D = P_{s1}$$

i.e. where
$$q = \frac{(a + mb)(1+x)^2 - (a - nb)(1+x)}{n + m(1+x)^2}$$

We do not need the value of p at this point. The area we require to evaluate is that enclosed by the two supply curves and the demand curve. Let this be A then

$$A = \int_0^{E_1} (P_s - P_{s1}) dq + \int_{E_1}^{E_2} (P_D - P_{s1}) dq.$$

On integration we get

$$A = -\frac{b^2}{2} (m + n) + \frac{1}{2} \frac{[(a + mb)(1+x) - (a - nb)]^2}{n + m(1+x)^2}$$

for any fixed demand curve (i.e. fixed value of m) the value of A will vary with n the slope of the supply curve. We find that the derivative dA/dn is

$$\frac{dA}{dn} = -\frac{1}{2} \left[b - \frac{(a + mb)(1+x) - (a - nb)}{n + m(1+x)^2} \right]^2$$

which is negative for all values of n .

Therefore for any fixed value of m the benefit area A is a monotonic decreasing function of n and the maximum value over the range $n \geq 0$ will occur when $n = 0$ and the minimum value when $n = \infty$.

When $n = 0$ the supply curve is horizontal i.e. the elasticity of supply is infinite and when $n = \infty$ the supply curve is vertical and the elasticity of supply is zero.

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September 1974.

APPENDIX 1

The Derivation of the With-Innovation Supply Curve from the Without-Innovation Curve

Let the without-innovation long-run supply curve be

$$q = f(p)$$

where q is the quantity the producers would choose to produce at price p .

The effect of an innovation is to increase production per unit value of resources utilised, for every producer, by 100x%. The individual producer has resources which are capable of being utilised to produce prior to the innovation, a quantity Q of the product. At price P his net revenue is

$$R = PQ - C$$

where C are his costs of production i.e. the value of the resources utilised.

The effect of the innovation on the same individual producer is to increase his output from the same value of resources to $Q(1+x)$. At price P his net revenue is

$$R' = PQ(1+x) - C$$

which since $P \times Q(1+x) = P(1+x) \times Q$ would be the same as his revenue from the resources without the innovation if the price had risen to $P(1+x)$. The effect on producers of the innovation is therefore equivalent to a rise in price of 100x% without the rise taking place.

This will attract new resources into the industry so that the quantity producers would choose to produce at price p will be

$$q'' = f[(1+x)p]$$

i.e. the same amount which would have been offered without the innovation at a price of $p(1+x)$.

Simultaneously the amount produced per unit value of all resources within the industry, both existing and those attracted by the with-innovation situation, will rise by 100x%. The with-innovation long-term supply curve, all other things being unchanged, will therefore be

$$q' = (1+x) f[(1+x)p]$$

Mr. Graves

October 11, 1974

John K. Coulter

Annual Production System in the Sahel

Like any other production system there are a host of social, economic and physical factors which interact in livestock production. Defects in any one of these can provide a bottleneck to production but there must be some set of priorities for the removal of such defects. It is hardly conceivable that all the defects are of equal importance.

Pages 8-10 of this memo describe the research that has been done in the Sahelian area. Information is available on how to control diseases, improved animal types have been bred, knowledge about natural pasture is in hand and these are stated to be highly developed studies in animal production and marketing.

Obviously this information is incomplete but it should be complete enough to identify real priorities so that the research resources could be concentrated on these.

If there is a large gap between existing knowledge and its use, then it would be better to narrow the gap by increasing the use rather than increasing the gap by enlarging the amount of knowledge.

If this is a fair assessment of the situation then perhaps the resources should be put into a set of production systems, using the existing knowledge. When these are operating it should be possible to identify priorities; at the moment some of the research projects are open-ended. For example "optimum use of the environment and improvement which could be made" (p. 15) could cover almost everything.

In conclusion therefore I would say that the proposal is put together too loosely for it to be acceptable in the present form.

Attachment

JKCoulter:apm

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Off-Campus Programs of International Agricultural
Research Centers

1. A substantial part of the activities of most international agricultural research Centers is carried out at locations away from the headquarters of the Centers. These activities, broadly speaking, are of three kinds: (a) core activities of research and training; (b) cooperative or collaborative research; and (c) outreach activities. It is the purpose of this paper to describe briefly the nature and the financing of each of the three.

Core Activities

2. The core program of a Center, according to the definition used by the Centers and by the Consultative Group Secretariat, is a set of long-term activities designed to progress toward the Center's fundamental objectives in research and training, as described in a basic statement approved by the Center's governing board (which some Centers refer to as their "mandate").^{1/}

3. The core program need not be confined to the headquarters of an institute. Parts of it may be carried on away from headquarters and even outside the host country. Parts of core programs typically conducted away from headquarters are research activities directed to the study of diseases not present at headquarters, or in ecological conditions different from those at headquarters. An example of the former is the work of the International Potato Center in the Toluca Valley of Mexico, directed to the study of blight; and an example of the latter is the work done on wheat and maize in the substations of CIMMYT in different parts of Mexico.

^{1/} Secretariat paper, "Budgeting and Accounting Procedures," July 11, 1974, p. 1.

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4. The core program represents the initiative of the Center and carries the approval of the Governing Board. So far as finance is concerned, the core program is funded within the procedures of the Consultative Group: that is, by donors sharing the budgetary costs and, especially with regard to new extensions of the core program, acting with the advice of the Technical Advisory Committee (TAC).

Cooperative Research

5. Core research is often done in cooperation with other research organizations, in which case it may be referred to as "cooperative" or "collaborative" research. It may be carried on by contract with another research organization or laboratory, or by cooperative arrangements with national, regional or international programs. The International Potato Center, for instance, contracts for some of the research work within its core program to be done by university research staffs in economically developed countries. The beef program of CIAT is carried on cooperatively in Colombia with the national Instituto Colombiano Agropecuario (ICA) with the use of staff and facilities provided partly by ICA.

6. Like other kinds of core activities, cooperative research represents the initiative of the Center and carried the approval of the Governing Board. Since cooperative research is done for the common benefit of the cooperating institutions, the costs are usually shared by agreement among them. The part of the cost borne by an international Center is, like the expenditure for other parts of the core program, financed within the procedures of the Consultative Group, by donors acting together with the advice of TAC.

Outreach

7. A third class of activity is one in which the expert staff of the international agricultural research Centers assist in carrying forward national

programs of research, production or training. This is one of the principal ways in which the findings of the Centers are given practical application in the field (others: conferences, headquarters training programs and the dissemination of research papers). Both the Consultative Group and the Centers believe that the further growth of outreach activities is essential to the success of efforts to feed the peoples of the developing countries at an adequate standard.

8. Generally speaking, however, outreach activities have not been planned or executed within the framework of Consultative Group procedures. In a typical case, a developing country proposes a research or production program and obtains financing for it from an individual donor country or agency: in addition to employing its own resources, the developing country contracts with an international center to provide needed technical assistance, which is funded out of the bilateral grant. Neither the formal initiative nor the financing arises from within the Consultative Group system; and Boards of Trustees take varying degrees of interest, and exert varying degrees of control, over this type of activity by the international agricultural research Centers.

9. Parts of both core and outreach activities may take regional form. Some of CIMMYT's work on certain diseases, a core activity, is coordinated by a senior scientist posted in the Middle East. CIP's assistance to national programs of research, production and training, essentially an outreach function, is carried out with the help of regional offices in different geographical areas. Regional arrangements of these kinds may make it possible to deal more economically with several countries having similar ecological or other features, and may shorten the lines of communication and supply from a Center to its collaborators and clients.

10. Some Centers observe that the present method of funding outreach programs makes this important type of activity dependent on the vicissitudes of financing by bilateral donors. They say (to quote IRRI) that the "uncoordinated, short-term, ad hoc nature of programming and support makes it difficult... to recruit good staff or to develop a sensible long-range program to assist the national research organizations."

11. There is therefore pressure to provide continuing support for outreach activities from core budgets. Members of the Consultative Group, however, have expressed concern that the limited funds available for multilateral use through the Group not be made generally available for assistance to national programs, whose potential demand for funds far exceeds multilateral resources. They observe that financial backing for national programs can be given from more plentiful sources: for instance, bilateral funds, national treasuries in developing countries, or credit from lending agencies.

12. The Consultative Group nevertheless has moved some way toward giving core support to staff arrangements which underpin the development and conduct of outreach programs. Three kinds of staffing have been involved, of which one is standard and two seem to be in the process of evolution.

13. It is understood to be standard practice that the international Centers maintain on their headquarters core staffs one or more members concerned with the stimulation, organization and supervision of outreach activities. Most Centers have such a staff member, often with the rank of Assistant Director General. So far as the Secretariat knows, the largest number of senior and support staff maintained at any Center headquarters for this purpose is three.

The Secretariat has only fragmentary information, but guesses roughly that total expenditures for this kind of staffing throughout the network may be from 2 to 3 per cent of core budgets and may reach a level between \$700,000 and \$1 million in 1975.

14. In addition to permanent headquarters staff with responsibilities for outreach, regional staffs exist or are in prospect. The most extensive is CIP's: in 1975, this staff is to consist of one support scientist in each of 4 geographical areas. The budgeted cost of this regional activity is \$270,000, or about 12 per cent of CIP's core budget. Depending on advice being awaited from TAC and the Consultative Group, CIMMYT may begin presenting proposals for regional services in 1976 and thereafter which, in 1974 dollars, might grow to a cost ranging between \$1 million and \$1.5 million a year.

15. A third kind of outreach staffing has been discussed by the Consultative Group: namely, a small complement of scientists (perhaps three) at each Center who would not have long-term duties at headquarters and who would be quickly available for assignment to new outreach projects as such projects arose. It has been suggested that the budget for these scientists would be met largely or entirely out of the funding of the special projects in which they are engaged, and that they might be supported out of some kind of revolving fund created out of the financing of special projects.

16. CIMMYT, however, has been able to develop and conduct a large program of outreach activities without any formal reserve of manpower. It has done so by making flexible use, for staff and outreach purposes, of scientists originally posted at the Center as visiting fellows.

17. On the other hand, the program of ILCA already envisages that outreach staff, presumably including a ready reserve, would be supported from the core budget. The Center envisages a complement of senior and support scientists who are expected to spend extended periods of time outside headquarters in assisting national programs of research and training. The number of scientists would rise from 14 in 1975 to 20 in 1978. Expenditures as a proportion of the core budget would decline from 30 to 20 per cent in those years, but, in 1974 dollars, would rise absolutely, from about \$600,000 to about \$1 million. This program, in principle, has already been accepted by the Consultative Group.

18. Two conclusions appear to emerge from the present state of off-campus activities. One is that more time and resources, with a larger impact on core staffs and budgets, are being devoted to the planning and conduct of outreach activities than may previously have been realized by members of the Consultative Group and its Secretariat. The other is that it probably is not feasible for the Centers, given their differing missions and their differing socio-economic settings, to staff and conduct off-campus activities, including outreach, in a uniform way. The problems of research on plants propagated from seed, for example, are different from those of research on plants vegetatively reproduced; a form of financing that may be feasible for countries on one level of income may not be feasible for countries on a lower level of income.

19. That makes it particularly important to have the expert advice of TAC on the program recommendations of the centers having to do with cooperative research or assistance to national programs. TAC is considering this general subject at its meeting in February 1975, and the Consultative Group may wish to draw TAC's attention to phases of the subject about which the Group particularly feels the need of guidance.

WORLD BANK GROUP

ROUTING SLIP		DATE
		September 27, 1971
NAME		ROOM NO.
Mr. Yudelman		
cc: Mr. Graves		
(Harold: I'll acknowledge personally to Melville on Tuesday.)		

<input type="checkbox"/>	APPROPRIATE DISPOSITION	NOTE AND RETURN
<input type="checkbox"/>	APPROVAL	NOTE AND SEND ON
<input checked="" type="checkbox"/>	COMMENT	PER OUR CONVERSATION
<input type="checkbox"/>	FOR ACTION	PER YOUR REQUEST
<input type="checkbox"/>	INFORMATION	PREPARE REPLY
<input type="checkbox"/>	INITIAL	RECOMMENDATION
<input type="checkbox"/>	NOTE AND FILE	SIGNATURE

REMARKS

The U.K. and the Evenson Paper

You will recall your 9/20 discussion with Harold in Baum's office.

We have now received the UK paper with request that it be "tabled" at the 10/30 CG. *attached*

Would you please have a look at it for quality and also let us have any comments on handling.

It could be "tabled" but I would just as soon see it circulated in advance unless you have problems with its content or tone.

(2 sets attached)

FROM	<i>Bruce</i>	ROOM NO.	EXTENSION
	Bruce M. Cheek	E-1039	3454



MINISTRY OF OVERSEAS DEVELOPMENT

Eland House Stag Place London SW1E 5DH

Telephone 01-828 4366

I
BHC
HGH
HGH
JC
CJ

Harold Graves Esq
International Bank for Reconstruction
and Development
1818H St NW
Washington DC 20433
U S A

Your reference

Our reference NRR 236/222/01

Date 20 September 1974

Dear Harold

At its November 1973 meeting the Consultative Group discussed an interesting paper prepared by Professor Evenson on the subject of "Investment in Agricultural Research." Subsequently the findings of this paper have been quoted at length to support many claims for the benefits to be derived from agricultural research. For example, Chapter 5 - Research and Technology - of the working document for the World Food Conference, "The World Food Problem - Proposals for National and International Action" draws on the conclusions of the Evenson paper.

Whereas we, like other donors, welcome this paper, we did not accept uncritically all the points made or the conclusions drawn by Professor Evenson and his co-workers. Hence, for the past few months our OIM Statistics Division has been examining in depth the Evenson Survey Document, and attached are 40 copies of a short paper commenting on some of the main points raised by Professor Evenson; a Technical Annexe deals with some of the methods used in the Evenson paper.

Briefly, our Statistics Division confirm Evenson's general claim that investing in agricultural research is well worth-while, but they suggest that the cost effectiveness is not quite as spectacular as that claimed in the 1973 paper. Furthermore, their paper places less emphasis on some points than does Evenson, and on others they come to different conclusions. The Technical Annexe is obviously not for the layman, but it reflects our Statistics Division's reservations about some of the statistical methods employed by Professor Evenson.

You may remember that we informed you during your visit to OIM earlier this year that our Statistics Division was preparing such a paper and you suggested that it would best be presented at the October meeting of the CG; Ralph Melville confirmed at the CG meeting in July that our paper was almost completed. We would be grateful therefore if you would table the enclosed paper at the forthcoming meeting of the Consultative Group.

Kind Regards,
Yours sincerely,

R K Cunningham

Bols.

COMMENTS ON "INVESTMENT IN AGRICULTURAL RESEARCH" -
A SURVEY PAPER BY R E EVENSON

(Prof. Evenson's paper was presented to the
Consultative Group in Washington in November 1973)

Professor Evenson's paper prepared for the Consultative Group on International Agricultural Research is addressed to three topics. Part I surveys data regarding investment in agricultural research and extension; Part II considers studies of the contribution of research activity to agricultural development; and Part III discusses the prospects and problems of improving the information resources related to the international research system.

Part I - Investment in Research and Extension

In Part I Professor Evenson considers the data at present available in making an attempt to answer four questions:

- (1) How much investment in agricultural research has been undertaken in national research systems in the post-World War II period?
- (2) How does investment in research compare with investment in extension? What are the relative "prices" of research and extension resources throughout the world?
- (3) How can "quality" standardisation be achieved?
- (4) How have international aid donor flows influenced investment decisions by less developed countries? What is the net effect of the shift of donor flows from support of national systems to support of international centres on national investment?

The answers to questions (1) and (2) require fairly comprehensive and comparable data on agricultural research and extension for all countries of the world. Evenson and Kisler¹ have attempted to compile such data using both published information and direct survey. Although they have made every effort to achieve comparability they recognise that the results are subject to error resulting from variation in coverage and differences in definitions particularly of scientist/technicians and research/extension. Secondly inter-country or inter-region and inter-temporal comparisons require that financial data is converted to common units - in this case 1970 US\$. The methods used to convert the data to 1970 real prices is not stated but the results will differ according to the method used and the basis chosen. The conversion to US\$ has been made on the basis of official exchange rates and as Professor Evenson recognises this may lead to some errors. We believe that these errors may be considerable. In a recent study by the World Bank² Professor Kravis has shown that very different results are obtained for inter-country comparisons depending upon whether official exchange rates or purchasing power parities are used.

Because of the doubtful quality of some of the basic data and the errors that may have arisen in conversion to 1970 US\$ we suspect that the picture provided by the results in Tables 1 and 2 of the paper is likely to give a distorted answer to questions such as (1) and (2) above.

In Section 1.2 of Professor Evenson's paper the share of agricultural product spent on research and extension is used to compare investment levels in different regions in 1965, for which year rather more reliable data were collected by Evenson and Kisler. If the quality of the basic data can be improved to the extent where local differences of coverage and concept are of insignificant importance, then a measure

of this nature, independent of the problems of exchange rates, could be useful for inter-country comparisons. Because of the problem of aggregating across countries within a region this measure would not provide useful inter-region comparisons. They would have little purpose in decision-making however unless they could be compared with some norm or target. We are not aware that such norms have been determined for developing countries and we do not believe that the use of norms such as the share of agricultural product spent on research and extension in developed countries are necessarily relevant to developing countries.

It is not clear whether the figures used by Professor Evenson for agricultural output are those for gross output or not but we believe they are. If so we are of the opinion that value added by the agricultural sector rather than gross output would provide a more meaningful comparison between countries with such dissimilar types of agricultural industries and at such very different stages of economic development. It is the value added component which is the measure of the contribution to the gross domestic product by the agricultural industry and it is to the increase of this that research and extension is directed.

Professor Evenson discusses the various ways of measuring the output of research activities, and the difficulties of taking into account the differences between countries and between different types of research. Expenditure on research is rejected as a measure of output because of the different rates at which scientists of a similar level are paid in different countries. Number of scientists or scientific man-years is rejected because of the difficulty of setting a suitable standard for the quality of scientists themselves. The measure Professor Evenson prefers is the number of research publications which meet the standards of certain international abstracting journals and this is the measure used in the research studies referred to in Part II. We do not believe that there is sufficient evidence at present to support this measure for inter-country comparisons of output. On the contrary we believe that the measure could as well reflect the differences in institutional arrangements for research and publication as it could differences in quantity or quality of output. We would wish to see evidence on the relative ease or difficulty with which a research scientist from a developing country can get his work published in comparison with similar quality work by a scientist from a developed country. Secondly we believe that it is possible that the institutional arrangements for agricultural research work in many developing countries, particularly in Africa, are such that the results of their work are to a much greater extent embodied in internal memoranda, departmental reports and in their own extension activities than in the case in developed countries.

Should further examination show that publications are an appropriate measure, we consider that the methods of selection and allocation of publications would need to be reviewed. We would need to be sure that the editorial staff of international abstracting journals are able to make a uniform world-wide choice and also that the choice, which must be subjective, is also consistent between journals and over time. Secondly we would need to be sure that the allocation of papers geographically was realistic. For example we are well aware that a considerable amount of research work in developing countries is carried out by UK expatriate staff. The results of this work, which will have been included in expenditure on research by developing countries, are often published after the scientist's return to the UK or for some other reason his address is given as that of his parent UK organisation. This practice obviously increases the number of papers allocated to the UK and reduces those allocated to the developing country.

Professor Evenson attempts to answer question (4) in Section 1.4 of the paper and again admits that reliable data, this time in respect of donor contributions to

agricultural research in developing countries, are not generally available. We are not entirely clear if Professor Evenson is considering only multilateral aid to research or total aid including bilateral assistance. Since he makes specific reference to AID programmes we assume that he is considering total aid and consider this is logical since multilateral and bilateral programmes must be intended to reinforce each other. We suspect that Professor Evenson is under-estimating support to national systems and have doubts as to whether "support for the International Centres now dominates the aid flow to agricultural research" or that "the direct financial support for national systems from the international aid agencies is not going to be very large in most countries in the next ten or so years". As far as the UK is concerned the contribution to the work of International Centres is small in relation to our total assistance for agricultural research and will probably continue to be so. We do not at present have regular data from which the proportions can be determined but from a special exercise on UK aid to research in 1972/73 it can be calculated that about 14% of our total aid to agricultural research was allocated to the International Centres. We do not have information on other donors activities in such detail but have no reason to think that they devote more of their aid to the International Centres than to national systems.

Part II - The Pay-off to Investment in Research

In Part II of his paper Professor Evenson considers the pay-off to investment in research. After a brief discussion of rates of return he reviews the two approaches that have been used in attempting to evaluate the return on investment on research; the transfer of knowledge from one country to another; and the possible differences in returns between the more applied and the more fundamental agricultural sciences.

Based on his review Professor Evenson puts forward the following statements:

- (a) The pay-off to research investment in the LDC regions of the world is extraordinarily high;
- (b) At least twice, perhaps three times as much growth, is purchased with the research dollar, than with the extension and other programme dollars;
- (c) There are no good substitutes for high-quality research systems;
- (d) Technology transfer is a function of national research capability;
- (e) The highest rates of return might well be realised in the more basic research programmes.

With the exception of statement (b) for which we can see no justification, we would accept all these statements although with a certain amount of reservation.

We have concentrated our review primarily on the commodity studies and to a lesser extent on the regression methods of the aggregate productivity based studies. We are critical of some of the assumption and underlying theory of many of the individual commodity studies and our criticisms are set out in a separate more technical paper. (See Annex) We are however of the opinion that it is theoretically possible and, in many cases, practical using data related to individual commodities to estimate the benefit arising from an innovation derived from a successful piece of research. Furthermore, we believe that our criticism of the theoretical approach and assumptions of these studies, if accepted, will not make very significant differences to the results which would still indicate a high rate of return for these particular innovations. We do not believe, however, that it is possible by

these methods to separate the benefits arising from the research from the benefits arising from the use of other resources employed in bringing about the innovation. We do not believe that all benefits resulting from an innovation, less other implementation costs, can be considered as arising from the research which led to the innovation. This we believe must have been the reasoning behind Griliches' method of calculating the benefit to cost ratio in his study of hybrid maize.³ It no doubt can be argued that without the research there would be no results to implement and thus no innovation and that therefore all net benefits flow from the research. We believe that it can equally well be argued that without the use of resources to implement the results of the research, no benefit to the economy would accrue from the research.

Studies of the benefits arising from particular research based innovation have all been based on successful research, and that which led to innovation. All research however does not lead to innovation, either because the research itself is unsuccessful or inconclusive or, although the research is successful in a technical sense, because of uneconomic implementation costs or some other reasons beyond the control of the research worker. The benefits from successful research will have to cover the costs of the unsuccessful which will, to a certain extent, reduce the high rates of return calculated for individual successful innovations. The cost of implementation on an industry wide scale for agriculture is often very great in relation to the cost of the underlying research. Although there is little evidence available we think that the total cost of research, both successful and unsuccessful, will still be relatively small in relation to the cost of implementation and total benefits of successful innovations. Providing this is so then the effect of allowing for unsuccessful research on the rate of returns on research investment may not be as great as might have been expected from the ratio of successful to unsuccessful research. For example, assume a successful innovation with benefits of 350, research cost of 3 and implementation cost of 97. The benefit cost ratio is 3.5. Let us assume that only 5% of research leads to innovation which would imply that this innovation had to carry the burden of unsuccessful research of 57. This would reduce the benefit cost ratio only to 2.2.

On the evidence of the cost benefit studies based on individual commodities, we believe that the rates of return to research are high, although perhaps not so high as some findings would suggest. This is reinforced by the results of other studies based on regression methods which Professor Evenson has called "aggregate productivity based studies". We agree with him that regression methods which may be regarded as more objective could provide stronger evidence than cost benefit studies of the contribution of research separately from implementation of the results. In practice, however, the studies that we have been able to review are subject to a number of defects related to the choice and specification of variables. The most important of these is the inability in our opinion to find a variable which can be considered as a reliable or accurate measure of the knowledge or the dissemination of knowledge arising from research. The use of expenditure on research as a measure of its value may be regarded as begging the question and cannot reflect quality differences. Attempts to overcome this have as far as we know been related to the use of publications as a measure. We have already argued in Part I above that we are far from satisfied with this as a measure of research.

Since we are agreed on the evidence that the internal rate of return or the benefit to cost ratio of investment research is high, we believe it is reasonable to assume that there is justification for further investment to the point where the internal rate is equal to the current price of capital or the benefit cost ratio is equal to unity. With limited funds it may however not be possible to take up all investment projects which satisfy the above criterion. Cost benefit techniques can however be applied to rank projects and this ranking together with assumptions about the risks in undertaking the various projects, should enable those faced with the decisions

about additional research investments to choose a rational portfolio. We therefore believe that there is sufficient justification for the development of the cost benefit commodity studies since they have a number of applications.

If we are to use these studies in determining future programmes of research involving the ranking of projects, this has some relevance to the discussion of rates of return. Professor Evenson has expressed a preference for the use of internal rates of return, but, although these are commonly used for assessment of investment projects, we would prefer net present value or benefits to cost ratio for this purpose as it is generally accepted that net present value methods provide a better method for ranking projects than do internal rates of return.

Finally we think it is important that it should be recognised that the benefits from research based innovations are not the only pay-off to investment in research. The other benefits arising from research are, however, even more difficult if not impossible to quantify. From agricultural research there will be a certain spin-off of knowledge which will not immediately be incorporated into an innovation but at a later date will benefit, and thus reduce the costs of, some other development. Research programmes also provide facilities for the training of the senior scientists of the future and may provide the only environment in which the scientist can develop his ability for scientific enquiry. These are also benefits which cannot be assessed and normally only arise at a much later date. Professor Evenson has produced evidence which suggests that only trained scientific staff in a research environment are really capable of assimilating scientific knowledge from outside their field of work and adapting it to their own particular needs. If a country or region neglects its own scientific research capability it will not find it possible to fully compensate by making use of technology transfers from elsewhere. It is clear that these other benefits although they cannot be measured, all tend to reinforce the general conclusions reached by Professor Evenson.

Part III - Information Resources for Policy

In Part III of his paper, Professor Evenson comments briefly on the information required for policy decisions by aid donors, both bilateral and multilateral, in connection with their assistance to agricultural research in developing countries. He proposes an information system which would provide answers to the problems of how research is to be developed and how it is to be aided. He also discusses alternative methods of achieving this. We agree for the need for such a system but believe that consideration should be given even initially to something more comprehensive. As we have said in Part II we believe that cost benefit studies could have an important role to play in the management of research programmes provided the necessary information is available. We believe that the information system should include this data. Much of it will be outside the field of agricultural research being a part of the development of general agricultural statistics and agricultural economic analysis. There is however a need for more and better information on the research activities themselves. Particularly information is needed on the costs of unsuccessful research including that which is technically successful but does not lead to any innovation. Further information is also needed on comparisons between experimental results and those obtained by the farmer and also on the patterns and costs of implementation.

We believe that an information system which provides for all these needs will enable the better management of research programmes. This should result in the selection of research projects with a greater probability of success and with a greater probability of implementation which in its turn should result in greater social and economic benefits. This must surely be one of the primary aims of all aid donors as well as international and national research organisations.

References

1. Robert E Evenson and Yoav Kisler: Investment in Agricultural Research and Extension: A Survey of International Data, August 1971.
2. Irvine D Kravis and others: A System of International Comparisons of Gross Product and Purchasing Power, 1974.
3. Zvi Griliches: Research Costs and Social Returns: Hybrid Corn and Related Innovation, October 1958.

Part III - Information Resources for Policy

In Part III of his paper, Professor Evenson comments briefly on the information required for policy decisions of aid donors, both bilateral and multilaterally, in connection with their assistance to agricultural research in developing countries. He proposes an information system which would provide answers to the problems of how research is to be developed and how it is to be utilized. He also discusses alternative methods of solving this. We agree for the need for such a system but believe that consideration should be given even initially to something more comprehensive. As we have said in Part II we believe that cost benefit studies could have an important role to play in the management of research programmes provided the necessary information is available. We believe that the information system should include the data. Much of it will be outside the field of agricultural research being a part of the development of general agricultural statistics and agricultural economic analysis. There is however a need for more and better information on the research activities themselves. Particularly important is needed on the costs of unsuccessful research including that which is largely unsuccessful but does not lead to any innovation. Further information is also needed on comparisons between experimental results and those obtained by the farmer and also on the patterns and costs of implementation.

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September 1974

A NOTE ON THE USE OF COMMODITY BASED STUDIES IN ESTIMATING THE PAY OFF TO INVESTMENT IN RESEARCH

Introduction

Professor Evenson's Survey Paper brings together the results of a number of studies of the benefits of agricultural research and on the evidence he concludes that there have been substantial returns to investment in such research. Since his paper does not present a critical evaluation of this evidence, we have made our own evaluation and in general we agree with his conclusions. Nevertheless we feel that it is worth pointing out what we see as flaws or limitations in the methods used in some of the commodity based studies he cites. We feel there is room for further work to improve the methods used in studies of this kind.

1. The use of Supply and Demand Analysis

Most of the studies base their measure of social benefit from research in agriculture on supply and demand curves estimated for the crop under review. Ayer's paper⁽¹⁾ clearly defines the "benefit area" as that enclosed by the demand curve and the with-innovation and without-innovation supply curves. The other papers seem to us to have used effectively the same definition, which rests on the welfare proposition that an innovation which gives a society the ability to produce more is beneficial. Most people would assent to this proposition, but it must be stated that it ignores the income distribution effects of an innovation. Also ignored are the levels of and effects on employment. Today in developing countries in particular, distribution and employment effects are considered to be of the first importance. It is therefore for discussion whether the "benefit area" type of measure can be suitably adapted to take them into account. This however is not taken up in this paper.

We have investigated some of the theoretical properties of the benefit area as defined by Ayer. The area is fixed by the intersection of the two long-run supply curves with a single demand curve. We are therefore comparing two long-run equilibrium positions on the same demand curve, and hence are assuming that tastes and incomes of consumers and all the other variables which together fix the position of the demand curve are the same in the two situations. Many of the innovation studies have taken years to implement, and this assumption would clearly be unjustified if attempts were made to draw curves reflecting the actual conditions before and after the innovation. We feel that the right approach is to estimate the demand curve existing after the innovation has been implemented and the long-run supply curve existing at the same time, and then to draw a second hypothetical supply curve reflecting what the supply situation would be at that time if the innovation had not taken place. This seems to us to have been the approach used in several of the historical studies.

To apply similar analysis to the potential benefits of proposed research we would start from projections of demand and supply for the period after the results were implemented.

2. Specification of the Supply Curve Shift

We think there have been mistakes in all the studies we have seen in drawing the hypothetical "without-innovation" supply curve. The exact nature of the shift which "loss" of the innovation would induce in the supply curve depends of course on the nature of the innovation itself. Griliches in his study of hybrid corn in the USA⁽²⁾

assumes that this particular innovation could be represented as an overall percentage increase in yield. Provided the increase is approximately the same for all producers in the industry, it seems a reasonable assumption and one which would be applicable to most if not all innovations in agriculture. If the increase were not approximately the same for all producers then the "without-innovation" supply curve could have a very different shape, and the assumption would in consequence be inappropriate. Our major concern, however, is that in specifying the supply curve shift, all the authors we have studied have neglected to take into account the effect of the innovation on the willingness to use resources which would previously have been more profitably employed elsewhere, or not employed at all. For ease of exposition at this stage it is better to work forward from the without-innovation supply curve to the with-innovation curve. All the points on the without-innovation curve which have a price coordinate above the equilibrium price represent production which would be called forth by a long run price increase. But this is exactly what an increase in yield for the same resources expended represents to the farmers and the effect is to shift the supply curve as conventionally drawn downwards (see Appendix I). At the same time, all the resources in the industry will be able to produce $(100x)$ percent more, where $(1+x)$ is the factor by which yields have changed. Thus if the original supply function were $q = f(p)$, then we would maintain that the with-innovation function, given the above assumptions, is $q_s = (1+x)f\left[\frac{p}{1+x}\right]$ and not $q_s = (1+x)f(p)$ as implied by the authors cited by Professor Evenson.

3. Properties of the Benefit Area

Now we come to the effect that different supply and demand elasticities have on the size of the benefit area. The problem of measuring the elasticity of supply and the size of the shift was given considerable attention in the papers by Ayer¹ and Ardito-Barletta³. Griliches² on the other hand chose what he regarded as a minimum percentage for the shift and then examined the effect of supply elasticity, again choosing that which he thought would give the minimum benefit from the innovation. To a large extent the availability of data will decide which of these approaches is adopted in a particular study and on occasions it will be worth trying both. We were surprised to find however that these different approaches led both Griliches and Ayer to the conclusion that minimum benefit accrues to society for any given demand elasticity when the supply is perfectly elastic and maximum benefit when supply is perfectly inelastic. Economic theory led us to the opposite general conclusion. Our own mathematical analysis supported this and we believe that Griliches and Ayer reached their result through the application of an approximate elasticity formula in a situation where the supply elasticity made very little difference to the size of the benefit area. In the event their approximation was sufficiently inaccurate to reverse the correct result.

Consider first the economic theory in the case discussed by Griliches. If supply is perfectly inelastic (ie resources do not enter or leave the industry in response to price movements) then society must take the whole benefit of the innovation in terms of additional corn. Given the relatively inelastic demand for corn which Griliches postulates, the valuation placed by society on this additional corn is also relatively low. But if supply is elastic in the same demand conditions, the long run price fall induced by the innovation will encourage some resources to leave the corn industry and produce other goods. In a competitive economy these goods must be valued at least as highly as further additional corn at its new equilibrium price, which with inelastic demand will be higher the more elastic his supply. A similar argument to show that elastic supply involves greater social benefit from technical change can be constructed for the case where demand is relatively elastic. In brief

the principle is that innovations release resources and where supply conditions are perfectly elastic these can be reallocated with maximum social benefit.

It is awkward to prove this result mathematically with complete generality, but we have proved it for supply and demand curves which have constant elasticity throughout the relative ranges, and for those represented by straight lines. The formal analysis of these cases is presented below. From it we derived certain other properties of benefit area which we have also tested graphically for other cases. Firstly, when the elasticity of demand is unity, the benefit area is constant with respect to the elasticity of supply. If the elasticity of demand is close to unity, supply elasticity does not make much difference. From numerical examples in the constant elasticity case we have shown that for values of the elasticity of demand* between figures - 0.5 and - 1.85 the difference between the maximum and minimum benefit areas will be less than 5% from an innovation equivalent to a 25% increase in yield. Secondly, as the demand elasticity increases the importance of the elasticity of supply increases rapidly. If the elasticity of demand is - 5 then the benefit from a 25% increase in yield will differ between maximum and minimum by 150%. This is clearly of importance when the approach favoured by Griliches is used in studying a crop which has a high elasticity demand, although it does not seriously affect his results for hybrid corn.

*The elasticity of demand k is defined as

$$k = \frac{p}{q} \cdot \frac{dq}{dp}$$

4. Analysis of the Benefit Area Assuming Constant Elasticities of Supply and Demand

We start from a given equilibrium price and quantity combination, where price = a and quantity = b. So that our analysis will correspond with conventionally drawn supply and demand charts, which show quantity on the horizontal axis normally used in mathematics for the independent variable, we have written the supply and demand functions unconventionally with price as a function of quantity. The three functions required are

The demand curve $P_D = a \left(\frac{q}{b} \right)^{\frac{1}{k}}$, $k < 0$, where k is elasticity of demand

The without - innovation supply curve $P_S = a \left(\frac{q}{b} \right)^{\frac{1}{w}}$ $w \geq 0$, where w is elasticity of supply

The with - innovation supply curve $P_{S1} = ab^{-\frac{1}{w}} (1+x)^{-\frac{w+1}{w}} q^{\frac{1}{w}}$, $x > 0$.

The initial equilibrium, E_1 , is where

$$P_D = P_S$$

i.e. where $p = a$ and $q = b$ as previously defined. The new equilibrium is E_2 where

$$P_D = P_{S1}$$

i.e. where $q = b (1+x)^{-\frac{k(w+1)}{w-k}}$

We do not need the value of p at this point. The area we require to evaluate is that enclosed by the two supply curves and the demand curve. Let this be A then

$$A = \int_0^{E_1} (P_S - P_{S1}) dq + \int_{E_1}^{E_2} (P_D - P_{S1}) dq.$$

On integration we get

$$A = ab \left[\frac{w}{w+1} - \frac{k}{k+1} \right] \left[1 - (1+x)^{-\frac{(w+1)(k+1)}{w-k}} \right] \text{ if } k \neq -1$$

or $A = ab \log (1+x)$ if $k = -1$.

The result for $k = -1$ shows that the benefit area A is independent of the value of the elasticity of supply w. For any fixed value of $k \neq -1$ the value of A will vary with w, and we must now seek that value of w for which A is minimised for a given k. We find that the derivative dA/dw is

$$\frac{dA}{dw} = \frac{ab}{(w+1)^2} \left[1 - (1+x)^{-\frac{(w+1)(k+1)}{w-k}} - \frac{(w+1)(k+1)}{w-k} \cdot (1+x)^{-\frac{(w+1)(k+1)}{w-k}} \log_e (1+x) \right]$$

Consider $\frac{dA}{dw}$ for values of k such that $0 > k \geq -1$. Then if we write

$$u = \frac{(w+1)(k+1)}{w-k} \text{ then } u > 0.$$

Substituting, we have

$$\frac{dA}{dw} = \frac{ab}{(w+1)^2} \left[1 - (1+x)^{-u} - u(1+x)^{-u} \log_e(1+x) \right].$$

write $y = (1+x)^u$

then $u \log_e(1+x) = \log_e y$

now $y - \log_e y \geq 1$ since it can easily be proved by differentiation that $y - \log_e y$ has a minimum value of 1 when $y = 1$.

Therefore $(1+x)^u - u \log_e(1+x) \geq 1$

$$(1+x)^u - 1 \geq u \log_e(1+x)$$

or

$$1 - (1+x)^{-u} \geq u(1+x)^{-u} \log_e(1+x).$$

Therefore since

$$\frac{ab}{(w+1)^2} > 0, \frac{dA}{dw} \geq 0.$$

Now consider $\frac{dA}{dw}$ for values of k such that $k < -1$. Then if we write

$$v = -\frac{(w+1)(k+1)}{w-k} \text{ then } v > 0.$$

Substituting, we have

$$\frac{dA}{dw} = \frac{ab}{(w+1)^2} \left[1 - (1+x)^v + v(1+x)^v \log_e(1+x) \right].$$

write $z = (1+x)^v$

then $v \log_e(1+x) = \log_e z$

now $z - z \log_e z \leq 1$ since it can easily be proved by differentiation that $z - z \log_e z$ has a maximum value of 1 when $z = 1$.

Therefore $(1+x)^v - v(1+x)^v \log_e(1+x) \leq 1$.

$$1 - (1+x)^v + v(1+x)^v \log_e(1+x) \geq 0.$$

Therefore since

$$\frac{ab}{(w+1)^2} \geq 0, \frac{dA}{dw} \geq 0.$$

Since we have already shown that for $k = -1$ this benefit area is independent of w , we have now shown that for all values of k the derivative dA/dw exists for all w in the range $0 \leq w < \infty$ and is positive or zero. Hence the benefit area A is a monotonic increasing function of w . Minimum benefit occurs when $w = 0$ and similarly maximum benefit when $w = \infty$.

5. Analysis of the Benefit Area Concerning Elasticities of Supply and Demand Represented by Straight Lines

Again we start from a given equilibrium price and quantity combination, where price = a and quantity = b . The three functions required in this case are

The demand curve, assumed to be downward sloping

$$P_D = -mq + (a + mb), m > 0.$$

The without - innovation supply curve, assumed upward sloping or horizontal

$$P_S = nq + (a - nb), n \geq 0.$$

The with - innovation supply curve

$$P_{S1} = \frac{nq}{(1+x)^2} + \frac{a - nb}{1+x}, x > 0, n \geq 0.$$

The initial equilibrium, E_1 , is where

$$P_D = P_S$$

i.e. where $p = a$ and $q = b$ as previously defined. The new equilibrium is E_2 where

$$P_D = P_{S1}$$

i.e. where

$$q = \frac{(a + mb)(1+x)^2 - (a - nb)(1+x)}{n + m(1+x)^2}$$

We do not need the value of p at this point. The area we require to evaluate is that enclosed by the two supply curves and the demand curve. Let this be A then

$$A = \int_0^{E_1} (P_S - P_{S1}) dq + \int_{E_1}^{E_2} (P_D - P_{S1}) dq.$$

On integration we get

$$A = -\frac{b^2}{2} (m + n) + \frac{1}{2} \frac{[(a + mb)(1+x) - (a - nb)]^2}{n + m(1+x)^2}$$

for any fixed demand curve (i.e. fixed value of m) the value of A will vary with n the slope of the supply curve. We find that the derivative dA/dn is

$$\frac{dA}{dn} = -\frac{1}{2} \left[b - \frac{(a + mb)(1+x) - (a - nb)}{n + m(1+x)^2} \right]^2$$

which is negative for all values of n .

Therefore for any fixed value of m the benefit area A is a monotonic decreasing function of n and the maximum value over the range $n \geq 0$ will occur when $n = 0$ and the minimum value when $n = \infty$.

When $n = 0$ the supply curve is horizontal i.e. the elasticity of supply is infinite and when $n = \infty$ the supply curve is vertical and the elasticity of supply is zero.

References

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- (2) Griliches: Research Costs and Social Returns: Hybrid Corn and Related Innovations. Z. Griliches 1958.
- (3) Ardito - Barletter: Costs and Social Benefits of Agricultural Research in Mexico. N. Ardito - Barletter 1971.

Statistics Division
Ministry of Overseas Development
London

September 1974.

APPENDIX 1

The Derivation of the With-Innovation Supply Curve from the Without-Innovation Curve

Let the without-innovation long-run supply curve be

$$q = f(p)$$

where q is the quantity the producers would choose to produce at price p .

The effect of an innovation is to increase production per unit value of resources utilised, for every producer, by $100x\%$. The individual producer has resources which are capable of being utilised to produce prior to the innovation, a quantity Q of the product. At price P his net revenue is

$$R = PQ - C$$

where C are his costs of production i.e. the value of the resources utilised.

The effect of the innovation on the same individual producer is to increase his output from the same value of resources to $Q(1+x)$. At price P his net revenue is

$$R' = PQ(1+x) - C$$

which since $P \times Q(1+x) = P(1+x) \times Q$ would be the same as his revenue from the resources without the innovation if the price had risen to $P(1+x)$. The effect on producers of the innovation is therefore equivalent to a rise in price of $100x\%$ without the rise taking place.

This will attract new resources into the industry so that the quantity producers would choose to produce at price p will be

$$q'' = f[(1+x)p]$$

i.e. the same amount which would have been offered without the innovation at a price of $p(1+x)$.

Simultaneously the amount produced per unit value of all resources within the industry, both existing and those attracted by the with-innovation situation, will rise by $100x\%$. The with-innovation long-term supply curve, all other things being unchanged, will therefore be

$$q' = (1+x) f[(1+x)p]$$

I

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Cable Address - INTBAFRAD

September 13, 1974

TO: Center Directors
FROM: Executive Secretariat
SUBJECT: Information on Outreach Activities

1. At the August meeting of the Consultative Group, it was agreed that the Secretariat should secure from Center Directors more complete information on their outreach programs, whether the programs were at an early stage of operation or in the planning stage. A number of donor agencies have bilateral funds available for such activities, but are not fully aware of the opportunities which might be available through the various centers. They would welcome more systematic information on any such programs which might merit their support. The Secretariat was therefore asked to secure this information from Center Directors in time to make it available to donors at the October 30-31 meeting of the Consultative Group.

2. Although statements on proposals for outreach activities are sometimes included in program and budget documents, statements about proposals have not been requested or received on a regular basis. Center Directors are now asked to provide the Secretariat with more detailed and comprehensive statements which might attract the interest of donors.

3. This material would complement the information requested of donors in the Secretariat's memorandum of September 12 on "Information on Agricultural Research Activities"; the Secretariat would forward the information to all members of the Consultative Group. The general subject might also be discussed by the Consultative Group in October, with a view to deciding what follow-up action might be useful.

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Telephone (Area Code 202) 477-3592
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September 12, 1974

TO: Members of the Consultative Group, Members of the
Technical Advisory Committee, and Center Directors

FROM: Executive Secretariat

SUBJECT: Information on Agricultural Research Activities

1. At the most recent meeting of the Consultative Group, it was agreed that donors should circulate lists of agricultural research projects sponsored by them which are of potential interest to the international agricultural research network. It was agreed that the Secretariat would make suggestions concerning the content of such listings, and that donors would circulate the information requested in advance of the meeting of the Consultative Group at the end of October.

2. From activities they are sponsoring or assisting, donor agencies are now asked to provide a descriptive list of projects from which the international centers might derive some benefit or to which the research programs of the centers might be capable of making a contribution. The list should include (a) projects in which the donor is assisting specific national research programs in developing countries and (b) projects of research (whether in the donor country or elsewhere) which are seeking results which would be broadly applicable to developing areas (for example, work carried out on USAID contract by Oregon State University to improve weed-control research in developing countries).

3. The Secretariat suggests that the most important points to cover are:

- a. Title of project.
- b. Location of project; name and address of principal project official.
- c. Duration of project.
- d. Scope and purpose of project.
- e. Description of activity, including cost, manyears required and type of scientific effort, methods of research being adopted.
- f. Stage of development: what has already been accomplished; availability of reports.
- g. Existing linkages with international centers or research programs in developing countries.

- h. Likely future course and content of project.
- i. Availability of training opportunities and possibilities for collaborative research.

4. It is requested that two copies of each list be sent to each member of the Consultative Group, one to each member of TAC, one to each Center director, and one to the Executive Secretariat. A mailing list is attached.

5. Depending on the amount and kind of material provided, members of the Consultative Group may wish to discuss at their October meeting whether and what kind of follow-up action would be helpful.

Attachment

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Stockholm, June 1974

News Release

IFS RESEARCH GRANTS

The International Foundation for Science has approved seventeen research grants to a total sum of \$100.000 going to individual scientists working in developing countries. The grants will cover costs for equipment, instruments, chemicals, glassware, scientific journals, and other expenses in connection with biological and agricultural research projects. The grants have been concentrated to five areas; aquaculture, legumes, food fermentation, forest soil microbiology, and natural products.

1. Aquaculture

Aquaculture may become an important food resource in developing countries. 12% of the yearly world production of finfish for human consumption comes from cultivated fish, which corresponds to 4% of the total production of animal protein in the world (milk products excluded).

While the catches of food fish cannot be expected to be even doubled due to natural limiting factors, the possibilities for an increased production of fish from aquaculture are considerable. It is estimated that the area for aquaculture can be increased ten times and that the yield might be fivedoubled. Important species which may be successfully cultivated are carp, milkfish, mullets, catfish and Tilapia. The main problem is to produce enough fingerlings and how to rear them. Fundamental studies of reproduction physiology is therefore needed.

The IFS has distributed five grants for aquaculture research:

Breeding of carp in fresh water (Ivory Coast)

Dr N. Kouassi, University of Abidjan, will undertake a study of the natural reproduction cycle of Labeo coubie and related carp fishes. The possibilities to induce spawning, the rearing, survival and growth rate will be studied in the laboratory and experiments to apply these results to ponds and barrages will be undertaken.
\$5.000

Studies on Chrysichtys nigrodigitatus (Nigeria)

Chrysichtys is a very popular fish in high demand in Nigerian markets. It lives in both fresh and brackish water. Dr B. Ezenwa, Federal Department of Fishery, Lagos, will study the distribution within Nigerian waters to enable collection of fingerlings for stocking ponds. He will study the possibility of hatchery production either by breeding adults in a confined environment or by artificial fertilization. Chrysichtys, which is limited to West Africa, has not been used for aquaculture before.
\$8.000

Grey mullets of India

Dr N.J. Sebastian, Department of Fisheries of Kerala, wants to study how to induce spawning in commercially important species of grey mullets and to conduct large scale rearing of their larvae.
\$3.200

Dr M.N. Kutty, Madurai University, Madurai, studies the influence of temperature, salinity and dissolved oxygen on the survival, energy utilization and growth of the mullet *Rhinomugil corsula*.
\$6.000

Improved sun-drying of fish (Senegal)

Dr O. Diallo, Institute of Meteorological Physics, Dakar, studies the construction of improved ovens for sun-drying of fish. Fish is a most important source of animal protein in Senegal, but the traditional methods of fish-drying leads to considerable losses in quantity and quality of the sun-dried fish. Improved processing methods are therefore needed.
\$3.600

2. Vegetables, grain legumes and tubers

The IFS research programme in this field is directed towards support to research on subsistence agriculture crops. The aim is to improve the yield and the nutritional quality of locally consumed food crops. The grain legumes are especially important as they are nitrogen-fixing. Important legumes are soybeans, chickpeas, pigeon peas, horse beans and cow peas.

Tubers are important staple foods in many tropical countries. Little research has been done on yams and cocoyam. The same is true with different types of vegetables as cabbage, lettuce and other locally used legumes.

Two grants have been distributed:

Genetic improvement of yams (Ivory Coast)

Dr B. Touré, University of Abidjan, Abidjan, has begun a study of the possibilities of genetic improvement of yams in West Africa. He is building up a collection of cultivated and wild yams and will study its flowering and the possibilities of developing hybrides. The variability between and within different clones of yams will be studied. Yam is an important tuber in the whole of the tropic West Africa, and is cultivated on 20% of the area for food crops.

\$9.100

Rhizobia in tropical legumes (Malaysia)

Mr S. Padmanabhan and Dr W.J. Broughton, University of Malaya, Kuala Lumpur, will try to develop bacteria strains suitable for inoculation on local grain legumes, especially on soy beans. Rhizobia have been isolated from about 40 different legumes. The primary object of this research is to solve nodulation problems among commercially important legumes. The nitrogen-fixing capacity, the competitiveness and the persistence of promising rhizobia will be studied.

\$7.000

3. Food fermentation

Fermented foods play an important role in many poor households. Fermentation of grain legumes, peanuts, cereals, fish, fruits, etc., is used to increase the nutritional quality, raise the protein content, improve digestability and storage life of the product. Systematic studies of the traditional fermentation processes may result in new or improved products and processes.

Microbial fermentation studies on "tauco", a soy bean paste (Indonesia)

Dr F.G. Winarno, Bogor Agricultural University, Bogor, will undertake studies on "tauco", a fermented soy bean paste, traditionally consumed by a large number of the Indonesian population, particularly by the low income families. Production is still done in small scale industry, using very simple methods. The use of single or mixed cultures and the various conditions will be studied.

\$8.500

Preserving of microbiological cultures (Indonesia)

Dr S. Saono, Treub Laboratory, Bogor, will improve techniques of preserving cultures of non-pathogenic microorganisms, which are important for the microbiological work in Bogor.

\$2.500

Development of cheap high-protein foods (Malaysia)

Dr Ho Coy Choke, University of Malaya, Kuala Lumpur, will undertake analyses of ontjom fermentation for content of protein, carbohydrates, lipids and nucleic acids for evaluation of nutritional value. He will further study the possibilities to isolate and select mutants of the active bacteria in the ontjom fermentation, Neurospora intermedia, for improved content of protein in essential amino acids.

\$8.500

4. Forest soil microbiology

In large tropical areas the original rain forests are rapidly disappearing or have already been destroyed. As a result the ecological balance is disturbed, leading to soil impoverishment and soil erosion. In several countries afforestation projects have therefore been initiated, both with indigenous and exotic species. When exotic pine species, suitable for paper pulp production are introduced, it is necessary to inoculate the soil with fungi, which can form mycorrhiza with the tree roots. The mycorrhiza enables the tree to utilize available phosphor and nitrogen which otherwise is not accessible. Very little is known about this mycorrhiza, if it can be introduced in pure culture and which fungi are the most efficient in different soil types.

The IFS has distributed two grants for mycorrhiza research:

Pine mycorrhiza in Ghana's afforestation programme (Ghana)

Dr A. Ofosu-Asiedu, Forest Products Research Institute, Kumasi, will study the most suitable and economic procedures to field inoculation of pines with mycorrhizal fungi, the mass production of suitable fungi and the performance of the inoculated pines. The natural occurrence of pine mycorrhizal fungi in Ghana will be investigated as well as the efficiency, adaptation, competitive ability of survival in Ghanaian soils.

\$5.000

Mycorrhiza associations in tropical pines grown in Nigeria

Dr Z. Momoh, Savanna Research Station, Zaria, to identify existing mycorrhizal fungi in plantations, study their biology and effect on the trees. The project includes research for other fungi capable of suitable associations with pines in Nigeria and insensitive to the high temperature and long dry seasons in northern Nigeria.

\$2.600

5. Natural products

The extraction of natural products from local plants, wild or cultivated, is a source of great importance for the production of medical and pharmaceutical drugs, and other economically important products.

Synthesis, structure modification and biological testing of natural occurring anthelmintic substances (Thailand)

To Dr V. Reutrakul, Mahidol University, Bangkok, to study diospyrol and hydroxystilbene, locally well known drugs against hookworms. Diospyrol is extracted from plant fruits which are available only seasonally and the extract is susceptible to air oxidation. If an effective anthelmintic agent can be obtained at a reasonable cost it will contribute tremendously to the well-being of the Thai people, as infections from intestinal worms are wide spread.

\$8.000

Studies on antithiamin factors of tea in causing beriberi (Thailand)

To Dr S. Vimokesant, Mahidol University, Bangkok, to study the significance of antithiamin factors from tea in causing thiamin deficiency in humans and to determine the reaction between thiamin and tannic acid and the biological value of the reaction products. The project aims at finding practical ways of improving the thiamin status of the Thai people in northern Thailand who chew fermented tea leaves as a stimulant.

\$3.700

Determination of alkaloids of Iranian Glauciums (Iran)

To Dr I. Lalezari, Teheran University, to study wild growing glauciums in Iran and to extract, isolate, identify and determine the alkaloids in the plant. The project will be followed up by pharmacological studies on separated alkaloids. It is expected that substituents for codeine and other opium alkaloids may be found, which might decrease the need of production of opium as a source of antitussive agents.

\$9.800

Study on medical plants - Adénia lobata and Vernonia colorata (Ivory Coast)

To Dr A.L. Djakouré, University of Abidjan, to extract, separate and study the alkaloids of Adénia and Vernonia. The work is undertaken in close cooperation with a group studying the pharmacological effects on the extracts.

\$3.500

Studies on cinnamon to improve the quality and production (Sri Lanka)

To Mr A.L. Jayawardene, Ceylon Institute of Scientific and Industrial Research, Colombo, to study the chemical differences of cinnamon oils due to geographic location and soil condition and studies of the chemical composition of the different endemic varieties of cinnamon. Cinnamon is the major spice produced in Sri Lanka which supplies the world with 58% of its cinnamon. The results are expected to be useful for the improvement of the quality of the cinnamon.

\$8.500

NEW MEMBERS

The International Foundation for Science, established May 26, 1972, admitted eight new members from Belgium, Finland, Ivory Coast, Niger, Norway, Senegal and Sudan at the third Interim Board meeting May 17, 1974. The Foundation has now 32 Member Organizations.

Argentina	Academia Nacional de Ciencias Exactas, Fisicas y Naturales Consejo Nacional de Investigaciones Cientificas y Tecnicas
Belgium	Académie Royale des Sciences, des Lettres et des Beaux- Arts de Belgique Koninklijke Academie voor Wetenschappen, Lettren en Schone Kunsten van Belgie
Canada	The Royal Society of Canada
Chile	Academia de Ciencias
Denmark	Det Kongelige Danske Videnskabernes Selskab
Egypt	Academy of Scientific Research and Technology
Finland	Soumalainen Tiedeakatemia Societas Scientiarum Fennica
France	Office de la Recherche Scientifique et Technique Outre-Mer
Ghana	Council for Scientific and Industrial Research
India	Indian National Science Academy
Indonesia	Lembaga Ilmu Pengetahuan Indonesia
Iran	University of Teheran
Israel	The Israel National Academy of Sciences and Humanities
Ivory Coast	Association Scientifique de Côte d'Ivoire
Japan	Japanese National Liaison Committee for IFS
Rep. of Korea	National Academy of Sciences
Netherlands	Koninklijke Akademie van Wetenschappen
Niger	Conseil National de la Recherche Scientifique et Technique
Norway	Det Norske Videnskapsakademi i Oslo
Pakistan	National Science Council
Philippines	Science Foundation of the Philippines
Senegal	La Délégation Générale à la Recherche Scientifique et Technique
Sudan	The National Council for Research
Sweden	Ingenjörsvetenskapsakademien Kungliga Vetenskapsakademien
Tanzania	Tanzania National Scientific Research Council
Thailand	National Research Council
United States	American Academy of Arts and Sciences National Academy of Sciences

GRANTING PROGRAMME FOR 1974

The aim of the IFS grants is to promote meritorious research in developing countries. The grants, providing for equipment, expendable supplies, literature, etc, go to young scientists from developing countries, on condition that the research activity takes place in the territory and for the benefit of the developing country. The criteria for a grant are the ability of the applicant and the quality and promise of the research project and its relevance to the needs of the country.

The Foundation has limited its granting work to biological and related sciences. Within this field five priority areas have been chosen in order to increase the impact of the granting work and to facilitate the establishment of regional contacts between scientists working with the same problems.

The priority areas for IFS grants are:

Aquaculture. Research on fish and shell-fish which are used for human food. Fry production, genetic improvement, feeding, cultivation techniques.

Vegetables, grain legumes, tubers and forage crops. Research on plant morphology, physiology, pathology, genetic improvement, cultivation techniques and processing methods.

Fermented foods. Improvement of microbiological cultures, fermentation processes and application of new cultures to process agriculture products and agriculture waste.

Forest soil microbiology. Studies on mycorrhiza in connection with introduction of pine species. Research on physiology, ecology and symbiotic efficiency of different fungal species. Development of pure culture inoculation of mycorrhizal fungi. Root symbioses in forest trees, including ectotrophic mycorrhiza endotrophic mycorrhiza and nitrogen fixing root nodules.

Natural products. Purification, isolation and utilization of natural products of possible economic importance (medicines, insecticides etc). Structure elucidation and phytochemical studies, including search of new sources of natural products.

Support may also be given to social and economic research connected with IFS grants in above mentioned areas, e.g. on acceptance and use of new products and processes.

For more information about the Foundation and its granting programme, write to

International Foundation for Science
Dr Olof Edqvist, Executive Secretary
Box 5073
S-102 42 STOCKHOLM 5
Sweden
Telephone: 08/22 07 60

11

BELLAGIO VI: STRENGTHENING NATIONAL AGRICULTURAL RESEARCH

(Notes on the conference held March 19-20-21, 1974)

The Bellagio Study and Conference Center
Villa Serbelloni
Bellagio, Italy

RECEIVED

1974 APR 19 PM 2:28

COMMUNICATIONS
SECTION

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mirrored or pre-emptive text

AGENDA FOR BELLAGIO VI

Theme of the conference: Strengthening national agricultural research systems

Sessions: A.M. - 9:00 - 12:30

P.M. - 3:00 - 6:00

Tuesday, March 19, 1974

Chairman: G. F. Darnell

Session 1, A.M.

Subject: Needs and opportunities in strengthening national research systems as seen by FAO, P. A. Oram

Subject: Some considerations in strengthening national research systems, S. Wortman

Session 2, P.M.

Subject: Strengthening agricultural research and food production services in the LDC's: some emerging problems and questions, F. F. Hill and L. S. Hardin

Wednesday, March 20, 1974

Chairman: J. A. Pino

Session 3, A.M.

Subject: A view from the inside I: organizing agricultural research in Nigeria, B. Shaib

Subject: A view from the inside II: agricultural research in Ecuador
F. Portilla

Session 4, P.M.

Subject: Linking research institutions in the developed countries with research in international centers and in national programs,
A. R. Melville

Thursday, March 21, 1974

Chairman: J. Bernstein

Session 5, A.M.

Subject: Regional activities to strengthen and service national programs, R. D. Havener

Subject: International centers' participation in building national research and training programs, N. C. Brady

Session 6, P.M.

Subject: Resume of conference

BELLAGIO VI - MARCH 18-22, 1974

LIST OF PARTICIPANTS

1. Ewert Aberg, Royal Agricultural College, Sweden
2. Guy B. Baird, United States Agency for International Development, Washington, D.C.
3. Joel Bernstein, United States Agency for International Development, Washington, D.C.
4. Nyle C. Brady, The International Rice Research Institute, Philippines
5. George F. Darnell, International Bank for Reconstruction and Development, Washington, D.C.
6. H. G. Dion, Canadian International Development Agency, Ottawa
7. F. Fournier, Office de la Recherche Scientifique et Technique Outre-Mer, Paris
8. Lowell S. Hardin, The Ford Foundation, New York
9. Robert D. Havener, The Arid Lands Agricultural Development Program, Beirut
10. F. F. Hill, The Ford Foundation, New York
11. J. H. Hulse, International Development Research Centre, Ottawa
12. A. Dam Kofoed, Danish International Development Agency, Copenhagen
13. William T. Mashler, United Nations Development Programme, New York
14. A. Colin McClung, The Rockefeller Foundation, New York
15. A. R. Melville, Overseas Development Administration, London
16. Peter A. Oram, Food and Agriculture Organization of the United Nations, Rome
17. John A. Pino, The Rockefeller Foundation, New York
18. Fabian Portilla R., Instituto Nacional de Investigaciones Agropecuarias, Quito
19. Bukar Shaib, Federal Ministry of Agriculture and National Resources, Lagos
20. Lars Strand, Norwegian Agency for International Development, Oslo
21. G. P. Tiggelman, Landbouwhogeschool, Wageningen
22. W. Treitz, Bundesminister für Wirtschaftliche Zusammenarbeit, Bonn
23. Josef von Ah, Swiss Office for Agricultural Research, Berne
24. Sterling Wortman, The Rockefeller Foundation, New York

Strengthening National Agricultural Research Services
(Notes on Bellagio VI Conference March 19-21, 1974)

The Situation

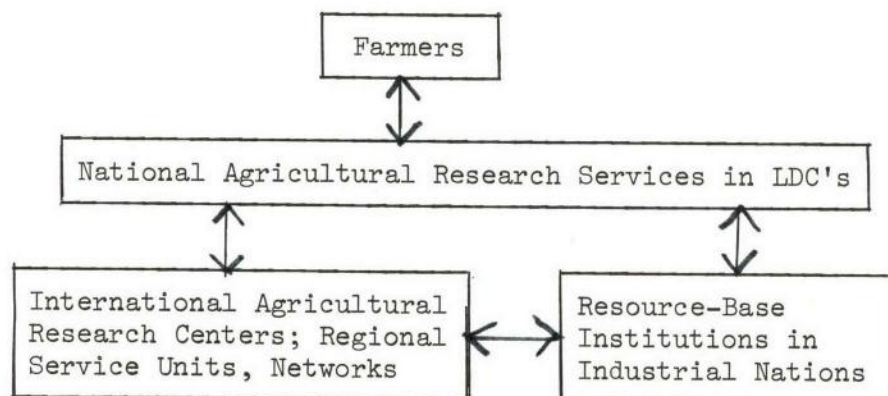
The present requirement for increased food production is such that many national agricultural research services are called upon to step up their performance. Conditions favoring this development include the following:

1. The world food situation. Newly developing and industrialized nations are increasingly aware of their precarious position with respect to the availability and costs of required food supplies. Thus it is expected that more governments (developing and developed) will make sustained commitments to agricultural development.

2. Technology generation. Improved technology - high-yielding varieties, good production practices, better farming systems - capable of making a difference is becoming available; additional promising advances are in the pipeline. The demonstration effect is positive. It is increasingly recognized, however, that effective use of this flow of internationally generated technology requires careful testing, modification, and adaptation to local conditions.

3. Global problem-solving system. A global system for solving food production problems is taking form. This worldwide network, imperfect as it now is, can extend from the farmer-producer back through his state and national institutions to research centers and universities in the industrialized nations.

In over-simplified form, the emerging nature of these linkages is reflected thus:



4. Pressure on national research institutions in LDC's. With respect to the global problem-solving system, the conference observed that:

A. Specialized capabilities of resource-base institutions in the industrialized nations are now being more effectively linked into the system. Connections between such resource bases and the international centers, as fostered by recent grants and contracts, should add importantly to the system's capacity to resolve some rather critical biological, agronomic and, perhaps, economic problems.

B. International agricultural research centers now exist, or are in the process of development, to deal with the major food crops, animals, and associated production problems. Effort should therefore be devoted to bringing these centers on stream so that their research, training, and outreach potential may be fully exploited. To help assure that adequate resources continue to be available to the existing international centers, some caution should be observed in the formation of additional international agricultural research and training institutes, at least for the next few years.

C. Advances are possible in national agricultural research services and in provision of the requisites for their success. More trained people are in place. These young scientists are increasingly attuned to the larger system in which their institutions are critical links. A major objective of the international centers and other assistance agencies should be to help strengthen these national research services. While insights are being gained into how this may be done, the process is nevertheless complex and differs from one country to another.

Mounting evidence demonstrates that actual returns to nations on investment in successful agricultural research is high; and, in the judgement of this

conference, it is essential that the process of strengthening national capacities be accelerated. The need is apparent, we have insights into means of doing it, and the timing is propitious.

D. At the producer level (where the actual production increases must be obtained) generally favorable prices offer strong inducement to increase output. Projections of continuing food shortages and population increases suggest that these relationships are likely to continue. The producers' real concerns, and those of responsible governments, relate to getting access to and understanding relevant technology; obtaining the required production requisites, especially the indispensable fertilizers, fuel, seeds, and plant protection products. For the development of these and other essential food-production services, farmers have every right to look to their state and national agricultural research institutions and related agencies.

Some actions to strengthen national institutions discussed at the conference

The conference concluded that for reasons mentioned above it was highly desirable that donors, recipient nations, international institutes, and others review and analyze existing or contemplated activities to strengthen national research systems. Further, it was the consensus that most of these discussions should be held jointly so that all parties would be fully informed. Failure to do so would be less efficient and might be misunderstood by some of the interested groups.

Among the types of action identified and discussed by the conference were the following:

A. Direct actions:

1. Establish more outreach projects and otherwise encourage more direct participation of the international centers in national programs. The

group favored center involvement in national programs but recognized that caution should be exercised to assure that core program would not suffer.

2. Utilize existing regional centers and selectively create new ones to provide diagnostic and planning functions and to coordinate and transfer to national programs the technology arising elsewhere in the world system. This approach was seen as desirable provided the regional centers are closely associated with the international centers.

3. Increase the involvement of centers of excellence in the developed countries and in the LDC's in the national programs of agricultural research. Some of this is going on, but much more is possible.

4. Establish an international organization capable of supplying a range of support functions to national research programs on a contractual basis using long-term, highly experienced staff. This is a new activity and one which warrants further study.

5. Under bilateral agreements, assemble ad hoc teams for the range of activities referred to in "4." Some of this has been done by various donor agencies, but with variable results.

6. Establish a diagnostic planning unit based on a small core staff of highly qualified scientists and administrators to help developing countries diagnose problems, analyze needs, develop plans, and establish priorities for strengthening agricultural research systems. This unit could be affiliated with any one of several presently existing agencies or it could be a new and independent undertaking.

B. Indirect actions:

1. Assist in the mobilization of advanced scientific capabilities by means of active information services concerning research in progress and talent

available, by involving advanced centers in LDC research programs, and by improving consultancy services.

2. Improve training for medium- and long-term manpower. Many institutions are involved in this activity. Continued attention to making the training relevant to LDC conditions is needed.

3. Build research components into development projects and tie this research to the international network.

4. Conduct additional workshops and conferences on strengthening national programs.

5. Establish a special advisory group similar to TAC to study needs and means of strengthening national programs and to assist donors, national groups, and network units in the development of efficient cooperative activities.

The next step

The above actions were seen as presently or potentially important means of strengthening national research programs. Some are well established, and their continuation appears to be highly desirable. Others are untested, and the consensus was that further analysis and discussion are needed. Toward this end, and toward developing a better understanding of work now under way, the following actions were identified by the group:

A. Invite donor agencies to circulate descriptive lists of their projects related to international agricultural research programs and research being undertaken in or on behalf of the LDC's. It was suggested that the CGIAR Secretariat be asked to specify format and other details for this listing and to circulate the assembled material to all participating agencies. They might also arrange a one-day program, possibly just before the CGIAR meeting in

November, 1974, to discuss this work. Both donor representatives and international center representatives should be present.

B. Consideration should be given to convening a conference about one year from now to bring together donor agencies, officials from the developing countries, and others to review various of the subjects listed in the preceding section. The group expressed particular interest in further discussion of items "4" and "6" of the "direct-action" list and "1," "2," and "5" on the "indirect" list of the previous section. It was suggested that some officials from the LDC's be present to describe their programs and that a few case histories be studied which deal with efforts to strengthen national research systems and means of putting technology to use.

It was suggested that The Rockefeller Foundation accept an organizing role in relation to this conference, drawing on other groups and individuals for advice on planning and execution. Attention was called to the fact that several meetings planned by FAO, UNDP, IBRD, and others will bear on this same subject and that an effort should be made to benefit by their discussions in planning the proposed meeting.

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

1818 H St., N.W. Washington, D.C. 20433 U.S.A.
Telephone (Area Code 202) 477-3592
Cable Address - INTBAFRAD

March 18, 1974

Sir John Crawford
32 Melbourne Avenue
Deakin
Canberra, A.C.T. 2600
Australia

Dear Sir John:

I was glad to have your letter of March 5, concerning the interest of the Papua-New Guinea Development Bank in the work of the centers and concerning the status of proposals for improved agricultural research in West Africa. We are looking forward to your visit to the Bank in late April so as to discuss a number of matters concerning the Consultative Group and would take up these two questions with you again as you suggest. Meanwhile, I am setting out what I think about the two matters you raise.

First, there is the request of the Papua-New Guinea Development Bank for advice on the work being done in IITA and CIAT and, in future, in the animal research stations which we are establishing. IITA is working on all three crops you mention, yams, cassava, and soybeans, with particular reference to small holders. I am enclosing a copy of IITA's 1974 budget proposal which does indicate recent work and proposals now being applied in their research program. Last week, Herb Albrecht was in the Bank on his way back from the Center Directors meeting at CIAT and I discussed the two points in your letter with him. He would be happy to have the Development Bank write to him directly and would then be prepared to make contacts between his staff and the New Guinea people. He suggests that, on hearing from New Guinea, he could let them have the final report which is about to be issued on their 1972 research and the relevant papers based on the February 1974 review of their work program. I am sure too that he would have them put on the list for IITA's newsletter and other occasional publications. It would be useful for the Development Bank to specify directly to him the various lines of interest that they have.

Concerning CIAT, I am enclosing the similar document for 1974 on program and budget together with a copy of its 1972 Annual Report. The Center also has the only operating livestock programs for the international centers and perhaps the beef and swine work would interest New Guinea. I intend writing a short note to Jerry Grant so that he will be aware that he may hear from the Development Bank. We can leave the question of the livestock research centers to discuss in April.

I thought it best to send the material now available to you so that you could make the contact again with the Development Bank and at the same time invite them to contact directly Dr. Albrecht and Dr. Grant whose full addresses I have attached.

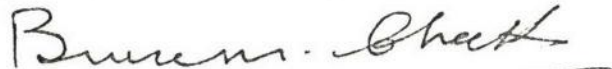
The "Betsche proposal" on rationalizing research in West Africa forms part of a larger picture of which you are well aware including questions of cooperation with the French in the CG, the need for closer relations between anglophone and francophone research in Africa, the desire of IITA to expand its outreach activities particularly in francophone countries -- and also the question of the effective operation of WARDA.

I have yet to take up with the West African Regional Office the results of their own review of Roger Rowe's memo of January 31 on this subject, which I sent you. At the same time, Mr. Baum has reviewed the comments of the French Alternate Executive Director, Mr. Faure, at the time of the 1974 IDA allocations to the centers, a copy of which I sent to you, and is asking us to take up with him the matter of our approach to collaboration with the French, starting from the exchange of letters between Giscard d'Estaing and McNamara in February 1973 when the French Minister put the trypanosomiasis proposal to him and urged that the CG support expanded programs in existing institutes in addition to creating wholly new ones.

By the time you come in April, I hope we will have a number of points to discuss with you on this rather broad and complex subject. I am attaching for your information both the Board summary on the IDA discussion which includes the French intervention and also the English extract of an article on agricultural science and research in Sub-Saharan Africa which proposes the creation of a Sahelian Institute of Agronomics which would have both training and research objectives. The journal from which this is extracted is called Techniques and Development and is published in Paris under the auspices of GERDAT and related French research institutes operating in Africa; this is from the November/December, 1973, issue. Finally, of course, we will have to see what benefit we can get from the CARIS pilot project in any review of West African matters.

With best wishes,

Sincerely yours,



Bruce M. Cheek

Enclosures

cc: Mr. Yudelman
Mr. Leslie Helmers
Mr. Roger Rowe
Mr. A. A. Neylan

BMC:mcj

5 March 1974

Mr Bruce Cheek,
Consultative Group on International
Agricultural Research,
C/- IBRD,
1818 H Street, N.W.,
WASHINGTON DC 20433. U.S.A.

Dear Bruce,

Would you be good enough to tell me what can be done to meet the request of the Papua New Guinea Development Bank for advice on the work being done in IITA and CIAT and, in future, the work of the animal stations in Africa or anywhere else we establish one. The Bank is particularly anxious to try and develop vegetable work in yams, cassava and soya bean, among smallholders. If at all possible I would like them sent the Annual Reports and any other documents that set out the nature of the work being done, then allowing the Bank to correspond direct on matters of interest to the staff there. Please do anything you can now, but you may wish also to talk with me about it when I come in late April.

Thank you for keeping me informed about Betsche's ideas. TAC's work cannot be reduced to a station by station review of what is going on within a hundred or more nations. It can, however, give strong blessing to efforts to review what is going on in important areas like West Africa and East Africa. This would be a first step to encouraging rationalisation of effort akin to, but certainly not necessarily identical in form to, WARDA. This is a matter I would like to discuss further with you and your colleagues in April.

Yours sincerely,


(J. G. Crawford)

OFFICE MEMORANDUM

1

TO: Files

FROM: Bruce M. Cheek *BMC*

SUBJECT: Workshop on Role and Function of International Agricultural
Research Centers

DATE: February 13, 1974

There will be a conference at CIAT in the week of April 22, 1974, sponsored by FAO and the UNDP, for the senior agricultural advisers and the resident representatives of these two organizations in Latin American countries.

The draft agenda is:

1. To inform participants of the work of the centers;
2. To inform the centers of the research activities in countries where the centers are operating;
3. To exchange views with the staff of the centers regarding what each sees as the major national research needs;
4. To examine the extent to which such needs are being catered for by the center programs;
5. To encourage better cooperation between the centers, national research and extension activities, particularly with reference to FAO/UNDP technical assistance in national programs and projects; and
6. To identify where and how new technology can be more effectively utilized with the aim in particular of advising governments and clarifying the country program objectives of FAO/UNDP.

cc: Mr. Yudelman
Mr. Fransen
BMC:mcj

I

June 24, 1974

Dr R.K. Waugh
Instituto de Ciencia y Tecnologia Agrícolas
Galerias Espana - 5o. PISO
7a. Av. No. 11-59, Zona 9
Guatemala, C.A.

Dear Bob:

Many thanks for your letter of April 4 and my apology for a tardy reply. However, I understand that Don Sutherland has visited Guatemala in the interim and, in principle, seems to support the proposal. I have mentioned your letter to him and added my support. I too feel that ICTA is following the right strategy to help solve problems associated with a developing agriculture.

Thanks also for your letter of December 6, 1973 and the note on ICTA. This is very helpful. Indeed, John Pino suggested that I write you for a copy of ICTA's constitution and format. I would be most grateful if you could send me a copy for use as a guide in other countries.

Best regards.

Sincerely yours,



James M. Fransen
Agricultural Research Adviser
Central Projects Staff

cc: Mr McGarry (with copies of incoming)
Mr Sutherland (with copies of incoming)
ARA Files--Guatemala Research (with incoming)

JFransen:jf

SECTOR PUBLICO AGRICOLA
INSTITUTO DE CIENCIA Y TECNOLOGIA AGRICOLAS
GALERIAS ESPAÑA - 5o. PISO
7a. Av. No. 11-59, ZONA 9
Guatemala, C. A.

April 4, 1974

Dr. James M. Fransen
Agricultural Research Adviser
Agriculture and Rural Development
INTERNATIONAL BANK FOR RECONSTRUCTION
AND DEVELOPMENT
1818 H., N.W.
Washington, D.C. 20005

Dear Jim:

Since our trip from Cali to Panama, I have had the opportunity to speak with Oscar Cordón and Ernesto Amado in relation to the Beef Cattle Project in Guatemala supported by the International Bank. I found that this project was, in a sense, seeking a home or some arrangement which would give their operations more flexibility and which would serve to develop technical backstopping.

We have now had three brief meetings with these people. We, in this case being: Ing. Astolfo Fumagalli, General Manager of ICTA, and myself, and Cordón and Amado. First, they indicated their general interest in the possibility of relocating their project and we furnished them with a description of our activities, informed them of our field of interest, and furnished them a copy of the Ley Orgánica of this Institute, ICTA.

Following that meeting, they definitely indicated their interest and drew up a "borrador" to be directed to the Minister of Agriculture, and which has served as the basis of discussion with us. (This has not gone to the Minister but he has been informed.) At that time, we had very little information about the cattle projects and we had the third meeting which was a general discussion as to the possibilities. Jim, you will understand that I am in no way at this time speaking officially, so please take my comments on this basis.

Lic. Cordón has discussed the matter with several people and the first reaction of the Minister and the National Planning Office was that ICTA might not be the place to put the project. The National Planning Office suggested that BAN-DESA, the agricultural bank, might be the location but Oscar Cordón is not in agreement with it, and I agree.

RECEIVED

Dr. James M. Fransen
April 4, 1974

2

ICTA can receive this group and personally, I hope that it can be worked out. I do not want to put pressure on anyone to locate this project with ICTA, but I personally feel that it would be highly desirable to do so. First, ICTA is a technological institute for agriculture and at this time we have only activities in crops, and just starting in swine. I think it would make a good sense to include cattle and then, those agronomic aspects such as pastures and soils and the social sciences such a sociology and economics could work with both, animals and crops. It is very likely, if they are not joined rather soon, that they never will be.

We also both know from personal experience that if we are going to join an animal activity with an ongoing agronomic activity, it is much better to do it at an early stage so that the agronomic activities do not build strenghten and capabilities proportionally greater than that of the animal group, and thus, move to the top into those positions which run the operation.

I do not know Ernesto Amado well and know Oscar Cordón only slightly better. I do have a very high regard for Oscar Cordón and I think we would be receiving a good leader if we receive the cattle project.

I can see some difficulties in getting this done and I know that the position of the Bank will be important. The kinds of problems that I can foresee at this time would be the usual ones. The commission which is essentially the board of directors for the project might not want to be dissolved, the Ministry of Agriculture might not want it taken directly out of their control, etc. There is also always the danger of a situation developing whereby the animal people do not collaborate well with the agronomic people, but if we handle this carefully, I think this part can be overcome.

Jim, as I mentioned above, I am not speaking officially but right off the top of my head, and if you have any comments, I would appreciate receiving them as personal observations and not necessarily as viewpoints of the Bank. I enjoyed seeing you in Colombia, and should you come to Guatemala, I sure hope that you will let us know a bit in advance. I think that ICTA has perhaps the most interesting production projects, which are just getting under way, that exist anywhere. I also believe that we are pretty close to full agreement on the kind of strategy that needs to be applied to production, and I personally appreciated your good strong verbal support at the meeting in Cali.

Sincerely yours,



Robert K. Waugh

P. S. My home address is: 9 Calle 3-45, Zona 10, Guatemala

RKW/pmi

435

SECTOR PUBLICO AGRICOLA
INSTITUTO DE CIENCIA Y TECNOLOGIA AGRICOLAS
GALERIAS ESPAÑA - 5o. PISO
7a. Av. No. 11-59, ZONA 9
Guatemala, C. A.

December 6, 1973

Dr. James M. Fransen
Agricultural Research Adviser
INTERNATIONAL BANK FOR RECONSTRUCTION
AND DEVELOPMENT
Washington, D. C.

Dear Jim:

It was good to see you at CIAT, and hope that you will pay us a visit here in Guatemala.

At this time, the new Instituto de Ciencia y Tecnología Agrícolas - ICTA has not started any animal work, but plan to start swine work during the first half of 1974. We have one man (M. S. from Florida State in Animal Nutrition, mostly ruminant) who is receiving 6 months of training with Jim Maner in CIAT. We also have identified a young Guatemalan at Davis who will finish his Ph.D. in genetics (animal) but who also, I believe, has a good base in nutrition who indicated his interest in production work. Perhaps we can hire him and give him the opportunity to learn about field work. He might be a leader in developing further animal production work, but we will give crop production and swine first priority during the initial stages of our programs.

If I don't see you before, we probably can have a good discussion at the meetings at CIAT in February. Also perhaps you could visit Guatemala during that same trip.

I am finding the work here a challenge, and up till now things have progressed satisfactorily, or even a bit better than we could have hoped. The test of our new institute should come next year when we start field work with farmers (production programs). At the present time we are testing crops and practices on farms.

I expect to be in New York about the third week of January. If there would be any good reason to do so, we might get together at that time.

Dr. James M. Fransen
December 6, 1973

2

Thanks very much for your letter and will look forward to seeing you early next year.

Sincerely yours,



Robert K. Waugh

P.S. Enclosed brief description of ICTA.

RKW/pmi

AGRICULTURAL SCIENTIFIC AND TECHNOLOGICAL INSTITUTE OF GUATEMALA

- ICTA -

ICTA is a decentralized autonomous organization of the Agricultural Sector of the Government of Guatemala. It is a new institution, inaugurated in May of 1973, for the purpose of contributing to agricultural production and rural development. The commonly used letter designation is ICTA, which in Spanish stands for the Instituto de Ciencia y Tecnología Agrícolas.

ORGANIZATION

ICTA is governed by a Board of Directors headed by the Minister of Agriculture of Guatemala. In addition, ex-officio members are the Ministers of Economics and Finance, the Head of the Economic Planning Council, and the Dean of the School of Agronomy, and one citizen at large, named by the other members of the Board.

The chief executive officer is the Director General (Gerente General).

Sub-Directors can be named as needed. The Administrative Services, headed by the Administrator, include officers of personnel, purchasing, accounting, cashier and budget.

A program office will be established and will include preliminary or feasibility studies, programming and evaluation, although how best to conduct this latter aspect has not been decided. The principal program operating arm of the institute is the Technical Unit, headed by the Technical Director.

RESPONSIBILITIES

It is the responsibility of ICTA to carry out research to solve agricultural problems which are related to the welfare of the rural population, to produce materials and determine methods to increase agricultural production, to promote the application of technology at the farm level and to contribute to rural development.

It is also the responsibility of ICTA to contribute to training of personnel at all levels needed for agriculture.

AREAS OF ACTIVITIES

As previously mentioned, ICTA is a new organization and its programs are not fully developed.

Initially, ICTA will concentrate on production of basic grains (corn, beans, rice, wheat sorghum), horticultural crops and swine.

ICTA operates as the main technological arm of the Government of Guatemala for agricultural production. It conducts research on its own experiment stations and on private farms. The aim is to determine technological packages for economic production and promote their application, working directly with farmers.

ICTA has a major educational and training plan to improve capabilities of its own personnel in universities and international institutions through short courses and longer term academic programs financed by foundations, funding agencies, international institutions and their own funds.

ICTA is developing a plan for agricultural production training in Guatemala starting in 1975.

POLICY AND PHILOSOPHY

ICTA is a member of the governmental sector and determines its programs in collaboration with the Ministry of Agriculture, the National Planning Council, the Sector Planning Office, and other institutions of the Agriculture Sector.

The programs of ICTA are directed toward contributing to increased production and the welfare of the small and medium sized farmer.

ICTA scientists are not only responsible for developing technology but also for its utility and its application.

ICTA believes that the appropriate technology can only be developed by studying the problems at the farm level and in consultation with the farmer, and by testing the technology with farmers before practices are recommended.

ICTA must concern itself not only with the technology of agriculture, but also the customs of the farmer and his family, availability of inputs and credit, markets, economic feasibility, infrastructure, and the general quality of rural living.

ICTA must coordinate its programs and activities with the National Agricultural Bank, the National Marketing Organization, with the General Services of the Ministry of Agriculture and other groups related to the rural sector, and other sectors such as health and education.

PRESENT STAFF

The technical staff of ICTA is small; at present there are (November 1973), among the Guatemalan personnel: 1 Ph.D. and 5 M.S. and about 28 University graduates.

PROGRAMS AND MAJOR AREAS OF WORK

Principal Areas and Products

As previously mentioned, ICTA will initiate work principally on production of basic food grains, horticulture and swine. The activities related to each product will be largely concentrated in selected areas of the country within four geographic and ecologic areas, the principal areas of production as follows:

- Central highlands: corn, wheat, and beans and horticulture, the latter two of lower priority;
- Eastern foothills and plains: beans, corn, sorghum, rice and swine;
- Northeastern lowlands: horticulture and rice;
- Pacific Coast: corn and sesame as an associated crop.

Specific Zones

More specifically, field work is being carried out at experiment stations and private farms as listed below. This work is designed largely to test and identify available technology.

- Quetzaltenango: corn, wheat, potatoes;
- Chimaltenango: corn, wheat, potatoes, beans;
- San Jerónimo: corn, beans, horticulture;
- La Fragua: no work being conducted but horticulture under irrigation is being planned for 1974.
- Los Amates: rice;
- Monjas and Ipala: Beans, rice, sorghum;
- La Máquina: corn, sesame.

The headquarters for the swine work and production training will be established at Cuyuta.

Soybean adaptation trial were seeded in 1973. A modest seem will be budgeted for further preliminary studies during 1974.

Production Work with Farmers

No major activities in production work with farmers have been initiated as yet. It is planned to organize production teams to work in limited areas of the Highlands, the Eastern foothills and plains, and the Pacific Coast to test technological packages in collaboration with farmers starting early in 1974. It is projected that this work will be expanded into major thrusts to increase production.

TECHNICAL AID AND NATIONAL AND INTERNATIONAL COOPERATION

Technical assistance and cooperation with national and international organizations was taken into consideration since the beginning of the planning of ICTA.

1. Agreement for Technical Assistance with CIAT

Even before ICTA was inaugurated, an Agreement for Technical Assistance was signed between the Government of Guatemala and the International Center of Tropical Agriculture (CIAT) of Colombia.

Under this Agreement, CIAT has assigned two professionals to Guatemala to work with ICTA, a technician assigned to CIAT by the Rockefeller Foundation to work with the General Manager, and another technician, using donation funds of that Foundation to work as Technical Director. CIAT has named the first technician mentioned as its Representative in Guatemala. In this way, strong relations are maintained with CIAT. Other CIAT professionals from the Colombian headquarters are actively participating in technical projects and the training of ICTA personnel.

2. Collaboration of USAID/Guatemala

The Agency for International Development has collaborated closely since the early planning stages of ICTA. The loan of USAID will be an important part of the budget of ICTA. Furthermore, ICTA has utilized funds of this organization for advisor's trips and for training purposes. During 1973 and 1974, a grant from AID will make possible the contracting of additional foreign technicians.

At the present time, there are two active contracts with the Universities of Mississippi, North Carolina and Texas A&M, sponsored by USAID, in the areas of Basic Grains, Soils, and horticulture, respectively.

3. Collaboration of Peace Corps

The Peace Corps of the United States has been collaborating in studies of the fertility of soils in the Research Division of DIGESA of the Ministry of Agriculture.

This work has been now transferred to ICTA and consists of a group of young college graduates who live in the rural areas of the country, conducting trials on the use of fertilizers.

It has been decided to request the extension of this collaboration with the addition of Peace Corps Volunteers with experience and knowledge of Agricultural Sciences in order to test technological packages, working directly with farmers in 1974.

4. Collaboration with INCAP

At present, the collaboration with INCAP is limited to studies on the nutritive value of sorghum, especially new varieties for which seed is being increased. It has been agreed that further collaboration is indicated as the programs of ICTA are developed.

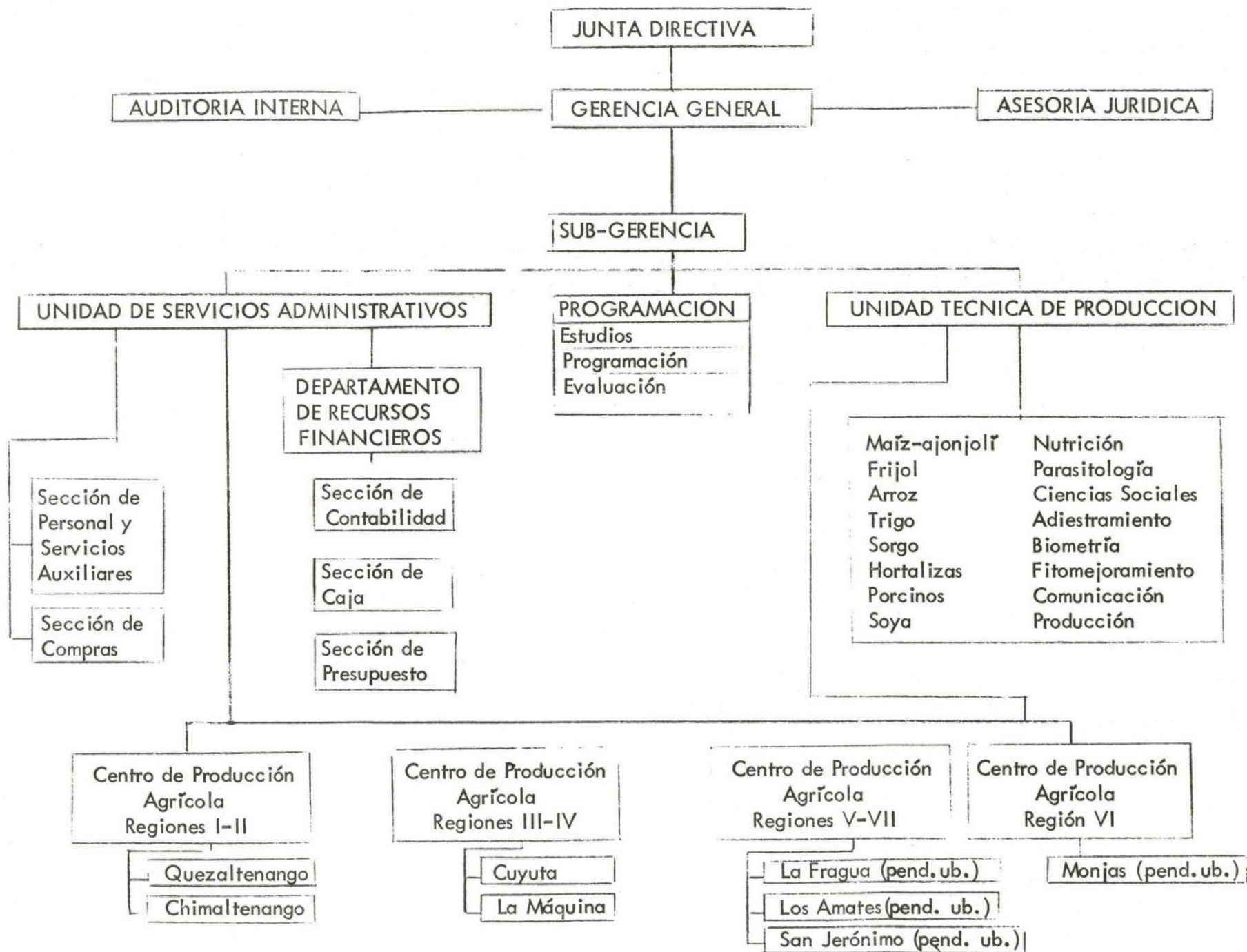
5. Other Collaboration Sought

Discussions are being conducted with agencies and institutions, national and international, interested in agricultural production and rural development. Some short-term consultants are needed but the greatest need of ICTA at this time is for active participation in its operating programs, wherein the foreign technician participates as a member of the ICTA team.

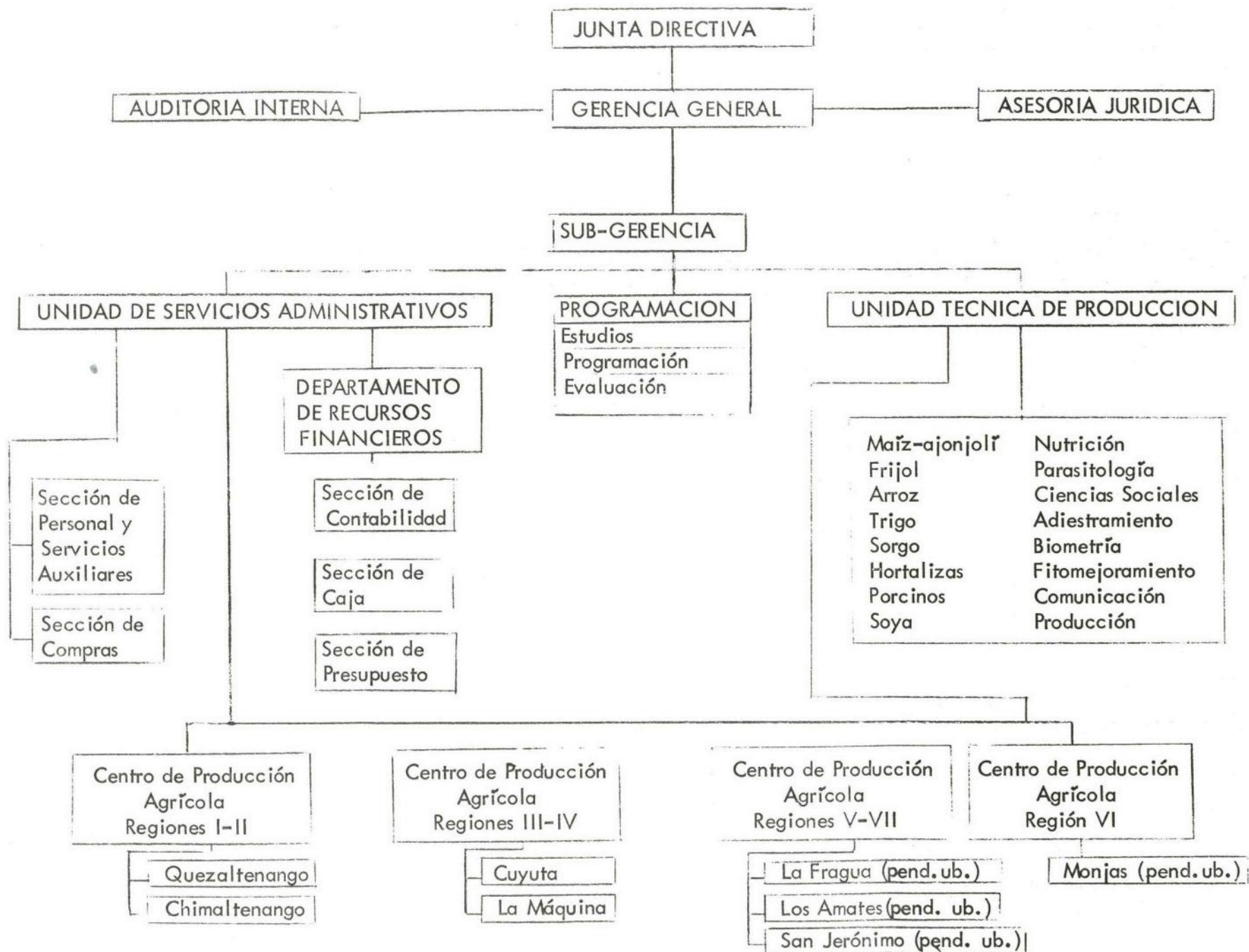
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11 NOV 1973

INSTITUTO DE CIENCIA Y TECNOLOGIA AGRICOLAS



INSTITUTO DE CIENCIA Y TECNOLOGIA AGRICOLAS



OFFICE MEMORANDUM

TO: Mr. W. Thalwitz

FROM: R. E. Rowe

SUBJECT: Agricultural Research in
Francophone Africa

DATE: January 31, 1974

I.

1. In a memorandum dated December 7, 1973¹, Mr. Peter Betsche examines the present status of agricultural research activities in French-speaking Western Africa and changes now under consideration addressed at instituting a greater centralization of activities and different financing formulae.
2. Present efforts in food crop research suffer from two major drawbacks: they are not always directed to the most pressing needs of the region and countries involved, and they are handicapped by an excessive degree of dispersion among an inefficiently large number of separate stations. Mr. Betsche proposes a Bank Group agricultural research sector review that would identify the precise content and impact of present programs; determine research needs on a priority basis; and make recommendations on how research should be organized.
3. As agricultural research, especially on food crops, is a key element in the successful formulation and implementation of development projects, particularly in the field of rural development, Mr. Betsche's proposals are very pertinent, and Bank concern and involvement in this field appropriate and deserving of high priority.
4. As you know, research in francophone West Africa is, for all practical purposes, in the hands of French Institutions. Mr. Betsche's proposal is basically that we should help these institutions and the governments to identify the gaps in their programs and to establish research priorities. Mr. Betsche also implies that, given the new emphasis that the institutions will place on individual research programs, there would be room for the Bank Group to participate in the financing of specific programs.
5. While I agree with Mr. Betsche's assessment of the present situation, I feel that the goals of the Bank effort that he proposes are too restrictive, and ignore the problem of research in the anglophone countries.
6. In my view the Bank's concern should be the establishment in West Africa of a permanent system of research adequate for the needs of all West African countries. With the exception of Nigeria (and there probably only in terms of cash) no country has the capability of mounting and sustaining

¹/ Memorandum to Mr. Hans Wyss, "Some New Developments Regarding Agricultural Research Stations in Francophone Africa - An Occasion to Re-think the Region's Need for Agricultural Research", copied to you.

an adequate agricultural research effort. Cooperation within the Region thus is essential; and probably effective cooperation over the long term will be possible only through a system of basic research being handled by international institutions and adaptive research by national institutions. The latter being assisted, as each national situation warranted, by outreach programs mounted by the international bodies.

7. To some extent these types of arrangement are already in effect. The International Institute for Tropical Agriculture (IITA) has been functioning for some years and has started a limited amount of outreach work. The West Africa Rice Development Association (WARDA) is assisting in national rice research activity as an intermediary between IITA and the International Rice Research Institute (IRRI) and the WARDA member Governments. Importantly the French Institutions operate on an international scale, although in the francophone countries only. They are, however, French national institutions and as such their programs and the quality of their programs may be subject to pressures and controls other than the real needs of the Region's agricultural sector. Thus while the reforms in the French based research effort described in Mr. Betsche's memorandum will probably result in somewhat better and more appropriate research they will not remove the basic disadvantages of a system whereby several countries are totally dependent upon a third party for the research needed to support their most important economic sector.

8. In an ideal situation, one might see the now to be consolidated French research effort being internationalized gradually and reshaped to provide, with existing and possible new international institutions, the basic agricultural research needed for the Region. I have no idea whether such a change would even be contemplated by France at this time, but in the interest of the future the possibility should be examined. In any case I think it very important that in considering immediate research needs we should not automatically assume that this research would best be carried out by the French Institutions. For example, there is virtually no research on irrigated agriculture in West Africa, yet this is of prime importance for many of the countries and especially the countries of the Sudano-Sahelian zone. A program of such research together with the provision of training in irrigated agriculture might be better handled by some form of new international institution than by GERDAT. Present deficiencies in arid zone research might also be handled in this way.

9. In view of the above I feel that any review of the research situation in West Africa should extend to the whole Region and consider the issue of the organization of research as well as identify specific research needs^{1/}. Given the key role of the French Institutions, however, the scope of a research survey can be determined only after an assessment of the French view on its long term role in the West Africa research scene. Consequently, I recommend that the Bank (the Bank representatives in these discussions would have to be fairly high powered) discuss this subject with the pertinent French authorities in Paris at an early date.

^{1/} I am somewhat skeptical about the assumption that GERDAT could not itself identify these research needs. Indeed, if it could not I would have major reservations about its ability to carry out effective research programs.

Mr. W. Thalwitz

- 3 -

January 31, 1974

Should these discussions prove favorable, it would be necessary to incorporate some time for research sector analysis in our and probably CPS's, but with the major effort in FY76.

10. As in the recent discussion on the Ivory Coast Oil Palm III Project the CPS representative indicated some strain in Bank/French Research Institutes relations, it will be essential to develop a Bank policy on this matter before any discussions are held.

RNRowe/mjt

cc: Messrs. Darnell
Cheek ✓
Wyss
Wadsworth
van Gigh
Betsche

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT
INTER-OFFICE MEMORANDUM

TO: Mr. Hans Wyse

December 7, 1973.

FROM: Peter F. Batsche

(Abidjan Office)

SUBJECT: Some new Developments regarding Agricultural Research Stations in Francophone Africa - An Occasion to Rethink the Region's Need for Agricultural Research.

INTRODUCTION

1. As a result of the space race, we have witnessed a quantum jump in technology equivalent to the rise of agriculture in neolithic times. Yet agriculture in tropical development countries, especially production of subsistence crops is still uncomparably below the capabilities and achievements of our time. Is it justified to accept yields of 700 kg of sorghum per hectare in Western Africa when genetic improvement of seed material results in yields of 8,000 kg and more in the U.S.? Increasingly food-crops are becoming cash crops in our Region. Supplying the ever growing urban agglomerations with the necessary foodstuffs becomes difficult ^{1/}. Many countries will be faced with the issue of either seeing their export-crop output dwindle or alternatively import more foodstuffs if their foodcrop per-unit-production cannot be increased dramatically. Where is the economic balance?
2. The present administrative changes of agricultural research in Francophone Africa are giving the Region a timely opportunity to reassess and analyze research needs in Western Africa. Such a review could be tied to a compelling international objective like the Schelian Drought relief or, in wider terms, the Bank's drive for income distribution and help to smaller farmers. It could take stock of the present situation, identify shortcomings and suggest priorities. It could prepare the Bank to make recommendations with a regional (if not worldwide) coherence and it could become the first basic document indicating economically justified research priorities on a West African basis, a reference guide for national, bilateral and international agricultural research in our Region.
3. Agricultural research can become the catalyst, the central innovative feature of a new and meaningful development effort. And when research investments pay off, they do so by generating geometric, not arithmetic, loops. This introductory excursion leads us back to the question at hand.
4. During the last few months, I had the opportunity of discussing with Messrs. P. Tuley (CDA), Cassé (FAC), D. Mascolo (Ministère de la Recherche Scientifique, Ivory Coast and INRS Quebec), Ollagnier (IFHO) and colleagues, certain developments in agricultural research which, I believe, merit Bank attention given the importance which we attach to rural sector development.

^{1/} See also minutes of Department Directors' Meeting, DDM/A/73-5 of June 18, 1973, World Food Situation

Background

5. France maintains a considerable number of agricultural and scientific research institutions in Francophone Africa (Annex 1). Until a few years ago, these institutions worked on their own and set themselves their goals. Freedom in research was jealously guarded but is responsible for the wide range of quantifiable achievements that was obtained by the different institutes. With a view to improving the situation, France, in the beginning of the 1970's, superimposed on the research institutes GERDAT, a body responsible to the "Direction Générale de Recherche Scientifique" (DGRS) of the Ministry of Scientific Affairs. GERDAT is both a coordinating and controlling body. Upon inception, established research institutions met the move with considerable opposition. Yet GERDAT has been able to establish itself and is giving increasing proof of its usefulness.

6. It appears that the next step towards a centralisation of the French research effort might be the merger of the various institutions of the GERDAT group into a single "Centre Polyvalent de la Recherche Agromique Tropicale" under the DGRS. Initial consultations between Mr. Doniau, Secrétaire d'Etat, and the institutions are now taking place. No doubt this new move will be resisted by the rather individualistic management of the various institutions and may well entail considerable changes in senior personnel with the inherent risk of loss of continuity. In this context it is worth mentioning that directors of the various institutes who are up for reconfirmation or election are, for the time being, obtaining mandates for only two or three years.

7. Up to now (with some variations according to country, research institution and costs), France, as a general rule, has paid a flat 50% of total costs of a research station with the host country contributing the other half. In some cases, France took over total cost. This arrangement involved for some nations considerable sums without their having control over application of funds or, consequently, their relevance to the particular needs of their country ^{1/}. When renegotiating aid conventions with its African partners, France is now introducing new financing arrangements for research.

Research Program Financing

8. The new formula now proposed by France would do away with the direct funding of entire research stations. Instead, funds would be tied to specific research programs. A research station's activities would thus consist of the aggregate of predetermined and agreed upon programs, each with its individual budget. Although identification and selection of individual programs is still handled rather casually, the trend is to introduce a special selection process by objectives with regional and national impact (in sophisticated cases with the help of pertinence and coherence graphs).

1/ Example: Ivory Coast budget 1973*	US\$ 12.3 million	100%
Financing French Contribution	US\$ 5.8 million	47%
Ivorian Participation	US\$ 6.5 million	53%

This example is given as an order of magnitude only. One should not infer that Ivory Coast was particularly unhappy about the financing arrangements.

* Budget of all agriculture research institutions.

9. Specific research programs would be financed according to the following formula:

- (a) for a program which only interests France, France would bear 100% of its costs;
- (b) for a program that is in the interest of the African country for which the program is financed and which receives the approval of France, or for a program which is agreed to be of interest to both, France would bear all expatriate cost, the African country the cost of African researchers and each would pay 50% of operations cost; and
- (c) for a research program which only interests the African country, the program would have to be funded entirely (including expatriates) by the country that wishes to carry out the project.

10. A category of its own is the "recherche d'accompagnement". It consists of research contracts with individual institutes for backstopping operations of agricultural projects and development schemes. The work covered under these contracts would consist mainly of field and screening trials under project conditions of previously tested materials and methods. For some institutions, the funds available for this project backstopping might be more substantial than those provided for their research programs (e.g. Dahomey, IRCT). However, these contract funds would clearly not permit venturing into new fields of research going beyond the immediate short term project requirements.

Brief Comment on New System

11. The main advantages of the proposed new system of research program financing appear to be a better control of, and discipline within the research stations. It permits an immediate orientation toward priority programs. (The policy needs careful handling if individual initiative is not to be replaced by a state of bureaucracy). Since the yardstick of success of an institute will be the accomplishment of its research program, poor conceptions or errors in programs might be detected earlier. Moreover, individual countries will have a decisive say and control in the setting of priorities for research institutions located in their territory. They will no longer be called upon to support research programs with little or no relevance to their own requirements.

12. The system has its shortcomings as well; what might appear as an advantage to one country might become a set back for the other. The major disadvantage could result in an increased nationalism and possessiveness of research data; the danger to neglect as irrelevant medium and long term programs, and, in certain cases, the inability to define research programs and identify meaningful priorities.

Regional Research Aspects and possible role of Bank

13. On the whole, advantages of the new system are likely to outweigh its drawbacks. Moreover, the switch to a programmed approach for agricultural research may well prove to be the catalyst for a host of research policy reviews and a new approach towards agricultural research in general. In this context, questions will arise regarding the economic and financial justifications of research programs, the need to strike a regional balance and coherence of country, regional and international research efforts.

14. BERDAT/FAC are thus faced with a formidable task and may increasingly seek the cooperation of institutions with regional and international experience like the Bank to help them identify and assess economic priorities and programs. Likewise, we might be able to assist the Governments in the region by helping them to define meaningful research objectives from a development planning point of view.

15. The Bank has had frequent contacts and a rewarding relationship with agricultural research institutions in Western Africa. The justification or "raison d'être" of many of our projects can be traced back to them. It is likely that the Bank's dependence on agricultural research will increase in the future, especially since our rural development projects hinge upon an innovative package for all farmers of a given area and therefore must include the hitherto rather neglected foodcrops ^{1/}.

16. Up to now agricultural research in our Region has mainly been orientated towards export crop improvements with very little attention given to staple foodstuffs. This approach ignored that traditional West African farmers in their majority still give highest priority to their subsistence needs in terms of labor input and timing of their work. This traditional ranking of work priorities accentuated the fact that ecological conditions dictate or limit the work potential of the West African farmer. He can only harvest what his family labor was able to till at the outset of the rains. Expansion of acreage is only possible through an increase of the rural labor force as mechanical cultivation methods. Export or cash-crops are, therefore, only produced on the cultivable acreage the farmer does not need for his own foodstuff requirement. This acreage is more limited the lower the yields he obtains on his subsistence plots.

17. All over Western Africa nutrition problems are increasing. The swelling of urban areas absorbs increasing amounts of foodstuffs while per unit production has scarcely increased. Foodcrops are more and more becoming market-oriented cashcrops. I, therefore, believe that unless we can genetically improve foodcrop yields (or introduce exotic, adapted, high yielding seed material), per capita exportcrop output will eventually decline ^{2/}. In countries which derive most of their export earnings from the agricultural sector, this trend cannot continue without affecting in time their balance of payments. This is not to say that increasing yields

^{1/} See para. 5 of memo of Mr. R. Rowe to Mr. L. Pouliquen, dated November 9, 1972.

^{2/} See for example: Ghana-cocoa project, Credit 205 GH, Supervision report dated October 10, 1973, para 2.01.

is necessarily the only decisive incentive for the farmer to move from a subsistence towards a market economy. Improvements in the marketing system, adequate price incentives at the input and output levels may be even more important in certain countries, but the only lasting and real solution to our problem lies in the increase of agricultural production per cultivated unit through genetic improvement.

18. The present changing situation in agricultural research in Western Africa offers the Bank a unique opportunity to reassess its needs, identify priorities and influence the programming of research toward economically sound objectives in the Region ^{1/}. Bank involvement in this field would not necessarily imply financial support. Bilateral and other organizations and aid programs would probably be eager to contribute towards well conceived research objectives, corresponding to economic priorities assessed by the Bank on a regional basis. Such an assessment could very well become the basic document and reference guide for future research efforts in our Region. Moreover, and when presented on a West African basis, it could be a useful indicator of regional priorities to international agricultural research organizations, providing a basis for an exchange of material and information on other continents with similar ecologies.

19. The proposed West Africa Region agricultural research sector review would have to be split into two phases, namely:

- (i) a preliminary stock taking phase which could consist of:
- a listing of all national, international, bilateral, etc. research institutions in the Region, an analysis of their links, backstopping or cooperation agreement, a short description of their fields of specialisation, past achievements, short and long term programs. This detailed stock taking of research results and research expectations should be done on a crop by crop basis.
 - a listing of export crop production, foodcrop production, export and import country by country, ecological zone by ecological zone. Food consumption and export crop production projections. First assessment of deficiency zones and economic crop growing potentials.
 - identification of the most appropriate methodology to assess and justify agricultural research programs economically (methods elaborated by SPRU -Science Policy Research Unit, Brighton, UK; INRS -Institut de la Recherche Scientifique, Quebec, Canada; and MIT).

^{1/} See Agricultural Research Programs in Western Africa, Memo n° 357 dated November 12, 1971 from Mr. de la Ronaudière to Messrs. Chauffournier and Evans.

- (ii) the second phase would consist mainly of identifying and justifying research priorities:
- drawing up of regional coherence charts of agricultural research for the various ecological zones, identifying short and long term deficiency zones ;
 - identifying the fields of agricultural research with the highest, economically justified, priorities on a regional and country by country basis;
 - suggestions concerning implementation of regional priority programs and their link with international efforts.

20. This review, undertaken by Bank staff with the support of various specialists from established institutions, would enable the Region to express its views and recommendations in a coherent way when assisting governments or institutions to draw up their research programs. Its leads could be taken up by economic and agricultural sector missions which should contain a detailed research chapter.

21. I recommend to discuss the foregoing proposal at HQ during my forthcoming visit. Do you agree?

PFBatscho/ma

cc: Messrs. Choufournier
de Vries
de la Renaudière
Wright
Thalwitz
Rove
Van Gigh
Wadsworth
PMWA

I

INTERNATIONAL AGRICULTURAL RESEARCH CENTRES

WASHINGTON - JULY 1973

ADDITIONAL BILATERAL RESEARCH SPONSORED BY BRITAIN WHICH SUPPLEMENTS
INTERNATIONAL CENTRES' PROGRAMMES

At the meeting of Directors of the various International Agricultural Research Centres, held at Bellagio in February of this year, the following observation was made.

"The Directors wish especially to note and commend the practice, now being developed by some of the donors and some of the centres, of working out joint or cooperative research projects between the centre and certain research laboratories in the donor country. This not only facilitates communication but brings to bear on basic problems vital to the centre's objectives a wider dimension of professional competence and facilities which the centre would find difficult to develop independently."

INTRODUCTION

In 1973 Britain contributed \$1.2m to the budgets of several International Agricultural Research Centres. These funds were given mainly to support certain selected parts of the research programmes of the International Institute for Tropical Agriculture (Legume physiology, soil and related research in the Farming Systems Programme), International Rice Research Institute (Rice Varietal Improvement Programme) and International Potato Centre (Taxonomy and Genetics Programme); a contribution to the enabling fund of the International Crop Research Institute for the Semi-Arid Tropics, was also included.

In addition to the above support the Overseas Development Administration (ODA) sponsors research work within the United Kingdom which is aimed at supplementing and reinforcing the programmes of various institutes. This extra research is financed from ODA's bilateral aid funds and does not compete with the support given direct to the International Agricultural

/Research

Research Institutes; this latter aid comes from ODA's multilateral pocket. Agreement for doing this work is reached after comprehensive scientific consultation and discussion between International Institute staff, ODA professional advisers and appropriate British scientists from universities or research organisations. This initiative, which began before the Consultative Group was established, is modest in size but is now considered to be important enough to bring to the attention of the Consultative Group, the Technical Advisory Committee and staff of the various International Institutes.

During the past two years, various International Institutes have become aware of several ODA bilateral research projects in developing countries the work of which is directly relevant to their own programmes of research. It is ODA's wish that strong scientific links should be established between these projects which are mainly but not exclusively in Africa and appropriate International Institutes.

Also, ODA has four scientific units in the United Kingdom, the Tropical Products Institute, the Centre for Overseas Pest Research, the Land Resources Division and the Centre for Tropical Veterinary Medicine. Any special competence and expertise possessed by these laboratories can be used to fortify the programmes of the various international institutes.

A. RESEARCH PROJECTS WITHIN THE UNITED KINGDOM LINKED WITH OR RELEVANT TO PROGRAMMES OF INTERNATIONAL INSTITUTES.

These projects cover three major activities, Animal Health, Grain Legume Research (physiology, breeding, nutrition, protein quality, microbiology and crop protection), Soil and related research (chemistry, physics, microbiology, fertility and environmental factors); two further projects deal with drought tolerance in cereals and potato genetics. Since projects are usually supported for three years, all subsequent costings are for that period. During 1972-75 the total cost of 15 such projects will be

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well in excess of \$1.25m.

1. Physiology of Grain Legumes - Reading University

To select or breed cultivars of Cowpea and Soya for the diversity of environmental conditions found in the humid tropics is both difficult and lengthy. Reading University (P A Huxley and staff) has placed its controlled environment facilities at the disposal of the IITA Grain Legume Programme (K O Rachie and staff) for screening the effects of such factors as day and night temperatures, daylength etc. As yet controlled environment facilities are not operational at Ibadan. Cost \$230,000.

2. Grain Legume Research - Cambridge University

Two lines of work are in progress - plant breeding and nutrition. The Cambridge programme (Alice Evans and K J Carpenter) is done in cooperation with CIAT (Phaseolus) and IITA (Cowpea); it is hoped it can become associated with ICRISAT (Chickpea). The germ plasm collection of Phaseolus vulgaris stands around 4,000 entries, breeding for rust resistance and studies of evolutionary genetics based on wild material have started. Screening for crude protein, methionine, trypsin inhibitors etc have been done and bioassays with rats and chicks are carried out for protein digestibility. Similar work will be done with Cowpea and perhaps Chickpea. Cost \$135,000.

3. Legume Protein Quality - Durham University

In cooperation with IITA, Durham University (D Boulter) is attempting to identify lines of Cowpea with high protein content, particularly those with high levels of methionine and low levels of toxic compounds. A quicker and improved method of determining S-amino acids is being sought. It is hoped to extend this work to include other grain legumes. Cost \$42,000.

4. Soil Microbiology Research - Rothamsted Experimental Station

Rothamsted Experimental Station (P J Dart) is working closely with the

/Farming

Farming Systems and Grain Legume Programmes of IITA on problems associated with nitrogen fixation. Cost \$53,000.

5. Crop Protection Research - Legumes - Wye College (London University)

Wye College (R L Wain) has made important contributions to our knowledge of the chemical basis of disease resistance in temperate legumes, e.g. the discovery of Weyerone. It is intended to extend this work to examine tropical legumes; a range of seed has been obtained from IITA and exploratory work has commenced. Cost \$40,000.

6. Groundnut Breeding - Reading University

Previously unknown species of Arachis are possible sources of resistance to important cultivated Groundnut diseases and pests such as Leaf Spot, Rosette virus and nematodes. A modest breeding methods research project at Reading University (A H Bunting) will concentrate initially on an attempt to introduce into A. hypogaea, by way of A. cardenasii and A. chacoense, resistance to Leaf Spot, one of the major Groundnut pathogens. This work will be linked with the appropriate International Institute when responsibility for Groundnut research has been allocated. Cost \$32,000.

7. Root Growth in Tropical Soils - Letcombe Laboratory, Agricultural Research Council

Methods for studying the distribution and function of root systems in soil, developed at the Letcombe Laboratory (R Scott-Russell), have been placed at the disposal of various programmes at IITA. Such cooperation should improve knowledge of root systems of tropical crops and should increase understanding of those problems associated with establishment of crops when water shortage and mechanical impedance are important. Cost \$20,000.

8. Research on Soils of the Humid Tropics - Rothamsted Experimental Station

Two specific aspects of soils work are to be done by the Pedology Department of Rothamsted Experimental Station (G Brown and D S Jenkinson)

in cooperation with the soil research of the IITA Farming Systems Programme. One aim is to use the special facilities at Rothamsted to provide basic mineralogical and chemical data of well-defined soil profiles found in the principal climatic/vegetation zones of humid West Africa by means of X-ray powder diffraction, electron microscopy, chemical and thermal methods. The other aim is to use techniques developed at Rothamsted, to study mechanisms of release of crop-available N, P and S in soils of the humid tropics which are subject to wetting and drying cycles. Cost \$75,000.

9. Research on Hydrous Oxides and Sorption Properties of Soils of the Humid Tropics - Reading University.

IITA is concerned with the assessment of changes in soil fertility produced by intensification of soil management systems. Such changes are to be studied at appropriate sites throughout West Africa. Some basic studies on aspects of this work will be done at the Department of Soil Science, Reading University (D J Greenland) which has special expertise in methods of examining forms, sorption-behaviour and amounts of hydrous oxides in soils and of interpreting effects of certain changes on soil properties. Cost \$60,000.

10. Predictions of Growth and Yield of Some Tropical Crops. Nottingham University/Reading University.

Previous work at Nottingham University and Reading University (J L Monteith and J Elston) has shown that predictions of growth of rice, maize, soybean and groundnuts, by use of models, and based on weather measurements, have been surprisingly accurate when compared with the actual growth of these crops. Similarly, physiological information has enabled fairly accurate predictions of yields of these four crops, i.e. the proportion of growth contributing to economically valuable parts. It is postulated that, if differences between prediction and reality can be accurately measured and if the times at which they arise are known,

/then

then reasons can be put forward why actual growth and yield are less than maximum possible values. This basic information could provide a more satisfactory alternative to the ad hoc approach and could lead to more rational experiments designed to test agronomic ways of improving growth of crops and increasing their yield. Future work at Nottingham and Reading on this subject will be done initially in cooperation with IITA but it could be extended to include those other institutes which also have an interest in this problem. Cost \$45,000.

11. Potato Genetics and Taxonomic Research - Birmingham University

This work fits into a wider scheme of experimental taxonomic research for potatoes whereby the evolutionary relationships of potatoes are investigated with special reference to the cultivated species. The knowledge thus gained should provide a deeper understanding of the reproductive and evolutionary biology of the group and thus facilitate its more efficient utilization by potato breeders. For example, gene flow from diploid to tetraploid and vice versa in Andean cultivated potatoes may be important. Birmingham University (J G Hawkes) in association with CIP will assess progeny of crosses between a range of cultivated diploids (Solanum stenotomum and S. phureja) and the tetraploid, S. andigena. Cost \$4,500.

12. Water Relations of Cereals - Plant Breeding Institute, Cambridge.

This work at the Plant Breeding Institute (under supervision of Ralph Riley) will attempt to identify those plant attributes which confer drought tolerance on cereals. Although barley will be studied initially, it is hoped that information obtained by this project will be useful both to ICRISAT and CIMMYT. Cost, \$22,000.

13. Trypanosomiasis Research

Altogether \$500,000 per annum is allocated by ODA for research on trypanosomiasis. Advice is given by a panel of eminent scientists and these research funds are distributed to organisations both in UK and

/overseas

overseas to work on all aspects of trypanosomiasis and tsetse fly research. Some of this work will be relevant to the research programme planned for ILRAD.

14. Tsetse Research Laboratory - Bristol University Veterinary School.

This laboratory has established techniques for the artificial rearing of tsetse flies which are then distributed to research institutes throughout the world. Again, this activity should be useful to ILRAD.

Cost \$225,000.

15. Foot-and-Mouth Disease Research - The Animal Virus Research Institute - Pirbright.

The World Reference Laboratory for Foot-and-Mouth Disease at Pirbright receives funds from ODA for epidemiological research into the distribution and persistence of foot-and-mouth disease in East, Central and Southern Africa. Their findings form the basis for the control of the disease in those parts of Africa and current research is directed at interpreting the role of game as reservoirs of disease. Such work should obviously be associated with that of the proposed International Livestock Centre for Africa (ILCA). Cost \$120,000.

B. SOME RESEARCH PROJECTS IN DEVELOPING COUNTRIES RELATED TO PROGRAMMES OF INTERNATIONAL INSTITUTES.

The following nine examples of projects are taken from the ODA bilateral programme. They are supported for three years in collaboration with the relevant national governments and their cost will be in excess of \$1.6m for the period 1972-75.

1. Maize Agronomy Research - Kenya

A four-man British research team comprising two agronomists (A Y Allan, D Laycock), a soil scientist (P H Cooper) and a plant physiologist (R Law) are based at the National Research Station, Kitale.

/Along

Along with colleagues within the Kenya Department of Agriculture, they are attempting to provide further agronomic information on how to improve the yields of existing high-yielding maize varieties in different ecological zones of Kenya. Another objective is information on the agronomic requirements of new higher-yielding material coming forward from the Kenya Maize Breeding Programme. Thirdly, it is hoped that basic studies of maize/soil/water relationships and careful analysis of growth of new varieties throughout the growing season will provide parameters useful to the National Maize Breeding Programme. It is suggested that close links with CIMMYT and other institutes would be valuable. Cost \$237,000.

2. Maize Breeding and Agronomy - Malawi.

This ODA research project located at Chitedze within the Malawi Department of Agriculture consists of a plant breeder (A Bolton) and an agronomist (A J Bennett). Their objectives are to produce higher yielding varieties of white flint or semi-flint maize with as much resistance as possible to Puccinia polysora, P. sorghi, Helminthosporium turcicum, to test the new varieties in different ecological zones and to examine the fertilizer requirements of any new varieties on various soil types and at different management levels. Again it may be useful to establish contact with CIMMYT and other institutes. Cost \$107,000.

3. Potato Research - Kenya

A team of 5 British agricultural scientists is employed at the National Agricultural Research Laboratory, Nairobi. It comprises a breeder (W Black), a horticulturalist (B Honess), a virologist (D Robertson), a bacteriologist (D C Harris) and a training specialist (J Bruce); each has a Kenyan counterpart. About 100 clones, bred at the Scottish Plant Breeding Institute, have been introduced. One has

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already been selected, bulked and should be released in 1974. A Kenyan potato breeding programme has been started, placing particular emphasis on yield, quality and resistance to Potato Blight. A comprehensive survey of potato viruses and vectors has been initiated and a close study has been made of the importance of Bacterial Wilt in Kenya and methods of screening and control. Training of East African potato workers has been started. The International Potato Centre has already been in contact with this project and it is to be hoped that even stronger links will be established, e.g. Kenya might have an important role in the CIP programme to provide potato varieties for warm tropical situations. Cost \$235,000.

4. Pigeon Pea Research - West Indies.

This project forms part of a programme involving the University of the West Indies, IDRC (sponsoring the breeding work) and ODA. The British responsibility will be threefold: comparing efficiency of native Rhizobia strains under varying conditions with material introduced from outside the region (P Quilt): studying the micro-climate of Pigeon Pea when grown as a row crop (large population) in Trinidad in the dry season with a view to understanding better the crop's tolerance of water stress (R Fordham): examining the epidemiology of Rust Disease (Puccinia cajani) which is severe in dwarf varieties grown in the row crop system and forecasting by means of the micro-climatological studies when outbreaks can be expected. ICRISAT and IITA may find this work useful. Cost \$245,000.

5. Some Problems Associated with Dryland Farming - Botswana

This three-man team of British scientists located at Content Experimental Station, Gaborones, comprises an agronomist/physiologist, an agro-engineer and an entomologist. Their work reinforces the

/Botswana

Botswana National Dryland Farming Research Programme. The failure of rainfall in this semi-arid region to meet potential evaporation except during erratic and limited periods necessitates study of soil/crop/water relationships and investigating optimal plant population and spacing in relation to water use; particular attention must also be given to those problems associated with germination and establishment of seed in soil which tends to cap (D Gibbon). The agro-engineer (R R Gladden) will work on tool and equipment design and methods of land preparation concentrating on tillage requirements, bearing in mind that power will be limited to draft oxen. The biology and control of American Bollworm (Heliiothis armigera) and Sorghum Stalk Borer (Chilo partallus) form the main work of the entomologist (R E Roome). These activities are in line with some of those of interest to ICRISAT. Cost \$215,000.

6. Soil Sulphur Deficiency - Northern Nigeria

Lack of soil sulphur has become more apparent throughout the world with the introduction of higher-yielding crops and sulphur-free fertilizers. This problem is even more acute in regions of heavy leaching and where there is negligible industrial pollution. An intensive study has been made at the Institute of Agricultural Research, Ahmadu Bello University (A R Bromfield) of the sulphur status of a wide range of soils with particular attention being given to sulphur-retaining properties. The amounts of sulphur which are added annually from the atmosphere have been measured at different centres. The cheapest way of supplying sulphur to sensitive crops such as Groundnuts is being worked out. The IITA is aware of this work and its staff are in contact with the project. Cost \$55,000.

7. Legume Microbiology - Malawi

This project (B J Whiteway) is supported within the Malawi Agricultural Research Council. A collection of soya bean rhizobial

/strains

strains is maintained and tested. Yields of soya have been significantly increased at various Malawi centres by inoculation of seed with improved rhizobial strains. Rhizobia capable of nodulating other legumes such as Phaseolus and Groundnut are also being tested. This work should be of interest to all International Institutes with a legume programme. Cost \$37,000.

8. East Coast Fever and Rinderpest Research - East African Veterinary Research Organisation, East Africa

ODA gives support in the form of staff and equipment to EAVRO and it arranges for UK organisations, such as the Agricultural Research Council Institutes at Compton (Institute for Research on Animal Diseases), Moredun (Animal Disease Research Association), and Pirbright (Animal Virus Research Institute) and the Ministry of Agriculture, Fisheries and Food Central Veterinary Laboratory at Weybridge, to participate in projects at EAVRO. Such support from ODA helps EAVRO form the base for the UNDP Special Fund Project of immunological research on tick-borne diseases. The part of the project which concentrates on East Coast Fever is likely to be incorporated into the ILRAD programme which will also probably receive funds from ODA. The project support given by ODA to EAVRO also enables that laboratory to produce most of the tissue culture vaccine used in the OAU Joint Campaign Against Rinderpest which is nearing completion in Ethiopia and Sudan. Cost \$485,000.

9. Bovine Pleuropneumonia Research - Federal Department of Veterinary Research, Nigeria

Studies of the immunology of contagious bovine pleuropneumonia have been done at the Federal Department of Veterinary Research at Vom, Nigeria. A neutralisation test using mice, developed at the Nuffield Institute for Comparative Medicine, London, was given practical trials in the field in Nigeria. The technique will be of value in assessing

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the potency of vaccines used to control this disease which causes considerable losses throughout Africa. This work should have some bearing on the programme of ILCA. Cost \$35,000.

C. ODA Scientific Units and Other Services in United Kingdom

The Centre for Overseas Pest Research, London (COPR) is mainly responsible for work on insect pests but also deals with birds and rodents. It is already working closely with IITA on a joint Pesticide Residue Project designed to test the effects of pesticide residues on soil flora and fauna populations, decomposition of soil organic matter and crop production; pesticide levels in soils will be monitored.

The activities of the Tropical Products Institute, London (TPI) cover a wide range but its main interests are those scientific, technological and economic problems which arise subsequent to harvesting crops, animals, timber and fish. It is concerned, therefore, with handling, processing, preservation, storage, transport, marketing and utilisation of plant and animal products and with industries based on them. Currently it is cooperating with CIAT on a project dealing with the storage of fresh cassava. The main causes of post-harvest deterioration are being sought and an attempt is being made to differentiate between physiological and pathological damage. Discussions are being held with CIMMYT about a possible project to study these factors which influence the susceptibility of improved varieties of maize to post-harvest infestation.

The Land Resources Division, Tolworth (LRD) is concerned with the assessment of land resources and the development of agriculture and forestry, almost exclusively in the tropics. Among the techniques used by LRD for resource assessment, airphotography interpretation, integrated survey, landscape analysis:land systems, and land classification are

of special importance. The staff of the Division comprises soil scientists, agriculturalists, rangeland specialists, foresters, ecologists, geologists, hydrologists, economists, etc. some of whom are already working closely with the Soils Programme of IITA and another has helped commission IITA's newly-installed laboratory equipment.

The Centre for Tropical Veterinary Medicine, Edinburgh (CTVM) deals with animal production problems as well as those associated with animal health. It is the youngest of ODA's four scientific units and thus its programme of work is not as developed as those of its sister units. However future cooperation with ILRAD and ILCA seems desirable.

Three additional but more modest services are maintained in UK by ODA by way of an Overseas Liaison Unit at the National Institute of Agricultural Engineering, Silsoe, a Tropical Section at the Weed Research Organisation, Oxford, and an Overseas Spraying Machinery Unit at the Imperial College (University of London), Silwood Park, Ascot. It may also be useful to note that several ODA specialist liaison scientists, based at appropriate British centres, are provided in the following disciplines: biometrics, crop and forest pathology, weed science, soil science, tropical botany and nematology; they have much experience in tropical problems and are available for short-term advisory visits.

FUTURE COOPERATION

It is hoped that this paper has provided members of the Consultative Group, Technical Advisory Committee and International Agricultural Research Centres with useful information which will enable them to assess how Britain can further help strengthen international agricultural research programmes through the work of its bilateral research aid programme and its scientific units. As we have

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seen, either use can be made of special research expertise and facilities within the United Kingdom or research projects which form part of ODA bilateral aid can be linked in some way with International Centres' outreach programmes. The Overseas Development Administration not only intends to continue with such support but is willing to consider proposals for further collaborative research projects along the lines described in this paper. Such activities are, as has been pointed out earlier in this paper, funded quite separately from Britain's contributions to core budgets of International Institutes.

Foreign and Commonwealth Office
Overseas Development Administration
Eland House
Stag Place
London SW1E 5DH

July 1973

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

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Telephone (Area Code 202) 477-3592
Cable Address - INTBAFRAD

April 30, 1973

TO: Members of the Consultative Group and of the Technical
Advisory Committee

FROM: Executive Secretary

SUBJECT: Meeting of Center Directors
The World Food Outlook

1. Members of the Consultative Group and of TAC will remember that at International Centers Week in 1972, directors of the international agricultural research centers decided to hold a meeting of their own to discuss matters of common interest. The meeting was held at Bellagio during February 1973.

2. Notes of that meeting now have kindly been made available by the directors, and are distributed herewith. It is requested that you keep them available for possible reference during International Centers Week in 1973.

3. The Ford Foundation likewise has made available a staff working paper dealing with the world food outlook. This also may be of interest to members of the Consultative Group and of TAC, and it is distributed herewith.

4. The tabulation of grants to centers, on page 24 of the paper, is based on information supplied by the Consultative Group Secretariat when the paper was in preparation. Since that time, there have been changes of a minor nature in the figures.

Attachments
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SELECTED NOTES

Meeting of Directors

International Agricultural Research Centers

February 11-16, 1973

Villa Serbelloni
Bellagio, Italy

Participating Centers:

AVRDC	Asian Vegetable Research and Development Center
CIAT	Centro Internacional de Agricultura Tropical
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo
CIP	Centro Internacional de Papa
ICRISAT	International Center for Research in the Semi-Arid Tropics
IRRI	International Rice Research Institute
IITA	International Institute for Tropical Agriculture

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INTRODUCTION

During International Centers' Week, 1972, the Directors of the various International Agricultural Research Centers met in Washington, D. C. for a half-day to identify and discuss issues of mutual concern.

The number of issues identified and questions raised led to a decision to get together for a longer session. Subsequently, the Directors accepted the invitation of The Rockefeller Foundation for them to meet at the Villa Serbelloni, Bellagio, Italy, the site in recent years of many conferences associated with agricultural and rural development. At the request of the Directors, Dr. Herbert Albrecht, director of IITA, made the arrangements and prepared the agenda based on their suggestions.

On February 11, 1973, 13 men representing seven centers convened at Bellagio for a 5-day meeting, with Dr. Francis C. Byrnes, secretary-treasurer of CIAT, serving as secretary.

Near the close of the meeting, the Directors, working in small groups prepared summary notes on the various agenda topics. This report represents a summary of the notes on those issues relevant to the deliberations of the Consultative Group on International Agricultural Research and associated donor countries and organizations.

The Directors wished it to be clearly recognized that, in recording these notes, they were setting forth how they see their own mission and responsibilities as well as their understanding of the mission, relationships and activities of the various organizations which provide support. To the extent their understanding or perceptions are not correct, they wish to be so informed. When the Directors discuss responsibilities --primary, secondary, etc.-- they refer to the work of the international centers, recognizing that much of this is accomplished by and through national institutions.

Participants in Meeting

Asian Vegetable Research and Development Center (Taiwan)

Robert F. Chandler, Jr., Director

Edwin Oyer, Associate Director

Centro Internacional de Agricultura Tropical (Colombia)

U. J. Grant, Director General

A. C. McClung, Deputy Director General

Francis C. Byrnes, Secretary-Treasurer

Centro Internacional de Mejoramiento de Maiz y Trigo (Mexico)

Haldore Hanson, Director General

Centro Internacional de Papa (Peru)

Richard L. Sawyer, Director

Edward R. French, Pathologist

International Center for Research in the Semi-Arid Tropics (India)

Ralph W. Cummings, Jr., Director

J. S. Kanwar, Associate Director

International Rice Research Institute (Philippines)

D. S. Athwal, Associate Director

International Institute for Tropical Agriculture (Nigeria)

Herbert Albrecht, Director

John Nickel, Associate Director

* * * *

Resource Persons:

Michael S. Ruddy, International Bank for Reconstruction and Development

Richard B. Myer and Cyriac Thannikary, International Institute for
Education

AGENDA

MEETING OF DIRECTORS OF INTERNATIONAL CENTERS

February 11-16, 1973

11 February, Sunday

After dinner	The Villa, ground rules and program	Dr. Wm. C. Olson
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12 February, Monday

0900 - 1000	Administrative details	Mr. Perugi
1000 - 1215	Inter-institute programs	H. Hanson, Chm.
1400 - 1730	Continue discussions	

13 February, Tuesday

0915 - 1215	In-house and external reviews Relationships among trustees, sponsors, CG and TAC Program determination and structuring	
1400 - 1730	Personnel matters	R. F. Chandler, Jr. Chm.

14 February, Wednesday

0915 - 1215	Continue discussions	
1400 - 1730	Continue discussions	

15 February, Thursday

0915 - 1215	IIE services and relationships	Resource persons: R. B. Myer and C. Thannikary, IIE
1400 - 1730	The budget process	U. J. Grant, Chm. Resource person: M. Ruddy, IBRD

16 February, Friday

0915 - 1215	Preparation of reports	
1400 - 1730	Review and acceptance of report	

The Trustees or Governing Boards

The Boards of Trustees or Governing Boards are the supreme bodies responsible for the respective international agricultural research institutes or centers. These Boards are entrusted with the responsibility for decisions with respect to policies, budget allocations and overall strategy of their respective centers for achieving the basic purposes for which each center was created. In so doing, they keep in mind the general allocation of functions set forth above with such modifications and extensions as may be approved within the constraints imposed by funds provided, for the most part, by members of the Consultative Group for International Agricultural Research (CG). Any major alterations or extensions of the field of coverage of a particular center would be brought to the attention of the CG and which in turn might seek the advice the Technical Advisory Committee (TAC) prior to action.

Acting within the above guidelines, each center is completely autonomous and independent. The Boards select and appoint the Director, establish the operating policies and general guidelines for the center's program, regularly review and oversee the center's program and operations, and assure that the center is proceeding satisfactorily toward the accomplishment of its major goals.

The Director is responsible for the execution of the center's program, including the selection and appointment of the staff, the full management of the program, and for reporting and communication with the Board, the sponsors or donors, the CG, and the constituency being served. He serves as a member of the Governing Board and as its executive officer. The Boards do not intervene in the day-to-day internal operation of the centers.

The Consultative Group

The Consultative Group for International Agricultural Research is an informal association of governments, international organizations, and private foundations whose members individually, and the group collectively have a deep concern for the improvement of agricultural (primarily food to date) production in face of rapidly growing populations in developing countries. It also is concerned about the welfare, well-being and improvement of opportunities for

independence and self-expression of the talents of the people served. Each member has at its disposal resources which it can apply toward this task. Each member retains the right of independent decision as to where the resources available for these purposes are invested. Each is seeking through joint consultation in the Consultative Group and through various other means to get the necessary information and background needed to make wise decisions as to how its resources can be invested and used for maximum effectiveness.

The CG secretariat provides service to the group collectively, to its members individually, and assists in providing communication and liaison among the group members and with the various international agricultural research centers. It attempts to help the CG members in balancing the allocation of their resources among the various centers to best advantage.

The Technical Advisory Committee

The Technical Advisory Committee was constituted to provide technical advice to the Consultative Group on: (1) global strategy for accelerating progress in agricultural, and especially food, production (and quality) in the developing nations, (2) quality and adequacy of proposals and programs designed to this end, (3) gaps in existing knowledge or programs needed to accelerate food production and means to fill these gaps, (4) appropriate distribution and allocation of responsibilities among international agricultural research institutes, especially for new functions not already assumed by existing institutes, and (5) any other ways in which progress in agricultural and food production and rural improvement could be accelerated in the developing nations. While concerning itself with center programs, its recommendations are made to the Consultative Group.

The members of TAC are selected on the basis of their individual competence to represent a wide geographic range of background and experience as well as a wide distribution of professional disciplines. The members, as well as its secretariat provided by FAO, do not represent the organizations, institutions or governments from which they are drawn. They are expected to be free, as agricultural statesmen, uninfluenced by any interest on organizational, national or regional ties or loyalties, to use their best judgment

to assure balanced and effective use of resources toward achieving agricultural and economic development on a global basis. The TAC justifies and gains the confidence of all concerned, including the donor members of the CG and the centers, to the extent that it functions in this manner.

The TAC establishes procedures for keeping informed on the performance and progress of the existing centers, and, from time to time, constitutes special task forces for making in-depth special studies on measures required to fill in gaps in needed programs required for accelerating agricultural progress. The TAC is an advisory body and does not have responsibility for program execution.

In filling these gaps, the TAC will enlist assistance from relevant groups in existing centers in making the evaluations more feasible.

It is hoped that the concerned center will be advised of any recommendation the TAC makes with respect to the program or allocation of functions of the center and that its Board might have an opportunity to consider and react thereto.

The Directors feel the need for more guidance from the TAC with respect to responsibility for intensive work on grain or food legumes. Present responsibilities assumed by the centers for food legumes are as follows:

ICRISAT	Pigeon peas Chickpeas	Primary Primary
IITA	Cowpeas Yam beans Winged beans Lima beans Soybeans Pigeon peas	Primary Exploratory Exploratory Exploratory Secondary Secondary
CIAT	Field beans (Phaseolus V.)	Primary
AVRDC	Mung beans	Primary
CIMMYT	None	
IRRI	None	
CIP	None	

Of the above, only ICRISAT feels that it has a clear and unequivocal mandate and there are obvious important gaps, such as soybeans, horse beans, perhaps groundnut, others.

Relationships

The relationships among the institutes, the Governing Boards, the Consultative Group, the Technical Advisory Committee, and the individual donor members of the CG supporting given centers imposes substantial obligations and responsibilities to assure appropriate and necessary flow of information, communication and understanding and for transfer of suggestions and ideas which may improve the effectiveness of this total network. This is inevitably an exacting and time-consuming process, but must be worked out in a manner which does not impose burdens on the staff of the respective centers to an extent which will interfere unduly with the professional and scientific program activities which are essential for accomplishing their major objectives.

The International Centers' Week is a key factor in this communication process. Here each center, each member of the Consultative Group and the members of the Technical Advisory Committee have opportunity to obtain an overview of each center's program and budget requirements. For the International Centers' Week to be most effective, however, a great deal of advance preparation and a considerable amount of supplemental and follow-up activity is necessary.

The paper, "Review Procedures," prepared by the Secretariat of the Consultative Group, identified as agenda item 9 of the CG meeting of November, 1972, has been reviewed by the Center Directors and is generally commended and endorsed as an appropriate procedure on a trial basis for the coming year, with the expectation that experience may suggest some refinements. To reduce unnecessary duplication of staff time, the visit to the center of representatives from the CG secretariat could coincide with or overlap with the meetings of the Trustees at the time when budget proposals are being considered. The Research Committee of the individual Boards might attend the in-house program review. Some representatives of the TAC or of the individual donors might

be invited as observers either to the in-house program review or a recap of the same. They could be invited as observers to commodity and over-all reviews.

Each of the donors will undoubtedly find other ways to communicate directly with the centers. The Directors wish especially to note and commend the practice, now being developed by some of the donors and some of the centers, of working out joint or cooperative research projects between the center and certain research laboratories in the donor country. This not only facilitates communication but brings to bear on basic problems vital to the center's objectives a wider dimension of professional competence and facilities which the center would find difficult to develop independently. Exchange of visiting scientists and scholars among the centers and relevant institutions in the donor countries would also seem to be worthy of more serious attention.

Collaboration Among Centers

1. The Directors recognized that the responsibility for accelerated food production in the developing countries is a joint task shared by many institutions, acting within a network of mutual collaboration and complementarity. The Directors considered it undesirable to assign any region or any crop, or livestock, or farming system as the exclusive responsibility of any center within this group. Rather, the network of centers and collaborating national and regional institutions should work in such ways as to make sure that any commodity or group of commodities in any region is best served through appropriate research, training, or other activities.

2. Within this network of collaborators, the Directors expect an international center to provide leadership on a general strategy for the group in relation to certain crops and systems, including, for example: Promotion of the world germ plasm collection, a dynamic breeding network, in-depth studies in such areas as physiology, biochemistry and genetics of the crop, as well as training, conferences and symposia. The Directors agreed that the leadership role is now being performed or developed by the centers in relation to the following commodities or farming systems:

AVRDC

Certain vegetables: Mung bean, Tomato, Chinese cabbage, Onion

CIAT	Beef, Cassava
CIP	Potato (solanum)
CIMMYT	Wheat, Maize
IITA	Cowpea, Yam, Sweet Potato, Farming Systems for the Lowland Humid Tropics
IRRI	Rice
ICRISAT	Sorghum, Millet, Pigeon Pea, Chick Pea, Farming Systems for the Semi-Arid Tropics.

3. In addition, some centers are adapting advanced technology and promoting accelerated production of certain crops and animals within their respective regions. These are:

AVRDC	Sweet Corn, Water Convolvulus, Cabbage, Cowpea, Sweet potato, Green pea.
CIAT	Phaseolus Beans, Swine, Rice, Maize, Agricultural Systems in Tropical America.
IITA	Cassava, Maize, Rice, Soybeans, Pigeon Peas.
IRRI	Cropping Systems Centered on Rice (South and Southeast Asia).

4. The Directors agreed that activities in paragraph 3, above, when involving a crop for which one of the centers takes general leadership responsibilities within the network (paragraph 2, above), should be considered as part of the overall strategy for the developing countries, rather than separate activities, and stressed the importance of consultation to insure that the relative advantages of each center in staff, materials, facilities and geographic proximity are utilized most effectively.

5. The Directors recognized that the ability of each center to provide assistance for crop improvement involves a "tooling up" process. Each center must:

- a. Build its own production expertise in each environment in which it works.
- b. Earn its credibility with governments and national institutions.
- c. Develop the confidence of donors.

6. The Directors reviewed examples of outreach programs, including IRRI (rice) and CIMMYT (wheat) in the 1960's. Those centers took at least five years to "tool up" by the following steps:

- a. Staff members of the Centers (IRRI) and CIMMYT) consulted with large numbers of national institutions each year for 5 years. They visited growing crops in various countries to observe production problems. They appraised national research facilities and research programs. They mingled with national research staffs to select training candidates.
- b. Fellowships were awarded to national research staff to spend 6-24 months at the centers. After return to their own countries, these scientists were visited each year by staff from the center to encourage them in their work. Generally, 5 years was required for the countries to develop, with the help of the centers and collaborators, the nucleus of their national staff for applied research and for production agronomy.
- c. Experimental nurseries were sent each year from the centers to collaborating national institutions. The nurseries were grown by the national scientists, including those trained at the centers. The nurseries served several purposes. First, they revealed the capability of different germ plasm in the environment of the specific country. Second, they trained local scientists in applied research. Third, they provided new guidelines for the breeding programs of the centers.
- d. Research administrators of the various governments visited the centers to gain better understanding of the new production proposals.
- e. Workshops were held every year between scientists of the national institutions and the staff of the centers.
- f. After 5 years, the "tooling up" began to show results. The center had accumulated some expertise. Credibility had been earned with governmental staffs, administrative and technical. Confidence of some donors had been achieved.
- g. The Directors agreed that the above process and timetable need not be the only approach. But the Directors recognized that each Center will need to build its own acceptability before outreach work is effective.

- h. When a government asks for help on a production project and there are several centers able to respond, the Directors expressed the view that the needs of the specific country will best be served by consultation among the centers, and by collaboration which draws upon the total resources for crop improvement.

The Directors considered the application of the above principles to several special commodity situations. The case of upland rice was one example.

In view of the importance of upland rice in Latin America and Africa as well as Southeast Asia, and in view of the great distances and language problems involved, IRRI should develop maximum collaboration with the programs of IITA and CIAT in order to make use of staff and facilities now being utilized for rice research and training in those institutions.

Given the several million hectares in upland rice in South America, a cooperative program among IRRI, CIAT, and one of the principal countries such as Brazil, would permit efficient and rapid development of upland rice in the area.

A similar project among IRRI, IITA and one or more of the countries of Africa might also be desirable. This approach would permit national programs in other countries to participate from the beginning, initially through training and international conferences, and later through outreach programs.

It is not the intent of the Directors that the above recommendations on upland rice should result in the reduction of the present level of work on lowland rice at various centers.

Another example was the case of the commodities for which ICRISAT has primary responsibility. The Directors felt that how ICRISAT will develop its network of relationships will have to await further developments of work at this newly established center.

Budgeting and Accounting

The Directors reviewed and accepted with minor revisions the draft proposal on Budgeting and Accounting Policies and Practices of International Agricultural Research Centers prepared by Mr. Michael Ruddy of the World Bank.

The Directors understand that, according to previous plan, the document will be reviewed by the Consultative Group and the donor agencies. With the concurrence of these agencies, the Directors feel that this paper outlines a reasonable framework for budgeting and accounting procedures and practices with sufficient uniformity to permit comparisons of budgets.

Personnel: Policies and Procedures

To the extent that local circumstances permit, the Directors agreed on the desirability of having fairly uniform personnel policies and procedures, particularly with respect to titles, interchange and recruitment of personnel, participation in commodity and professional conferences, travel and similar activities. They compared present practices on these matters, but agreed that each center will enunciate its own policies in this area.

Similarly, the Directors reviewed the Summary of Overseas Personnel Policies, as prepared for the meeting by William Gormbley of the Ford Foundation. They supplied missing information, revised out-of-date material, and generally agreed to bring policies into as close agreement as possible. The secretary was directed to incorporate the revisions and to circulate the revised document to the Director of each center for reference. They recognized that such factors as the following must be taken in account in comparing center policies on personnel perquisites: Whether the center provides for housing, nature and adequacy of local schools at the secondary level, distance involved in daily staff travel, and local availability of supplies and services.

Representatives of the International Institute for Education (IIE) reviewed the current procedures related to administration of international staff members, and the Directors asked them to prepare background data for later review on a number of issues associated with retirement benefits, income tax liabilities, and insurance. The IIE representatives agreed to study the situation and to report directly to the management of the center at an early date.

Plans for Next Meeting

Agreeing on the desirability of meeting periodically, the Directors scheduled their next meeting to be held during International Centers' Week.

From this time forward, responsibility for organizing the meeting and agenda will rotate among the directors on an alphabetical basis by center. Consequently, Dr. Robert J. Chandler, Jr., director of the Asian Vegetable Research and Development Center, will be in charge of arrangements for the meeting in July-August, 1973.

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BUDGETING AND ACCOUNTING POLICIES AND PRACTICES
OF
INTERNATIONAL AGRICULTURAL RESEARCH CENTERS

A draft proposal for consideration by the
Consultative Group on International
Agricultural Research and Directors
of Agricultural Research Centers.

February 15, 1973

For discussion purposes.
Drafted by the Consultative
Group Secretariat (M. Ruddy)
IBRD.

Budgeting and Accounting Policies and Practices of
International Agricultural Research Centers

1. This paper proposes a common framework of budgeting and accounting procedures and practices for the international agricultural research centers supported by the Consultative Group on International Agricultural Research. Work on this framework started in New York in February 1972, at a center workshop on budgeting and accounting practices sponsored by the Ford Foundation. During the past year, through correspondence among the participants, progress has been made toward developing generally agreed upon budget terminology, concepts and formats, together with consistent accounting practices and standard financial reports.
2. The balance of this paper describes the positions reached, and sets out recommended financial policies and practices for further consideration. The discussion is in five sections (Sections 2 through 6).
3. Section 2 defines basic terms used in describing Center operations.
4. Section 3 describes the planning and budgeting cycle.
5. Section 4 sets out a proposed format for the annual budget and describes proposed standard budget tables.
6. Section 5 covers the principal policies and practices proposed to be used in accounting for assets, liabilities, capital balances and unexpended funds. It covers the content of major categories of the balance sheet, provides definitions for various balance sheet items, describes accounting treatment and underlying policies, and proposes general rules for valuation and presentation.
7. Section 6 describes the statement of sources and uses of funds (the operating statement). It defines cost and sets out the general rules and

accounting practices which might be used in accounting and reporting for operating grants and contracts.

8. The concepts, definitions and report formats proposed in this paper are a starting point for evolving basic financial policies and practices; what follows is not a finished or polished product. It is desirable that work be continued to refine and extend the preliminary statements of policy suggested in this paper.

Section 2: Basic Terminology

A. Program

9. As used in this paper, a program is defined as a set of organized activities designed to progress toward defined objectives.

10. The core program of a center or institute is a set of long-term activities designed to progress toward the center's fundamental objectives of research and training, as described in a basic statement approved by the center's governing board (which some centers refer to as their 'mandate'). The core program need not be confined to the headquarters of an institute. Potato research at Huancayo, for instance, is part of the core program of the International Potato Center; and work for a core program may even be carried on outside the host country of an institute, for example by contract with another research organization or laboratory, or by other cooperative arrangements with national or regional institutes (sometimes called linkages).

11. The hallmark of the core program, so far as content is concerned, is that it represents the initiative of the center and carries the approval of the governing board. So far as finance is concerned, the core program is usually funded by several donors.

12. A core program may consist of a number of different activities aimed at different research questions or action targets. These also may be referred to as programs or program elements. A multiple-crop center, for instance, is considered to have a program for each crop with which its activities are concerned.

13. For purposes of making the annual budgets of international agricultural research institutes comparable with each other and more easily understood and evaluated by donors, it is proposed that the recurring expenditures of programs being analyzed in detail be assigned to the following seven "program" headings:

- (a) Research - This category shows the cost of study and investigation aimed at the improvement of crops, animals or agricultural systems.
- (b) Conferences and fellowships - This category includes the staff and other identifiable costs of conferences, workshops, symposiums, fellowships and training initiated by a center for the purpose of enhancing its capacity to plan and carry out a core program, as in the case of a scientific seminar designed to expose the problems of research into a particular commodity or of a fellowship to strengthen work on a particular problem.
- (c) Library, Documentation and Information Services - This category shows the annual cost of library services, of the publication of technical bulletins, of translating, of printing, and of miscellaneous public information activities.
- (d) Service Operations - This category shows the costs of station operations (such as the operation of motor pools, of building and grounds maintenance, and of guard services), and the cost of services which cannot be easily associated with specific programs.

- (e) General Administration - This category covers the cost of the Board of Trustees, the office of the director general, and of administrative functions such as accounting, personnel administration, procurement and other general administrative functions.
- (f) All Other - Any costs which cannot be associated with the above activity headings should be shown under this heading; to the extent they are not self-explanatory, they should be explained in a footnote. Two items which belong here are (1) an item indicating, to the extent possible, the costs of special projects, and (2) in the case of projections into future years, a one-line item showing any explicit allowance for price changes throughout the program.
- (g) General Operating - Into this category should be placed the cost of the necessary consumable supplies (electric power, fuel and the like).

B. Special Projects

14. Special projects usually are highly specific in purpose and limited to a definite span of time. They often are financed by a single donor, and are likely not to be continued or renewed when the donor's support comes to an end.

15. In contrast to the content of a core program, the content of a special project is often stipulated, or at any rate, strongly influenced, by the donor. The project usually consists, basically, of making practical use of a center's research results or its expert staff in a single country (which may or may not be the center's host country).

16. A large class of special projects is composed of outreach programs. These typically are programs of technical assistance by the personnel of an international

institute to research or extension efforts in a developing country, carried out under a contract with the recipient country and financed by that country with the help of an outside donor or donors. Examples include IRRI outreach projects in Bangladesh and India, and CIMMYT's assistance to wheat programs in countries of northern Africa.

17. Another class of special projects is composed of training exercises, carried out for the benefit of trainees from a particular country or region, and financed by a donor particularly interested in that country or region. Examples are some of the training exercises carried out by CIAT with the financial support of the Inter-American Development Bank.

18. The funds for special projects are not included in the allocations made within the framework of the Consultative Group. It often is not possible to understand the budget of a center, however, without knowledge of special project activities, and these should be adequately described in the budget presentations of the centers.

C. Capital Plan

19. In their present state of evolution, many of the international agricultural research centers have yet to complete their construction of buildings and acquisition of equipment. Even CIMMYT, though long established, is now engaged in a 10-year program of capital improvements.

20. The creation and completion of physical facilities can be expressed in a plan for capital expenditures. The capital plan includes the costs of acquiring land, of construction of equipment and furnishings, and of services and fees associated with these items, including fees for architects and consultants.

21. The capital plan obviously is of central importance to center planning and budgeting, since the capacity of center facilities will have an important influence on the level of operations and running costs. The plan may also provide an element of flexibility in center commitments and cash flow, since parts of it may be accelerated or deferred according to the availability of funds.

D. Funding

22. The resources necessary to carry out the work of the centers are partly in the form of grants or contracts made by foundations, governments and international organizations, and partly from the income of the centers themselves.

23. Five types of grants are commonly made by donors:

- (a) Grants which may be used both for core operations and for capital expenditures, so long as these items are included in the center's core budget and capital plan as approved by the center's governing board and presented at International Centers Week. Some donors are satisfied for the centers to decide for themselves how to allocate these grant funds; USAID expects that its grants of this type will not be used to pay for more than one-quarter of a center's capital outlays.
- (b) Core Unrestricted Grants - These are funds made available for the core program, as approved by a center's governing board and presented to International Centers Week, without being limited to specific elements of the program. Donors do not intend these funds to be used for special projects or for the indirect costs of such projects when these costs are additional to the center's normal running expenses. The basic Ford and Rockefeller Foundation grants to the centers usually are of this type.

- (c) Core Restricted Grants - These are funds made available for specific elements in the core program, including the support costs of these elements. Examples: Canadian financing of the triticale program at CIMMYT; the proposed UNDP grant for millet and sorghum research at ICRISAT.
- (d) Capital Grants. Funds made available for the capital plan of the center, as approved by the governing board and presented to the members of the Consultative Group at International Centers Week. With the specific permission of donors, such grants may be used to establish or replenish working capital funds or revolving funds, as may grants of type (a). Replacement of capital items, unless provided for in a capital grant, are charged to current operations.
- (e) Special Project Grants. These are for projects not presented to the Consultative Group for funding; they are likely to be solicited from individual donors known to be interested in the type of project in question. These grants should bear the full costs of the special project, including the cost of any burden put on a center's general services.

24. Except for grants of type (a), and apart from exceptions specifically agreed by donors, funds from these different types of grants are not interchangeable: that is, grants for core may not be used for the capital plan, and vice versa; nor may core and capital grants be used for special projects; nor may funds for special projects be used for other purposes.

E. Organization

25. For budgeting and accounting purposes the organization of a center consists of three major categories. They are:

- (a) Program Units - Organizational units charged with the responsibility of carrying out specific programs or program elements (whether core or special projects).
- (b) Support Units - Organizational units charged with the general support functions for a Center. Support units are further categorized as service units and general administration. In general, the costs of these units are not easily identifiable with or readily assignable to specific programs or program elements. The station operations activity, tractor pool or motor pool, would be examples of support units;
- (c) Auxiliary Service Units - Organizational units established for the purpose of providing services financed through revolving funds which are self-sustaining and do not draw on the center's program resources. Housing for trainees, snack bars and cafeteria operations are examples of auxiliary units.

F. Classification of Expenditures

26. Resources provided through various grants are classified at the time of disbursement as being for either program costs, support costs (including general administration and service operations) or general operating costs. In determining the total cost of a program, both the cost of support units, and general operating cost should be allocated to programs. That is, in accounting for grants and contracts the total cost of a specific program will consist of: its direct cost (i.e. personal services cost for staff assigned or contributing to the program, as well as supplies and travel directly related to the program, etc.); support

costs (that is, a fair share of the staff and other direct costs of support units), and general operating costs (i.e. a fair share of costs such as heat, light, power, general supplies, etc.).

27. In general, cost allocations for both support operations and operating costs should be made to all programs whether core or special on an equitable basis. In the absence of more refined cost accounting procedures, an allocation based on the ratio of a program's total personal services cost to the center's total personal services cost for all programs and projects can be considered equitable.

G. Staffing

28. In carrying out their missions, the International Research Centers employ staff in one of three major categories: Principal staff, support staff and general purpose staff. These are defined as follows:

- (a) Principal Staff - Staff assigned major responsibility for the conduct of a program, program element or major work components of the center, special technical staff with educational or work experience amounting at least to a Ph.D. degree. Principal staff are either on a fixed term or regular appointment.
- (b) Support Staff - Intermediate level scientific staff with less than a Ph.D. degree and/or administrative staff who do not have major supervisory responsibilities;
- (c) General Purpose Staff - Staff not classified in the above categories.

Section 3: The Planning and Budgeting Cycle

29. The planning and budgeting cycle refers to the annual process by which centers cost out their ongoing and proposed programs of work. Budget data are organized on the basis of programs and support operations, and reflect future as well as current and past resource requirements.

30. For most centers, the first phase of the budget cycle starts during the first quarter of the preceding year with an internal review of programs and supporting services. By the middle of March, the broad cost dimensions for the centers' various programs should have reached the point where preparation of the formal budget can proceed. Ideally, the centers' budgets should be approved by the Boards of Trustees not later than the first of June so that the final budget proposals can be transmitted to the Consultative Group and donors by July 1.

31. Donors have asked that as a second phase in the budgeting cycle, the Consultative Group Secretariat should consolidate the budgets submitted by individual centers and prepare a budget analysis and review document. This document would serve as a basic background paper used by donors and by TAC during the August International Centers Week in discussing programs and budgets of individual centers. It would be designed to:

- (a) communicate global current and long-range financial requirements for ongoing and proposed programs;
- (b) provide comparative data on program thrust, levels of effort and financial characteristics between centers; and
- (c) help TAC and donors to make informed judgements on resource allocation issues for the budget year which starts the following January and to consider provisional levels of financing over a period longer than one year.

32. The third phase of the budgeting cycle takes place in November when the members of the Consultative Group state their intentions concerning the programs and budget recommendations made by TAC. Based on these recommendations, members of the Consultative Group and the Secretariat will review funding requirements and related budgetary problems.

33. Following the meeting of the Consultative Group, the centers will of course revise their budgets as necessary to implement the approved plan of work within the resources provided by the members of the Group. A copy of the revised budget should be sent to the Secretariat for information purposes. The principal function of the budget during the implementation phase is to provide the directors of centers with a framework for managing their plan of work within the resources provided and for assessing deviations in time to take corrective action.

Section 4: The Annual Budget Document

General

34. The annual budget document sets out the recent financial history of the centers, the resources required for the coming year to maintain ongoing programs and to fund new programs, and projects the future costs of current proposals over a three-year planning period. The budgets are prepared by the centers' staff and presented to the Board of Trustees each year, preferably not later than June, for consideration and approval. Once approved by the Board of Trustees, the budget document constitutes a formal request for donor support of the centers' proposed operations.

Format and Content

35. It is recommended that the annual budget be presented in three narrative sections, and that it include an appendix of standard budget tables. Appendices would also be supplied when new programs are proposed or when capital additions are requested. Section 1 of the document would be introductory. It would

summarize the key elements of the center's budget contrasted with the budget and estimated cost of the previous year, and would cite the principal reasons for changing costs. Normally this section would not exceed one or two pages.

36. Section 2 would explain the program structure of the center and identify major program changes (i.e. deletions, significant expansion, or the addition of new programs). This section would constitute the main frame of the budget document and probably run 7 to 10 pages. It will be mostly narrative dealing with major food supply problems, the people affected, and how the centers' programs address these problems and at what cost. It will explain and will compare the plan of work for the year ahead with the level of effort, and costs and accomplishments of the past year.

37. Section 3 would provide a more detailed explanation of particular cost changes. It will explain, for example, the reasons for major equipment acquisitions, additional staffing, and other major cost elements in the budget. In addition it should contain a section dealing with new capital requirements. A more detailed presentation of the capital budget should be made in an appendix.

Appendix A - Standard Budget Tables

38. It is proposed that all centers provide a set of four standard budget tables which in combination will show a center's recent financial history, set out requirements for the budget year and project the cost of current proposals over a future three-year period. These tables are discussed in turn below:

- (a) Table I: Summary of Costs by Major Program or Activity - See format page 15. This table shows the total cost of the center's operation broken down by major "programs" or functional headings. It also shows the principal elements of each program.
- (b) Table II: Summary of Manyears and Cost by Organizational Unit - See format page 15a. The first section of this table shows man-years (principal and support staff) and cost for program units,

and support units according to the center's organizational structure. General operating costs are also shown to balance the table with the totals shown in Table 1. The second section of this table shows expenditures by major expense category (i.e. personal services costs, consultants, travel, etc.).

- (c) Table III: Summary of Sources and Application of Funds - See sample format page 15b. The first section of this table shows actual projected funds for core and special projects and breaks down funds by type of grant and major donor.

Except for earned income the terminology used in this table is defined in Section 1 of this paper. Earned income results from the incidental sale of animals, crops and assets; through interest earned on cash balances; and from recovery of a fair share of support and general operating costs of special projects from the grants supporting these projects. It is considered as a discretionary source of funds which may be used, subject to restrictions established by the Board of Trustees, to meet the overall requirements of the Center.

The application of funds section of this table shows the uses of funds for core operations, special projects, revolving funds, capital and unexpended balances. In cases where funds provided in one category do not equal expenditures for that category, and the difference is not accounted for by unexpended balances, a footnote should be provided which explains the difference.

(d) Table IV: Summary of Financial Data - See format on page 15c. This table shows the basic financial characteristics of the center expressed in normal balance sheet terms (i.e. current assets, fixed assets, liabilities and unexpended operating and capital balances). It also shows, in highly summarized form, sources and uses of funds and staffing for core and special projects. Its purpose is to set out on one page the center's main financial characteristics.

1974 BUDGET

Agricultural Research Center

Summary of Costs by Program and Activity 1970-1977

(US \$ thousands)

Major Activities	Actual			Est. & Budget			Projected		
	1970	1971	1972	1973	1973	1974	1975	1976	1977
	Core	Core	Core	Est. Exp. Core	Budget ^{a/} Core	Budget Core	Core	Core	Core
1. Research									
Beef									
Swine									
Rice									
Corn									
Potato									
Food Legumes									
Tropical Root Crops									
Agric. Systems									
Etc.									
Total	---	---	---	---	---	---	---	---	---
2. Conferences & Fellowships									
Fellowships									
Workshops									
Conferences									
Symposia									
Etc.									
Total	---	---	---	---	---	---	---	---	---
3. Library, Documentation & Info. Services									
Library									
Documentation									
Information									
Total	---	---	---	---	---	---	---	---	---
4. Support Operations									
a. Service Activities:									
Buildings & Grounds									
Common Lab. Services									
Station Operations									
Tractor Pool									
Motor Pool									
Etc.									
Total	---	---	---	---	---	---	---	---	---
b. General Administration:									
Board of Trustees									
Office of Dir. General									
Accounting									
Purchasing									
Personnel									
Other									
Etc.									
Total	---	---	---	---	---	---	---	---	---
5. General Operations									
Communications									
Office Occupancy									
General Supplies									
Etc.									
Total	---	---	---	---	---	---	---	---	---
6. All Other									
Provision for Future Price Changes									
TOTAL CORE	---	---	---	---	---	---	---	---	---
TOTAL SPECIAL PROJECTS ^{b/}									

a/ Show revised 1973 budget based on final allocation approved by the Consultative Group.
b/ Attach a schedule itemizing all special projects for the budget year.

1974 BUDGET

Agricultural Research Center

Summary of Manyears and Costs by Organizational Unit - 1970-1977

By Organizational Unit	Actual				Est. & Budget													
	1970		1971		1972		1973 Est.		1973 Budget ^{b/}		1974		1975		1976		1977	
	Man- Years	a/ Cost	Man- Years	Cost	Man- Years	Cost	Man- Years	Cost	Man- Years	Cost	Man- Years	Cost	Man- Years	Cost	Man- Years	Cost	Man- Years	Cost
1. Program Units																		
Agriculture Economic																		
Agriculture Engineering																		
Agric. Production Systems																		
Animal Sciences																		
Plant Sciences																		
Total Operating																		
2. Support Units																		
(a) Service Operations:																		
Common Lab. Services																		
Buildings & Grounds																		
Motor Pool																		
Tractor & Equip. Pool																		
Labor Pool																		
Etc.																		
Total																		
(b) General Administration:																		
Board of Trustees																		
Office of Dir. General																		
Accounting																		
Personnel																		
Purchasing																		
Other																		
Etc.																		
Total																		
3. General Operations																		
Communications																		
Office Occupancy																		
General Supplies																		
Etc.																		
Total																		
Provision for Future Price Changes																		
Total Core																		
By Object of Expenditure																		
Personal Services Costs																		
Consultants																		
Supplies																		
Services																		
Travel																		
Vehicle, Machinery & Transp.																		
Indirect Costs																		
Total																		
Provision for Future Price Changes																		
Total Core and Budget																		

a/ Include only manyears of principal and direct support staff.

b/ Show revised 1973 budget based on final allocations approved by the Consultative Group.

1974 BUDGET

Agricultural Research Center

Summary of Sources and Application of Funds

(US \$ thousands)

Sources of Funds	Actual			Est. 1973	Budget		Projected		
	1970	1971	1972		1973	1974	1975	1976	1977
1. Core Operations:									
(a) Unrestricted									
Rockefeller Foundation									
Ford Foundation									
U.S. Aid									
Etc.									
Total Unrestricted	---	---	---	---	---	---	---	---	---
(b) Restricted									
CIDA (Swine)									
CIDA (Cassava)									
Etc.									
Total Restricted	---	---	---	---	---	---	---	---	---
(c) Gross Core Funds Required									
Less Unexpended Core Balances									
Less Earned Income									
(d) Net Core Funds Required ^{a/}	---	---	---	---	---	---	---	---	---
2. Capital Funds:									
(a) Revolving									
(b) Buildings									
(c) Gross Total Capital Funds Required									
(d) Less Unexpended Balances									
(e) Net Capital Funds Required	---	---	---	---	---	---	---	---	---
(f) Total Funds Required ^{b/}	---	---	---	---	---	---	---	---	---
3. Special Projects:									
(a) Ford Foundation (Rice in Brazil)									
Etc.									
(b) Special Programs (New Grants)									
(c) Special Programs (Unexpended Balances)									
(d) Total Special Projects ^{c/}	---	---	---	---	---	---	---	---	---
4. Earned Income:									
(a) Retained Start of Year									
(b) Annual									
(c) Total Earned Income (End of Year)	---	---	---	---	---	---	---	---	---
5. Total Gross Funds Required ^{d/}	==	==	==	==	==	==	==	==	==
6. Less Funds Available ^{e/}	---	---	---	---	---	---	---	---	---
7. Net Funds Required									
<u>Application of Funds</u>									
1. Core Operations									
2. Working Capital									
3. Capital Expenditures									
4. Earned Income									
Subtotal	---	---	---	---	---	---	---	---	---
5. Special Projects									
6. Unexpended Balances									
Unrestricted Funds									
Restricted Funds									
Capital Grants									
Special Projects									
Retained Income									
Total	---	---	---	---	---	---	---	---	---
Total Application of Funds	==	==	==	==	==	==	==	==	==

a/ For 1974 through 1977 complete only lines 1(d), 2(f), 3(d), 4(c) and 5.
b/ Total Funds Required = 1(d) + 2(e).
c/ Total Special Projects = 3(a) + 3(b) - 3(c).
d/ Total Gross Funds Required = 1(c) + 2(c) + [3(a) + 3(b)].
e/ Funds Available = the sum of unexpended balances and annual income.

1974 BUDGET

Agricultural Research Center

Summary Financial Data - 1970-1974

(US \$ thousands)

	1970	1971	1972	Est. 1973	Budget	
					1973	1974
<u>Current Assets</u>						
Cash	---	---	---	---	---	---
Receivables from Donors	---	---	---	---	---	---
Other Receivables	---	---	---	---	---	---
Inventories	---	---	---	---	---	---
Prepaid Expenses	---	---	---	---	---	---
Other Current Assets	---	---	---	---	---	---
Total Current Assets	---	---	---	---	---	---
<u>Fixed Assets</u>						
Revolving Fund Balances	---	---	---	---	---	---
Operating Equipment	---	---	---	---	---	---
Livestock	---	---	---	---	---	---
Research Equipment	---	---	---	---	---	---
Furnishings & Office Equip.	---	---	---	---	---	---
Buildings	---	---	---	---	---	---
All Other	---	---	---	---	---	---
Total Fixed Assets	---	---	---	---	---	---
TOTAL ASSETS	===	===	===	===	===	===
<u>Liabilities</u>						
<u>Current Liabilities</u>						
Payables to Donors & Sponsors	---	---	---	---	---	---
Total Liabilities	---	---	---	---	---	---
<u>Unexpended Funds and Capital Balances</u>						
Capital Balances:						
Working Capital	---	---	---	---	---	---
Other	---	---	---	---	---	---
Unexpended Grants:						
Capital Grants	---	---	---	---	---	---
Unrestricted	---	---	---	---	---	---
Restricted	---	---	---	---	---	---
Special Projects	---	---	---	---	---	---
Earned Income	---	---	---	---	---	---
Total	---	---	---	---	---	---
TOTAL LIABILITIES AND CAPITAL BALANCES	===	===	===	===	===	===
<u>Sources of Funds</u>						
Operating Core	---	---	---	---	---	---
Operating Special Projects	---	---	---	---	---	---
Other Income	---	---	---	---	---	---
Capital	---	---	---	---	---	---
Total	---	---	---	---	---	---
<u>Application of Funds</u>						
Operating Core	---	---	---	---	---	---
Operating Special Projects	---	---	---	---	---	---
Revolving Fund	---	---	---	---	---	---
Working Capital	---	---	---	---	---	---
Capital - Other	---	---	---	---	---	---
Total	---	---	---	---	---	---
UNEXPENDED BALANCES	===	===	===	===	===	===
<u>Memo Items</u>						
Manyeans of Staff:						
Core Program	---	---	---	---	---	---
Special Projects	---	---	---	---	---	---
Total	===	===	===	===	===	===

Section 5: Policies and Procedures Used in
Accounting for Assets, Liabilities,
Capital Balances and Unexpended Funds

39. The organization and structure of the annual budgets, also shape basic accounting practices and financial reporting. In proposing accounting procedures and financial reports for centers, a fundamental consideration has been that accounting should be kept relatively simple. Obvious as this may seem, it cannot be taken for granted.

Accounting Procedures

40. In general, accounting procedures for agricultural research centers are designed to provide effective expenditure control and to: (a) measure resources held; (b) reflect claims on and interest in those resources; (c) measure changes in resources over time; and (d) measure the application of resources for approved programs.

41. This section of the paper proposes a standard format for reporting on (a) and (b) above and sets out recommended accounting procedures for determining a center's financial position. Section 5 recommends accounting procedures to be used in measuring (c) and (d) above.

Financial Reporting

42. One important aspect of developing a common budgeting and accounting framework involves reaching agreement on a standard format for reporting a center's financial position to those who have interests in and must make judgments on financial performance. Page 17 attached shows a proposed balance sheet which would be prepared and certified annually by a center's auditors. A discussion of the accounting procedures and policies underlying the preparation of the balance sheet follows.

THE INTERNATIONAL RESEARCH CENTERS
BALANCE SHEET

December 31, 197
(US\$000)

		Actual		Est.	Budget
	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>
<u>CURRENT ASSETS</u>					
Cash					
Accounts Receivable Donors ^{1/}					
Accounts Receivable - Other ^{2/}					
Inventories					
Prepaid Expenses					
Other Current Assets	---	---	---	---	---
Total Current Assets	---	---	---	---	---
<u>FIXED ASSETS</u>					
Revolving Funds ^{3/}					
Operating Farm Equipment					
Research Equipment					
Vehicles					
Furniture, Fixtures & Off. Equip.					
Buildings					
Land					
Other Fixed Assets	---	---	---	---	---
Total Fixed Assets	---	---	---	---	---
Total Assets	==	==	==	==	==
<u>LIABILITIES</u>					
Accounts Payable					
Payable to Donors					
Other Liabilities	---	---	---	---	---
Total Liabilities	---	---	---	---	---
<u>CAPITAL BALANCES & UNEXPENDED FUNDS</u>					
Capital Grants:					
Fully Expended					
Unexpended	---	---	---	---	---
Sub-Total	---	---	---	---	---
Unexpended Operating Grants:					
Core					
Special Projects	---	---	---	---	---
Sub-Total	---	---	---	---	---
Retained Income					
Total Capital Balances	---	---	---	---	---
Total Liabilities and Capital	==	==	==	==	==

^{1/} Provide a schedule of donor payments and note reasons for outstanding balances.

^{2/} Of which XXX represents advances to employees.

^{3/} Attach a schedule listing individual revolving funds and show how increase in carrying value has been financed.

Accounting for Assets

43. Total assets are broken down into two categories - current and fixed assets. Current assets are those which, in the normal course of operations, can be readily used or quickly converted to meet current operating or capital requirements. These include cash, accounts receivable from donors and others, inventory and prepaid expenses. All remaining assets are fixed and cannot under normal circumstances be used or converted to meet current operating requirements. These include the physical plant, various tangible capital assets, land and other assets representing relatively long-term investments.

Current Assets

(a) Cash

- (i) Definition - Cash is defined as actual money or instruments which are generally accepted as money and available for ordinary operating or capital needs.
- (ii) Procedure - To operate effectively centers must maintain a liquidity position consistent with normal cash flow requirements. The appropriate level of liquidity will vary from center to center, and from year to year for a given center, depending upon the combined disbursement pattern for a particular set of grants.

Actual cash transfers from donors frequently lag substantially behind commitments, and often do not take place until a center is well into its operating year. In order to deal with this problem, it is proposed that centers establish liquidity requirements based on 40 days' average cash requirements. It is proposed that liquidity requirements be provided for annually out of retained earnings or out of unexpended balances from operating grants.

(iii) Valuation - All cash balances held in non-US currency should be shown on the balance sheet in US dollars converted at the year-end exchange rate. Gains and losses on currency conversion should be accounted for as an adjustment to other income.

(b) Accounts Receivable (Donors and Others)

(i) Definition - The two major types of receivables to be accounted for are receivables from donors and all other receivables. Accounts receivable from donors represent the amount pledged in support of the center's approved program of operations. Other receivables cover advances to staff and/or amounts due centers from miscellaneous sales.

(ii) Procedure - It is recommended that receivables from donors be recorded at the time financial commitments are made (after January 1 of each year) and drawn down as cash payments are received. The audited financial statements should show any amounts due from donors at year-end for commitments made for that year and should explain any outstanding receivables. In addition, the audited financial statements should include a schedule showing payment dates on all grants. The adoption of this procedure will help identify the sources of cash flow problems. Advances to staff should be identified separately from other types of receivables on the audited financial statements.

(iii) Valuation - All receivables should be shown on the balance sheet at net realizable value.

(c) Inventories

- (i) Definition - Supplies or other items not expended at the time of purchase, such as scientific supplies, automotive parts, office equipment, and general supplies.
- (ii) Procedure - It is recommended that in those instances where a Center finds it necessary to purchase a substantial portion of its supplies well in advance of actual use, that a base stock inventory should be established and treated as a capital requirement. This requirement should be funded through a capital grant or through allocations of retained earnings.

In cases where the majority of stock items can be procured locally or imported without difficulty, capitalization of base stock should not be necessary. Current usage of supplies and materials should, of course, be charged against operations.

- (iii) Valuation - Regardless of which method of accounting is used for stock items, a physical inventory of supplies should be taken at year-end and included in the balance sheet under current assets. Outstanding purchase orders at year-end for items which can be identified with specific programs, and which are expenses of the year, should be treated as a current expense of the specific programs involved, rather than as ending inventory.

(d) Prepaid Expenses

- (i) Definition - An expenditure, often recurrent, for benefits to be received in a future period. For example, prepaid rentals, insurance premiums, etc;
- (ii) Procedure - For material amounts, centers should accrue prepayments; and
- (iii) Valuation - The balance sheet should show prepaid items at the estimated value of benefits to be received.

(e) Other Current Assets

Items which fall within the definition of current assets not specifically covered above should be classified on the balance sheet under this general heading. The balance sheet should show these assets at cost or net realizable value whichever is lower.

Fixed Assets

(a) General

(i) Definition - All tangible assets acquired through a capital grant.

(ii) Procedure - It is recommended that the initial acquisition of items purchased through a capital grant be treated as fixed assets. Individual assets over \$300.00 should be inventoried and controlled by tagging and by appropriate detailed records, combined with a periodic physical check. Items purchased from capital grants costing less than \$300.00 should be capitalized under the category all other fixed assets.

Asset replacements and nominal additions, (e.g. vehicle replacements, additional library books, kitchen ware additions, etc.) should be treated as a current operating expense. It is proposed that the following breakdown of fixed assets be shown on the audited financial statements: Revolving Funds, Operating Equipment (other than vehicles), Research Equipment, vehicles, Furnishings, Buildings, All Other Fixed Assets, and Land.

(iii) Valuation - The basis for valuating fixed assets should be cost. If the Center wishes to show the approximate book value of assets currently held, it should apply its own schedule of depreciation and indicate the depreciated value in a footnote to the balance sheet.

(b) Revolving Funds

- (i) Definition - A fund established out of retained earnings or by a capital grant for a self-sustaining activity from which monies are continuously expended, and replenished through a service fee or other income.
- (ii) Procedure - It is proposed that auxiliary activities such as staff housing, guest housing, training dormitories, dining room, cafeteria operations, and laundry services be established as self-sustaining operations and funded through/capital grants. Enabling grants should provide the physical assets required and an appropriate element of working capital. Revenues to cover on-going operational costs should be generated through appropriate service fees.
- (iii) Valuation - The audited balance sheet should show the current value of all revolving funds and in addition show in an attached schedule any depletions or additions to the original capital grants.

Accounting for Liabilities

44. There are two aspects of liability accounting which require comment: the treatment of outstanding purchase orders at year-end (operating commitments) and payables to donors or sponsors.

- (a) Operating commitments - At year-end Centers will have a number of outstanding commitments for items purchased but not received. In order to have a fairly simple and clear-cut rule for handling outstanding commitments, it is proposed that purchase orders dated prior to December 15 be treated as current costs and shown on the balance sheet as accounts payable. Purchase orders dated after December 15 should not be accrued as expenses for the current year.

- (b) Payables to donors and sponsors - In cases where donors require reimbursement of unexpended grant balances, the amounts to be reimbursed should be determined and transferred to the liability account at year-end.

Capital and Unexpended Balances

45. The operating resources and assets held by the Center are financed in the form of operating grants or contracts and capital grants. Operating grants provide funds to meet the cost of current operations and in most cases these resources are used to carry out the approved programs. Capital grants are made to enable a Center to acquire or expand its basic plant, or other physical assets, to provide base stock inventory levels, or to establish revolving funds for auxiliary enterprises. It is proposed that in accounting for grants the following practices be adopted:

- (a) recording the initial grant - at the time firm commitments are made by donors and sponsors the Center should record a "Receivable from Donors" on its books. A corresponding entry should be made to an appropriate "Capital Grant" account (e.g. operating grant - core, capital grant - buildings, Capital Grant - Revolving Funds (dormitories) etc.).
- (b) receipt of grants - when cash payments are received from donors, an entry should be made to reduce the "Receivable from Donor" account.
- (c) disbursements - expenditures for capital items should result in decrease in cash and an increase in fixed assets. Operational expenditures should be charged at the time of disbursements to various programs, support activity or indirect costs.

(d) closing entries -

(i) capital grants - annual expenditures for capital items, as measured by the increase in various categories of fixed assets, should be compared with the enabling capital grant.

The difference between an increase in a specific fixed asset and the capital grants provided for this asset should be transferred to an unexpended capital grant account at year-end.

(ii) Operating grant: core - expense accounts established to measure the uses of resources for core operations should be closed at year-end to an appropriate "Operating Grant: Core" account. In cases where total expenses for core operations plus any increase in current assets are less than the operating core grants, amounts to be reimbursed to donors should be determined and transferred to the liability account, "payable to donors and sponsors". Any balance remaining in the core operating account after this adjusting entry is made should be closed to an unexpended grants account.

Section 6: Statement of Sources and
Uses of Funds

46. In the preceding section a format for reporting on a Center's financial position was proposed and the underlying procedures to be used in accounting for assets, liabilities and capital balances were discussed. This section contains recommendations on accounting for and reporting on the sources and uses of grants and revenues. It is primarily concerned with the process of associating various costs with programs, organizational units and sources of funds.

Accounting for Costs

47. The level of expenditures applicable to an arbitrary period of time (a calendar year in the case of agricultural research centers) and therefore assignable to grants for that period can in itself be a complex subject. In recommending procedures for accounting for assets, liabilities and capital balances, an effort was made to chart a course around most of the complexities of this problem. There remains, however, the difficult problem of determining which costs benefit which programs and are therefore properly associated with specific grants. Given the rather elaborate mosaic of grants and the differing types of financial commitments made to centers this problem could be inherently complicated. What follows is an attempt to find a few relatively simple rules and concepts for avoiding the more difficult aspects of this accounting problem.

Suggested Rules for Assigning Costs

48. A major objective in accounting for costs is to determine the total cost of programs or program elements for which grants or contracts have been provided. Total program costs are defined in this paper as direct program costs plus indirect cost.

- (a) Direct program costs consist of expenditures and commitments (accrued expenses), other than for capital acquisitions, which can be directly identified with programs (research, training, and library and documentation);
- (b) Indirect program costs consist of the direct cost of support and administrative units and general operating costs. Indirect costs should, as a general proposition, be assigned to programs or special projects in the ratio each program's personal services costs bear to the total personal services cost for all programs and special projects.

Reporting on Sources and Uses of Funds

49. The purpose of a center's certified operating statement (statement of sources and uses of funds) is to inform donors and sponsors how grant funds were used by showing the total funds provided for various programs and the costs charged to these programs. A sample format of a proposed audited operating statement is shown on page 27.

THE INTERNATIONAL AGRICULTURAL RESEARCH CENTER
 OPERATING STATEMENT
 For the Year Ending December 31, 19__

	Actual		Est.	Budget
	1970	1971	1972	1973
				1974
<u>Sources of Funds</u>				
1. Operating Grants - Core ^{a/}				
a) Unrestricted				
b) Restricted	---	---	---	---
Total Core	---	---	---	---
2. Special Projects ^{a/}				
3. Earned Income ^{b/}	---	---	---	---
Total Operating Funds	==	==	==	==
<u>Application of Funds</u>				
1. <u>By Program</u> ^{c/}				
A. Research				
Wheat				
Rice				
Maize				
Etc	---	---	---	---
Total Research	---	---	---	---
B. Conferences & Fellowships				
C. Library, Documentation & Information Services				
D. Service Operations				
E. Administration				
F. General Operating Costs	---	---	---	---
Total Core Program Costs	---	---	---	---
2. <u>Special Projects</u>	---	---	---	---
Total Operating Costs	==	==	==	==

3. By Capital Grants:

Capital Expenditures:

Working Capital

Revolving Funds

Other Capital Items

Total Capital

_____	_____	_____	_____	_____
=====	=====	=====	=====	=====

4. Unexpended Balances

Unrestricted Funds

Restricted Funds

Capital Grants

Special Projects

Retained Income

Total Unexpended

_____	_____	_____	_____	_____
=====	=====	=====	=====	=====

Total Application of Funds

=====	=====	=====	=====	=====
-------	-------	-------	-------	-------

Memorandum Section:

Program Department Costs

Support Department Costs

General Operating Costs

Total Operating Costs

_____	_____	_____	_____	_____
=====	=====	=====	=====	=====

-
- a/ Attached schedule 1 to show funds provided and costs by individual donor.
 - b/ Attached schedule 2 to show source and use of earned income for the current year.
 - c/ Attached schedule 3 to show the current year breakdown between core unrestricted, core restricted and special projects.

The International Agricultural Research Centers
Schedule 1: Funds Provided and Cost of Individual
Grants for the Year Ended December 31, 19

	Approved Grant	Expenses Charged		Unex- pended Bal- ance	Payable to Donors	Total
		Direct	Support Dept.			
Total Unrestricted Core						
Core Operations - Restricted						
U.S. AID						
EIDA						
Total Restricted Core						
Special Projects						
Ford Foundation						
U.S. AID						
CIDA						
Total Special Projects						
Capital Grants						
Ford Foundation						
Rockefeller Foundation						
Total Grants & Expenses						

The International Agricultural Research Centers
Schedule 2: Detailed Schedule of Earned Income
for the year ended December 31, 19

	<u>Approved Budget</u>	<u>Actual</u>
<u>Sources of Earned Income:</u>		
Interest on Deposits		
Sale of Crops		
Sale of Assets		
Indirect Costs charged on Special Proj.		
Etc.	—	—
Total	==	==
<u>Application of Earned Income:</u>		
Applied to Core Operations		
Applied to Revolving Funds		
Applied to Working Capital		
Transferred to Retained Earnings		
Etc.	—	—
Total Application of Earned Income	==	==

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I

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COLLEGE OF AGRICULTURAL SCIENCES
AGRICULTURAL EXPERIMENT STATION
DEPARTMENT OF ENTOMOLOGICAL SCIENCES

137 GIANNINI HALL
BERKELEY, CALIFORNIA 94720

January 10, 1973

TO: Technical Advisory Committee on International
Agricultural Research

FROM: Ray F. Smith, Chairman, Department of Entomological
Sciences, University of California

SUBJECT: Crop Protection in Developing Countries

Peter Oram has asked me to prepare an overview of the crop protection situation in developing countries for your consideration at the TAC meeting in Rome later this month. It was originally intended that this statement be distributed with the usual cover for agenda items. However, this has not reached me yet, and I am sending my statement directly to you so it will be in your hands prior to the Rome meeting. I shall be present in Rome for a portion of the TAC meeting to amplify this statement as needed and as would be useful.

Attachment

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1973 OCT 10 10:25

agreement

... in some cases ...

SUBJECT: ...

FROM: ...
TO: ...

1973 OCT 10

DEPARTMENT OF ENTOMOLOGICAL SCIENCES
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I

Critical Need in Developing Countries for
Increased Crop Protection Response Capability

The world has seen in recent years an amazing change in the race between food production and human population increase. Tremendous gains in food production have occurred in many parts of the world and this trend is expected to continue. This widely publicized phenomenon, often termed the "Green Revolution," has resulted from a combination of many factors; the chief among them are: (1) the introduction of new high-yielding crop varieties, (2) the availability of purchased production inputs, e.g., fertilizers, pesticides, tractors, (3) new crop management technology (including double and multiple cropping), (4) improved irrigation capability and (5) the long-term cumulative effect of development efforts by national governments and international agencies. It should, of course, be recognized that a part of the gains in food production in some years have also been the result of favorable weather.

The system of traditional agriculture, which is characteristic of many areas in developing nations, is beginning to give way to modern agricultural technology. Traditional agriculture with its labor intensive, small fields sparsely planted with seeds of mixed genetic types is not as readily exploitable by endemic plant pests as are modern "monoculture" systems. The mixed culture also provides some protection against climatic adversity and attack by new pests because of its inherent heterogeneity. Furthermore, plants grown under the tillage system of traditional agriculture are generally not as susceptible to some pests as those developed under more favorable conditions for growth.

Pressured by a multitude of ubiquitous pests over many centuries, man's crop plants have become adapted through natural selection to the selective pressures of these traditional agricultural systems (agroecosystems). This state is stabilized by an array of genetic factors for high yield combined with tolerance to low fertility, pest attack and other environmental stresses. Moreover, these traditional systems usually represent an efficient allocation of man's available resources and rarely respond to additional investment of resources without accompanying introduction of new technology for increased production. This means that if modern pest management practices are imposed on traditional agroecosystems without also increasing the basic production potential, the investment will not be profitable; on the other hand, new crop protection inputs may be needed most critically where the

traditional agriculture has been modified by introduced technology, e.g., new varieties and fertilizers.

As contrasted to traditional agriculture, modern agriculture is a more intensified system that integrates capital inputs with management technology to maximize production per unit of area at minimum cost per unit of production, hopefully on a continuing basis. Many of the practices developed to achieve this goal contribute significantly to increased plant pest problems and thus may prevent achievement of the goal. For example, plant introduction and exchange has resulted in varieties with higher yields, resistance to pests and other desirable qualities; but this plant movement may carry with it new pests and disease pathogens and the introduced plant types may be susceptible to indigenous pests and diseases. Modern monocultures frequently involve only a single plant variety with a very narrow genetic base thus enhancing their vulnerability to devastation by pests and disease. Plant breeding and selection often place major emphasis on a single or very few qualities, consequently history records many examples of new varieties highly susceptible to previously innocuous pests or to new pest strains. Vegetative propagation, e.g., bananas and potatoes, has the real disadvantage of disseminating serious pathogens through infected or infested stock.

In addition, many cultural practices of modern agriculture may enhance susceptibility to disease or attack by insects. These include (1) fertilization which produces larger and more succulent plants that are often more susceptible to disease or insect damage than plants grown at lower nutritional levels; (2) irrigation which favors many disease and insect pests as contrasted to the fluctuating soil moisture levels under natural rainfall condition; (3) tillage and other soil manipulations are often an important factor in increasing the incidence of disease as compared to no-tillage or limited tillage cultures; (4) double and triple cropping which promotes rapid increase of pest populations; and (5) more dense plant populations with resulting micro-environment changes that favor the development of some pests. These same cultural practices may at times inhibit certain other pests, but in general, the balance is one favoring increased pest and disease incidence.

The "Green Revolution" has introduced many of these practices into the developing nations at a very rapid rate, and the pace of the process promises to quicken in the future. The rapidity by which these practices have been adopted and the increased production which resulted have been both surprising and gratifying. Motivated by the increased production with the new practices, many developing countries and international organizations have placed increased emphasis on the development

and introduction of new agricultural technology. These modernizing practices, which also enhance the potential for destructive pest attacks, are being introduced without proper attention to crop protection as a component of agricultural development programs. This is not to question the validity of these developments—there is now no other alternative. The fact remains that the changed agroecosystems resulting from the introduction of new methodologies produce shifts in and very often an intensification of pest and disease problems. This proven hazard is not today properly reflected in most of the development programs around the world. There is mounting evidence indicating that pest and disease problems in the developing countries are becoming more severe, indeed in some cases devastating, as the modern practices are introduced. Unless bold measures are taken to protect the food crops of developing nations against the ravages of pests and diseases, the production gains realized recently could vanish and hope for the future could be lost. Along with the introduction of new production technology, the introducers and the recipient developing nations must assure the development of an adequate crop protection response capability in order to protect the food production gains. This must involve significant effort in the training and retraining of crop protection and pest management specialists, the organization of new types of programs for research at the adaptive and implementation levels, and the education of the general public and farmers as to the significance of crop protection to their welfare.

Hazards to Environmental Quality and Other
Unwanted Secondary Effects from Crop Protection Activities

As part of modern concern with the quality of the environment, we must take into account crop protection activities as they may have direct and indirect impact on the environment. This is true if for no other reason than that it is almost impossible to do anything within an environment—whether this environment be the entire biosphere, a restricted agroecosystem, a lovely home garden, or a quiet living room—without having a secondary and often unexpected impact on that environment. Some pest and disease control activities, especially those involving use of pesticide chemicals, may have a significant impact on environmental quality or stability in an agroecosystem. However, we should not become obsessed with these disruptive influences on environmental quality resulting from pest control activities for they are relatively minor as compared to other disruptive aspects of man. It would be better if these negative aspects of pest control would be examined as just one of the many considerations as better methods of managing the environment, including improved pest control, are sought. This more positive approach can contribute

to an enhanced environment and at the same time to the improved nutrition and health of man in all parts of the world.

The insertion of a chemical pesticide into an agroecosystem has as its objectives a change in the living conditions of at least two components of the system. Usually insecticides are applied for the purpose of bringing about a drastic reduction in numbers of one or more species of pests so that more favorable conditions can be provided for the growth and development of a crop species. Thus, the environment is changed and as a consequence there occur reactions and adjustments among other components of the agroecosystem. Chain reactions of enormous complexity may be set in motion by the application of biologically active pesticides such as the organochlorine, organophosphorus, and carbamate compounds used during the last quarter-century. These interactions are so complex that it is doubtful that even the most simple has ever been described completely or understood fully.

The environmental disruptions resulting from use of the synthetic organic pesticides have resulted in substantial alteration of the faunal composition of our agroecosystems, especially those that have received intensive treatment, deciduous fruits and cotton, for example. Some of the changes that have been most frequently observed following applications of pesticides have been severe outbreaks of secondary pests and of normally minor species and the rapid resurgence of treated populations. The severe and long-lasting depressions of natural enemies compared to pests following exposure to pesticides often is the result of the denial of adequate food for the natural enemies brought about by destruction of the prey species (i.e., the pests).

Considerable field experimentation in recent years has produced strong evidence to support the proposition that natural enemy suppression by pesticides is a major cause of change in pest status and resurgence of treated populations. Nevertheless, some evidence is available that shows factors other than the destruction of natural enemies are also involved in these population phenomena. Species-specific response to other mortality factors can be expected to occur just as it does to intoxication by pesticidal chemicals. Therefore, it is likely that other factors often operating in intricate complexity are also responsible for some of the pest "upsets" that have been attributed to the adverse effects of pesticides alone. A better understanding, than now exists, of the complex interactions taking place in agricultural ecosystems is needed. The interactions between pests and their hosts, natural enemies, and competitors and between the natural enemies and their natural enemies and competitors must be better understood in the development of effective pest management systems.

A Broad Ecological Approach is Required
for Stable Pest Management and Control

The revival of the old era when pest control was to a great extent ecologically-oriented is now firmly established today. This has come about largely as the result of public reactions to problems associated with pesticide chemicals combined with failure of complete dependence on chemicals to give adequate crop protection. There are numerous well-documented examples of the inadequacy of a unilateral chemical approach in both developed and developing countries. Unless a broad ecological approach such as emphasized by "integrated control type" programs is initiated, additional "pesticide abuse" situations will arise. Complete dependence on hazardous, broad spectrum pesticides over a period of time not only fails to control the pests in question but actually aggravates pest problems, endangers human health and threatens environmental quality. Furthermore, pesticide misuse imposes an additional real cost on food production.

The integrated control strategy employs the idea of maximizing natural control forces and utilizes other pest management tactics with a minimum of environmental disturbance and only when crop losses justifying action are threatened. Adverse weather factors, while a powerful repressive force for pests in agroecosystems, are not consistent enough to be a reliable suppressor of major pests. Use of natural enemies and plant resistance are basically compatible and supportive in the integrated control strategy. Cultural control, a third basically compatible tactic, is commonly used in ways to expose the pests to adverse weather, to disrupt their natural development, to increase the action of natural enemies, or to increase the crop's resistance. Chemicals, although not always compatible with the use of natural enemies, often can furnish a reliable immediate solution to a problem. Thus, pesticides are an important and necessary element in integrated control programs. Finally, a basic fund of ecological and biological knowledge is needed to guide decision-making in the integrated control strategy.

It is mandatory that scientists, in seeking better crop protection, explore the potentials of pest control with broader perspective than looking to single uncomplicated solutions. The search should include the broadest array of possibilities for control with emphasis in utilizing those forces which nature itself has put foremost; that is, the use of natural enemies, of plant resistance and of manipulations which expose pests to adversities of the environment.

The attainment of resistance in our crop plants to all major pests and diseases is an unrealistic goal. Nevertheless, resistance to key pests and diseases

or even partial resistance to some of them can be most useful in integrated control programs and at times is an essential element.

In the utilization of natural enemies, consideration must go far beyond the techniques of classical biological control, i.e., introduction of parasites and predators into new areas. Attention should also be given to assessing and understanding the role of natural biological controls, manipulation of the environment to increase efficiency of existing natural enemies, periodic colonization of natural enemies, supplemental feeding of natural enemies, and utilization of the invertebrate pathogens such as viruses.

The horizons suggested by introduction of new invertebrate pathogens and utilization of indigenous ones, such as insect viruses, have hardly been touched. It is highly probable that pathogens selective for certain species or groups of insects and innocuous to vertebrates abound in nature, but too little effort has been made to find them, characterize them, and develop them for practical use. Pathogens have many of the advantages of chemical insecticides and they lack many of their disadvantages; furthermore, the available pesticide application technology is adaptable to them. Some of the known pathogens are quickly and highly effective, specific in activity, safe and biodegradable. In some cases, they can be readily stored. Their cost, lack of proved reliability, patentability, and problems of registration clearance present some of the disadvantages and the barriers to their development. FAO and WHO are now making progress in establishing protocols for determining safety to humans for these microbial control products.

Pesticide Chemicals Serve a Special and Essential Need in Crop Protection

Chemical pesticides remain in many situations a most powerful and dependable tool for the management of pest populations. They can be more effective, dependable, economical, and adaptable for use in a wide variety of situations than many other proven tools for maintaining pest populations at subeconomic levels. Indeed, use of chemical pesticides is the only known method for control of many of the world's most important pests of agriculture and public health. No other tool lends itself to such comparative ease of manipulation and none can be brought to bear so quickly on outbreak populations.

Narrowly-selective chemicals appear to offer an almost ideal means of pest control. However, only a very few such chemicals have been discovered and developed for commercial use. Future prospects for additional developed chemicals have become

very dim. Historically, the chemical industry, for the most part, has had little interest in finding and developing this type of compound. The financial return upon investments in research and development of truly physiologically selective insecticides is small when compared with that for the broad-spectrum compounds now so widely used for insect control. Except for a relatively few key pests of major crops, e.g., boll weevil, rice stem borer, and codling moth, the chemical industry would be hard pressed to recover research and development costs of monotoxic compounds for pest control.

It is highly unlikely that the chemical industry will be willing to make unaided any substantial effort to discover and develop new selective compounds. This results from the problems involved with development of resistance to insecticides in many pest species with resultant rapid obsolescence of the chemical, unwanted side effects, high costs of securing tolerances and registrations for use, and a society that has become increasingly critical, perhaps unreasonably so, of chemical pesticide use. In fact, the prospects are so unattractive it is unlikely that industry will attempt to market such compounds previously synthesized and known to possess interesting selective properties but which are now sitting on the shelves of their chemical laboratories. This dilemma is one of the major obstacles blocking the development of adequate crop protection for the future.

Fortunately, it is not always necessary to rely upon the physiological selectivity of chemicals to obtain some of the specific effects required in integrated control and other pest management systems. Ecological selectivity obtained by the discriminating use of even the most broad spectrum insecticides can be employed in many cases for the development of effective, economical, and ecologically sound pest control programs. Development of such programs is presently limited to some extent by a lack of knowledge of the ecology, biology and behavior of pest/natural enemy/crop complexes. A more seriously limiting factor is a shortage of properly trained, imaginative, and capable applied crop protection specialists dedicated to the development of pest management systems based on the principles of integrated control. Nevertheless, there are some encouraging examples of progress along these lines in both developed and developing countries.

While it is recognized that pesticide chemicals have been and will continue to be an essential part of crop protection, current practices in pesticide use have not always been sound, not only in terms of food production, but also from the standpoint of human health and environmental quality. There is substantial need for trained personnel to assist and guide the "pesticide management process," i.e.,

the proper selection, procurement, formulation, packaging, shipment, storage, marketing, application, and disposal of pesticides.

The New Pest Control Technologies
on the Horizon Cannot be a Full Solution

Insect hormonal chemicals, a variety of biochemical determinants of behavior, notably pheromonal type chemicals, and genetic interferences with reproduction have stirred imaginations of entomologists looking for a third horizon of insect control. These developments have not progressed far enough, however, to establish their probable utility or possible adverse consequences. However, there is now considerable evidence that none of these new technologies will be panaceas and problems of resistance, residues and undesirable ecological side effects will also be associated with many of them. For the foreseeable future, these new technologies must be looked upon as potential weapons which may be added to the crop protection scientists arsenal. Furthermore, the systematic gathering of qualitative and quantitative information on pest ecology and behavior is essential if many of the newer, as well as the older, non-pesticidal control techniques are to find their proper place in systems of crop protection.

Integrated control or pest management schemes will not arise automatically from neither research emphasizing the new pest control techniques nor from long term basic research alone. Practical integrated control programs available today have arisen only from pragmatic research directed at finding solutions for the real crop protection problems as they exist in farmers' fields. In nearly all cases integrated control programs come about as the result of a gradual evolution in which new technology has been introduced in a step-by-step process rather than through the introduction of a complete fully-formed system.

Crop Protection in the International Agricultural Research and
Training Centers and a Multi-Country Research Project Approach to
Strengthening Programs and Solving Critical Crop Protection Problems

The Consultative Group has been giving considerable attention to the development of international research and training centers as a basic element in a worldwide agricultural research network. Significant accomplishments have already been achieved by these centers and more are anticipated. However, in the crop protection field it is widely recognized that their scientists are but a "thin line" in the battle against pests and disease. Moreover, these international centers must, in addition to their own research programs, form vital linkages with programs in both

developed and developing countries if they are to reach their full potential for contributing to improved agricultural technology. The international centers have and will continue to produce new technology applicable to the problems of the developing nations, but that is not enough. There must be a mechanism to join the efforts of developing nations with those of the centers and other applicable institutions such as agricultural universities and institutions in developed countries and certain international organizations. The coordination of efforts on common crop protection problems through cooperative multi-country research projects could form such a set of linkages for an international research network subtending the network of international agricultural research centers.

These linkages must go beyond the "program collaborator concept." Under the "outreach" program of the International Rice Research Institute, for example, genetic materials are made available through a system of collaborators in many parts of the world. The collaborating countries or institutions have and can benefit from this participation by screening these genetic materials for adaptability to local conditions. But that system does not go far enough in assisting with the development of viable local programs. The "multi-country research project concept" would establish a more intimate relationship with collaborating institutions by involving their personnel in the processes of problem identification, project planning, project implementation, and project review. This should enable the developing countries to utilize more effectively their own scientists and the new technology flowing from the international centers and elsewhere.

At the present time there is very little collaboration between developing countries faced with the same pest or disease problem. Most developing countries have very limited scientific or other resources to bring to bear on such problems. The cooperative multi-country research projects would be a means of maximizing the utilization, on a collective basis, of these scarce program resources, of minimizing research results applicable to the real problems of each participating country.

Two elements would be critical to the success of these cooperative multi-country research projects: (1) a source of "international" funding to defray the truly "international costs" of the project such as the cost of meetings for planning and reviewing research and perhaps project initiation and modest operational costs of in-country project components; and (2) a management institution which would provide leadership in developing, implementing, and carrying out the project activity as well as managing the financing for the project. This management institution could be, for example, one of the international centers, or another appropriate

international organization, or an agricultural university in a developed country.

Other important characteristics of cooperative multi-country research projects on crop protection problems might be as follows: (a) a collaborative research relationship between two or more research and/or educational institutions in developing countries and one or more "common interest" international institutions or agricultural universities from a developed country; (b) a "common crop protection problem" which is subject to a multi-country approach and which will benefit from the broader perspective than can be gained by confining research efforts to a single country; (c) financial support by the collaborating institutions (including both developing and developed country institutions) to the extent of local funding availability and by other "international" sources; (d) a focus on high-priority crop protection problems in each collaborating country; (e) a technical committee of the active researchers from each collaborating institution. This technical committee would have responsibility for developing the project outline which would ascribe the research role to each collaborating institution. This approach would avoid unnecessary duplication of effort, expedite research progress through pooled resources and enhance communication between scientists of common interest in different countries so that each can benefit from the results and experiences of his international peer group; and (f) have the goal of strengthening crop protection programs in the developing countries commensurate with their long-term needs to insure against catastrophic crop losses from pests and diseases.

An important justification for "internationalizing" crop protection research is the fact that many of the most serious pest problems are very widespread in distribution and importance. These problems must be studied and understood on an international scale to permit development of ecologically and economically sound, long-term control strategies. On the other hand, many pest problems are location-specific in that certain varieties perform differently between areas as a result of differences in strains or races of the pests or different environmental factors. We must know and understand the common elements of different locations which account for problem similarities but just as importantly we must know the factors which produce problem dissimilarities between locations because these may provide the basis for control procedures at other locations.

In summary, the cooperative multi-country research project approach enables a group to accomplish collectively objectives that cannot be realized working independently with limited resources.

The Future Trends and Needs for Crop
Protection in the Developing Countries

It is clear that enhanced crop protection response capability is an essential requirement for increased food production in the developing countries. This enhanced capability will assist both in securing the gains achieved and to be achieved through the "Green Revolution" and by reducing the severe food losses to pests and diseases. To improve significantly crop protection response capability, an immediate and broad attack on the problem must be made including, a) training and retraining of crop protection and pest management specialists; b) education of farmers and the general public in crop protection matters; c) in-country institution building; d) development of implementation technology for crop protection systems; and e) adaptive research approached on a collaborative, multi-country basis to develop crop protection solutions suitable for farm-level usage.

Training. Many crop-protection administrators, researchers, teachers and extension workers in developing countries received their formal training during the fifties and early sixties when an over-reliance was placed on pesticide chemicals for crop protection. In addition, many of these same scientists were trained in sophisticated university laboratories quite unlike the ones usually available to them in their home countries. Many of these crop protection personnel are becoming increasingly aware of the importance of a broad ecological approach to crop protection and the significance of an intensified attack on practical problems threatening food production. Their earlier training is inadequate to meet these new goals and much additional training will be needed. A great variety of tactics are available to achieve these training objectives, including short courses, workshops, conferences, short-term consultants, and most importantly, active participation in collaborative research projects in the developing countries. Future training of additional crop protection specialists for the developing countries should be focused on the special needs within their own agricultural systems and should also emphasize locating the training in the developing areas.

Education of General Public. Substantial efforts should be made to inform the general public as to the severe food losses caused by pests and diseases and the significance of an ecological approach to crop protection and the preservation of environmental quality. An informed public (including farmers) is an essential step in the implementation of adequate and effective crop protection programs.

Institution Building. Although some progress has been made toward development of in-country crop protection capability in local institutions, this must be

expanded and reinforced with emphasis on a multidisciplinary approach to crop protection. Again, participation in multi-country research projects should assist in this goal.

Implementation Technology. To implement these crop protection programs, changes in farmer and consumer attitudes and also of government regulations are needed along with increased awareness and knowledge of the complexity of agroecosystems. We need especially to alter our pattern of pest control advising. Not only are the biological aspects of crop protection complexities involved in the program implementation but also the political, social, regulatory, and educational avenues will have to be developed if the real food production potential is to be attained and protected.

Adaptive Research. In the first place, adaptive research derived in large part from existing knowledge and aimed at the problems as they exist in farmers' fields is needed. This adaptive research should include a) learning how to use chemical pesticides to the best advantage, b) understanding the ecology of the pest in its agroecosystem for purposeful manipulation of pest populations, c) comprehending the significance of the non-crop elements of the agroecosystem and their limitations on various control methods, and d) solving the incompatibilities among various control technologies. A reasonable balance of strategic or long term research should be included to provide the framework of understanding on which improved crop protection measures of the future will be based. The strategic research could provide ecological knowledge to improve the background of new control measures, predictive modelling, better understanding of processes involved in agroecosystems, etc., which should lead to improved crop protection.

Berkeley, California
January 10, 1973

This statement was prepared by Ray F. Smith, Professor of Entomology, Entomologist in the Agricultural Experiment Station, and Chairman of the Department of Entomological Sciences, University of California, Berkeley. He is also currently Project Director of the University of California/USAID Project on Pest Management and Related Environmental Protection and has been the Rapporteur for the FAO Panel of Experts on Integrated Pest Control since 1967.

I

Attachment 1.

Page 1.

Hanson's letter to Albrecht, January 10, 1973

Subject: Agenda Proposals for Bellagio

Agenda Item 1. Inter-Institute Program Relations. (Lead discussant:
Hanson.)

Topic 1. What should be the division of labor and forms of cooperation between centers working on the same crop?

This topic covers the following relationships:

Rice: IRRI, CIAT, IITA.

Maize: CIMMYT, CIAT, IITA.

Sorghum: ICRISAT, CIMMYT.

Potatoes: CIP, CIMMYT.

Grain legumes: CIAT, ICRISAT, IITA.

Barley: CIMMYT, ICRISAT.

It also includes the following questions:

- (a) What is meant by "primary" and "secondary" responsibility for a crop?
- (b) What is meant by a "relay station"?
- (c) Is "primary" responsibility world-wide, and is "secondary" responsibility regional? What is the relationship between them?
- (d) When two Centers work on the same crop, what forms of cooperation are desirable regarding:
 - Annual research programming.
 - International workshops.
 - Use of training facilities.
 - Outreach projects.
 - Distribution of germ plasm.
- (e) What is the experience to date of two Centers participating in the same outreach project?
Other aspect of Topic 1?

Topic 2. Discussions between economists of the Centers, including meetings at CIMMYT (November 1972), TAC (February 1973), and Centers Week (August 1973).

Topic 3. Jurisdiction over programs by Centers Trustees; and effects of recent program recommendations or decisions by TAC, the Consultative Group (as a body), and the Consultative Group staff.

Topic 4. Relationships between Centers and Regional Bodies. We can consider:

WARDA

Asian Vegetable Center

Southeast Asian Regional Agricultural Center

Inter-American Institute for Agricultural Sciences

Proposed Near East crops research center

Mediterranean-Neareast Wheat and Barley Program

Asian Corn Program

Andean Corn Program

Central American Foodcrops Improvement Program.

Above topics taken from Albrecht agenda of December 5, plus additions by CIMMYT. More topics may be added by other Centers, at Bellagio.

Topic 5. Should Center staff stationed outside the host country be charged to Core Budget?

Several donors have asked CIMMYT whether it is willing to absorb in its core budget the salaries of staff stationed outside the host country. Examples are:

- (a) Regional wheat production consultant for Mediterranean and Near East.
- (b) Regional wheat pathologist for Mediterranean and Near East.
- (c) Regional seed production specialist for Mediterranean and Near East.
- (d) Maize pathologist for Southeast Asia, to work mainly on one disease (downy mildew).

CIMMYT has taken the position that all such personnel outside the host country are best financed by special grants because: as soon as a Center assigns resident personnel outside its host country, and charges them to its core budget, it begins to use its core budget to compete with the bilateral activities of its own donors.

On the other side of the argument, CIMMYT is not able to conduct research in Mexico on some diseases of wheat and maize which are widely prevalent, and it would obviously serve the purposes of CIMMYT's mandate if we were able to place a full-time researcher to work on wheat diseases in North Africa, or the Andean zone, or on maize diseases of southeast Asia?

Do the Directors of other Centers face a similar problem?
Do they have any advice to CIMMYT? (Sooner or later this problem will face any Center engaged in outreach projects.)

Attachment 1.

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Agenda Proposals for Bellagio

Agenda Item 2. Program Reviews. (Lead discussant: John Nickel, IITA).

Consultative Group document, Agenda Item 9, Meeting of November 1-2, 1972, serves as adequate outline.

Attachment 1.

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Agenda Proposals for Bellagio

Agenda Item 3. Financial matters. (Lead discussant: U. J. Grant, CIAT).

This is an accumulation of many topics, loosely called "financial", and it is possible that Grant will want to ask some others to present the initial discussion on some of the following topics:

Topic 1. Michael Ruddy paper on financial reporting between Centers and the Consultative Group. (Harold Graves indicated there will be a revised paper ready for Bellagio).

Topic 2. Definitions of:

- (a) Overhead or indirect costs, as used for charging donors of special grants.
- (b) "Administration" as used in preparing core budget.
- (c) "Special projects", as used by Centers in excluding some activities from core budget.

Topic 3. Honoraria and fees:

- (a) What treatment does each Center give to Trustees, including honoraria and expenses?
- (b) What is the top range of consulting fee paid by each Center?
- (c) What treatment does each Center give to members of external Panels, if different from consultants?

Topic 4. Revolving fund for housing and food services:

- (a) Does each Center have such a fund?
- (b) What services are merged in this income-expense fund?
- (c) Are prices set so as to accumulate a surplus, and surplus will be used as a depreciation fund to pay for replacement of capital items at end of their useful life?
- (d) Do external auditors review the accounts of the fund?

(If answers to these questions are brought by each Center in writing, the discussant can present a composite picture).

Topic 5. IIE Services contract.

- (a) Do the Directors want to initiate discussions with IIE on eliminating the cash advance which is made as a precaution against termination of IIE agreement? (Not the quarterly advance for disbursements each quarter).

- (b) Do the Directors want to appoint someone to review the adequacy of present insurance package procured through IIE, and to present recommendations to the Centers? William Gormbley says the present package was agreed in 1969, at which time the benefits from IIE were identical to those provided by the Foundations to their own staffs. Since 1969, the Foundations have increased their benefits (such as medical insurance, because of rising medical costs) but no one has reviewed the IIE contract on behalf of the Centers.
- (c) Do the Directors want to ask IIE to investigate an offshore retirement and insurance package for non-US citizens employed by the Centers? William Gormbley says that at present, any non-US citizen collecting retirement or life insurance payments from TIAA-CREF will be forced to pay substantial US income taxes, even though he is not a US citizen and does not live in the US. This could be avoided if an offshore insurance and retirement system were set up at a place like the Bahamas. IIE could still be the administrator on behalf of the Centers. We would need to authorize IIE to investigate and present its recommendations to the Directors.
- (d) Do all Centers avoid payment of FICA taxes (US social security taxes) on non-US citizens employed through IIE?
- (e) The question has been raised by some CIMMYT employees who are US citizens that they do not want to pay FICA taxes (social security). The legal status of the Centers enables IIE to stop paying these taxes, but IIE says it must make the decision in regard to all Centers, not just one Center, and the decision may have to be unanimous for all employees, not on an individual employee basis. Has this question arisen in other Centers? What is the view of the Directors?

Topic 6. Cash flow problems, and Bank borrowing by Centers.

- (a) What has been the experience of all Centers to date with bank borrowing.
- (b) What is the view of the Directors regarding the circumstances which can justify a bank loan, its size, and duration.
- (c) Do the Directors want to express a collective view to the Consultative Group regarding a reserve fund for meeting cash flow problems when pledged funds are delayed?

- (d) CIMMYT is accumulating a reserve fund of its own, which is expected to reach \$200,000 in 1973. What is the practice in other Centers?

Topic 7. Investment by Centers of "surplus funds" at interest.

- (a) What has been the experience of Centers to date?
(If a bank agreement is involved, can we circulate copies at Bellagio?)
- (b) What is the form of authority from the Trustees to the Center Director to place funds at interest?
- (c) For what purpose have the Trustees of each Center authorized the Director to use the interest earned?

Topic 8. Tax payments by Centers.

CIMMYT pays normal taxes in Mexico and collects back a refund at the end of the year, for which the Mexican Government must go through a formal appropriation.

What is the arrangement of other Centers regarding taxes including:

- (a) Payment of income taxes and social security taxes on non-citizens of host country.
- (b) Vehicle registration taxes.
- (c) Visa fees to host government.
- (d) Customs duties on imports.

Topic 9. Credit cards for Center Employees.

What is the practice of Centers in providing to its employees, at Center expense, the use of Air Travel Cards, and general credit cards (such as American Express).

Where cards are provided, do you require that bills be paid by the employee, and reimbursement requested from the Center, or does the Center pay the bills direct?

Topic 10. Personal loans, or other forms of emergency aid.

- (a) Does your Center make personal loans to employees against future salary, or otherwise?
- (b) Do you provide any other way of meeting emergencies in a family?
- (This generally applies with greater urgency to lower paid staff, who are most often citizens of the host country.)

Topic 11. Insurance package.

Can the Directors bring to Bellagio a statement of their insurance package, excluding life and medical insurance on employees, and we can prepare at Bellagio a table comparing the adequacy of coverage at each Center? This would include:

- (a) Bonding of employees who handle money.
- (b) Vehicle insurance package.
- (c) Liability insurance for persons other than employees who are killed or injured on Center property, or by acts of Center employees off the property, but still permitting lawsuit against the Center.
- (d) Fire and theft insurance against buildings and movable property.
- (e) Travel/accident insurance on Trustees, consultants, etc. travelling on Center business.
- (f) Loss of luggage while travelling on Center business.
- (g) Professional liability insurance.
- (h) Officers and Trustees liability insurance.

Has any Center had experience with a professional insurance survey, which might assist other centers, both in the type of person employed, and the findings?

Topic 12. Center reporting to the US Internal Revenue Service on Form 990, Return of Organization Exempt from Income Tax.

CIMMYT received a letter from the US Treasury Department dated 11 April 1972, stating:

- (a) CIMMYT is exempt from paying US income tax.
- (b) CIMMYT is not a private foundation.
- (c) US citizens cannot contribute to CIMMYT and deduct the contribution in calculating US income tax.
- (d) CIMMYT is not liable for US FICA taxes (social security) unless we file a waiver.
- (e) For the time being, CIMMYT must still file an information return on Form 990, stating its income.

Is this the same status received by all Centers?

CIMMYT wants to discuss certain interpretations about how to fill out Form 990, believing that all Centers should follow the same interpretations. (CIMMYT will circulate a separate paper on this item.)

Agenda Item 4. Personnel matters. (Lead discussant: Robert Chandler.)

Like Item 3 on Financial matters, Item 4 is a loose accumulation of topics all related to personnel practices. It is possible that Chandler may ask others to make the initial presentation on some topics.

Topic 1. What should be the degree of uniformity between Centers, on personnel matters?

- (a) Since salaries of senior professional staff are claimed to be influenced by an international standard, should there be a common scale? How can the Centers compare salary data between themselves?
- (b) Should perquisites be uniform or similar?
- (c) Should titles be uniform or similar?

To what extent can practices in a host country cause different Centers to follow different scales and different perquisites for senior professional staff? For supporting staff?

Topic 2. Should salaries and benefits be uniform for nationals of host country and those recruited internationally engaged in similar work?

- (a) What is present practice of each Center?
- (b) Should the directors seek a consensus on this?
- (c) Can differences between Centers be justified by differences between host countries?

Topic 3. Comparison of packages of benefits for professional staff.

Assuming that Ford Foundation will provide a discussion paper showing comparisons between present packages of benefits used by centers and some donors, the Directors can discuss the differences, and decide whether they want a consensus on each benefit. This covers:

- (a) Housing benefits.
- (b) Vehicle benefits.
- (c) Education benefits.
- (d) Shipment of personnel effects.
- (e) Medical benefits: Checkups, medical evacuation, medical travel for consultation.
- (f) Insurance package: Life, accident, major medical, property in transit and at post.

- (g) Retirement benefit.
- (h) Other cash allowances:
 - Overseas premium
 - Hardship allowance
 - Cost of living allowance.
- (i) Other reimbursements:
 - Language study
 - Membership fees for professional organizations.

If we do not receive a discussion paper on the above, it will be necessary to achieve such a comparison of benefits during the meeting, by the contribution of each Director. For this purpose, each Director would need to bring his personnel manual, or some document that summarizes benefits for personnel.

Topic 4. Package of benefits for "support staff", who are generally host country nationals.

- (a) Does each host country of a Center have a social security package, and does each Center supplement that package with retirement, insurance, and medical benefits? If so, can we discuss the program of supplementation.
- (b) How does each Center try to relate its salary and benefit package for local "support staff" to the local market of salaries and benefits? What type of local organizations do you interview when seeking to establish the "going rate" in your host country? Do you follow the "going rate" or stay substantially above it?
- (c) Has any Center had experience in employing a local labor specialist as a consultant, to advise on the requirements of the local laws? Is there any experience here that will benefit other Centers?

Topic 5. Package of benefits for outreach staff, assigned outside host country.

CIMMYT has had a problem when some donors of special grants to CIMMYT have asked to use their level of benefits in the grant, and this causes some CIMMYT staff to receive benefits that are less than those stated in the CIMMYT personnel policies.

CIMMYT believes there should be agreement among the Centers on what should be the minimum package of benefits which the Centers will accept in a Special Grant for an outreach project.

CIMMYT will circulate a separate paper on this topic, with recommendations.

Topic 6. Travel practices.

- (a) Each Director might be asked to submit a summary of the class of air travel used, and the discussant can formulate a comparison.
- (b) Travel of spouse on business trips at Center expense. Same procedure as for (a).

Topic 7. Leave practices.

- (a) Annual.
- (b) Sick leave.
- (c) Compassionate.
- (d) Study leave or sabbatic leave.

Topic 8. Retirement.

- (a) Does each center have a mandatory age of retirement?
- (b) Do centers have a retirement system for employees not covered by IIE employment? Could we see a document which describes the system of contributions and benefits?

Topic 9. Personnel cooperation between Centers .

- (a) Inter-Center recruitment.
- (b) Staff exchanges for periods of months or years.
- (c) Staff participation in events of other Centers.

Topic 10. Personnel "tenure" and "non-tenure" at Centers.

CIMMYT's Administrative Review Panel found much confusion among CIMMYT staff regarding their expectations of "tenure", which might be stated: If a man is employed under core budget, is he given "indefinite" or "permanent" status, and a man employed under a Special Grant (two or three years) is given "term employment"?

What happens if a man employed originally under core budget is asked to take an assignment under a term project?

CIMMYT Trustees asked CIMMYT to learn what is the practice of other centers regarding "permanent employment" or "tenure"? Do all appointment letters state a fixed term, renewable, or do some letters specify indefinite employment? Or like CIMMYT, is there confusion?

What should be the practice?

Agenda Item 5. Future meetings between Directors and other Centers' staff. (Lead discussant: Chairman Albrecht.)

- (a) Can we schedule at Bellagio another meeting of Directors at Centers Week, and identify agenda items? *
- (b) Looking beyond Centers Week, 1973, can we assume that these meetings will be needed at least twice a year, and make tentative inquiries for a meeting place in February and August each year?
- (c) Should the group have a standing chairman each year, or a rotating chairman each meeting? Should we decide on a chairman now for the meeting at Centers Week?
- (d) Should the Directors consider plans now for a series of meetings by specialized staff of the Centers to discuss practices and experiences in:
 - Publications
 - Biometrics
 - Handling of visitors
 - Executive offices
 - Controller offices
 - Personnel offices (or relevant personnel)
 - Economic staff
 - Farm managers
 - Laboratory heads
 - Training directors
 - Outreach directors.
- (e) Since economists of the Centers will be meeting during Centers Week at the request of the Consultative Group, should the Directors plan to meet with the economists in Washington during Centers Week?

* Hanson has agenda suggestions for next meeting including:

- (a) Trustee affairs.
- (b) How should we keep donors informed?
- (c) Host government relations.
- (d) Press relations.
- (e) Leadership succession in Centers.
- (f) How to maintain high quality among scientific staffs.

CIMMYT suggestions for documents or data to be brought by Directors
to Bellagio.

(Note: CIMMYT believes that Bellagio discussions, or private conversations, may be helped if the Directors bring the following types of information with them.)

(1) Full text in the Manual or policy statement of your Institute regarding:

Wives travel on business trips at Institute expense.
Study leaves and sabbaticals.

(2) How much increase in payroll did your Institute incur by its salary increases for 1973? CIMMYT increase was:

Annual rate of payroll, December 1972	\$ 1,451,267
Annual rate of payroll, January 1973	1,555,016
Gross increase	103,749
Percent of increase	7.1%

(3) Summary of insurance package carried by your Institute, prepared by your Controller or Executive Officer, including vehicle, fire, theft, liability, security bonding, etc. but not including the insurance given to employees.

(4) Sample reports of External and Internal Program reviews. (This will be such an important topic that it would be helpful to have enough copies to circulate to all participants.)

(5) Computer facilities: Could we know the equipment and staff each Institute maintains for computer services. On computers, the make and model. On supplemental equipment such as puncher and sorter, make and model. On staff, do you employ a puncher? Programmer(s)? Do you lease or buy equipment?

(6) Placing surplus funds at interest: If your institute has a document describing the loan arrangements for surplus funds, may we see copies?

(7) Personnel benefit package: If Ford Foundation does not supply a comparison of benefits used by all Centers, we will need a manual or other statement of your package of benefits to discuss during the meeting.

(8) Retirement plan for local employees, not through IIE. If your Institute has such a plan, could we see the document establishing the terms?

Support for Research

The Pearson Commission called on the industrialized countries to devote "a significant share" of their research and development resources and facilities to projects specifically related to problems of developing countries. It suggested a target for 1972 of 5 percent of public expenditure for research and development, and said that at least half of that amount should actually be spent in developing countries. It urged "intensive and concentrated effort in areas most likely to offer far-reaching returns". Among the areas mentioned were population studies, food supply and tropical agriculture.

In the last two years Canada has taken several steps to answer this call. It has financed the launching of the International Development Research Centre in Ottawa, pledging support of a budget of some \$30 million over its first five years. And it has become a financial partner in three of the four major institutions of research and training in tropical agriculture: the International Institute of Tropical Agriculture in Nigeria, the Centro Internacional de Agricultura Tropical (CIAT) in Colombia, and the Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT) in Mexico. A short section on each of these ventures follows.

The assistance to both CIAT and CIMMYT is aimed at helping to reverse one of the most worrying trends in the pattern of food production in the 1970s: the widening of the protein gap. World Health Organization figures show that, while the per capita production of the staple foodstuffs may have increased slightly during the last few years, the per capita consumption of protein has declined on a worldwide basis — and drastically so in many of the poorer countries where protein deficiency disease, or kwashiorkor, is widespread. Since about 70 percent of the protein in the human diet at present comes from vegetable sources and 30 percent from animal sources, an increase of production in both categories is clearly the best means of making more protein available over the next 10 years. Canada's help with the cassava-swine project at CIAT, and with the triticale project at CIMMYT, is an effort to tackle the problem in both categories.

Cassava, a starchy root plant otherwise known as manioc or yuca, is the principal source of food for some 300 million people in tropical Africa and Latin America. The worldwide average yield is only four tons per acre, but there have been experimental yields of 40 tons per acre; the protein value also varies widely among the plants that CIAT workers have collected in Colombia and Ecuador, ranging from less than two to more than seven percent. Both these variations, together with the fact that the plants may take anywhere from 10 to 28 months to mature, suggest interesting avenues for research. The possibilities for increasing yield and protein value, and breeding earlier maturing plants,

seem good. Until now, comparatively little research has been done on this backyard crop.

CIAT is further experimenting with schemes of turning cassava into animal protein, through feeding it to swine in place of corn.

Problems of introducing existing breeds of swine into tropical lowland areas, and adjusting them to the high-energy diet of cassava, are also being faced at CIAT. But solution of these problems would mean a boon to millions of farmers on smallholdings which could not carry cattle, for a few pigs would add needed animal protein to the family diet. Besides the research programs at the CIAT farm near Palmira in Colombia, some 15 to 20 agronomists are being trained in the cassava-swine system, so that they may launch extension programs in their own countries around Latin America and the Caribbean. Canada has announced a contribution of \$3,250,000 over five years to support this cassava-swine project.

A similar sum of \$3,250,000 is being used to support the triticale breeding project at CIMMYT. Triticale, a man-made plant derived from crossing wheat (*Triticum*) with rye (*Secale*), has existed for 80 years but only recently were problems of infertility and shrivelled grain overcome — partly through the work of plant breeders and scientists from the University of Manitoba. There is hope that it may not only prove to be a source of very high quality protein, but also keep the rye characteristics of reasonable yields under dry conditions and thrive under conditions of heat and cold where traditional grains do not excel. Triticale is already being grown experimentally in more than 20 countries through CIMMYT's international nursery program. The work undertaken during the next few years is likely to be decisive, since the genetic ingredient that suggests triticale is widely adaptive as well as high yielding may be selected out during the continuing breeding program, unless research is held to such well-defined objectives at this stage. The Canadian assistance is therefore offered at a crucial point. Some of the research work will be carried out at Macdonald College (McGill University) and at the University of Manitoba, as well as in Mexico and other countries.

At the International Institute of Tropical Agriculture in Nigeria, the emphasis is upon general research into soil and crop management on small multi-crop farms in the humid and sub-humid tropics, together with work on maize and rice improvements. The IITA was established in 1968 as a partnership between the Ford and Rockefeller Foundations and the Nigerian Government, which made available the 2400-acre site north of Ibadan. Canada became a full partner in 1970 with a contribution of \$3.4 million over five years, and is represented on its executive committee. Much of the early work at IITA has consisted of resettling villagers, clearing forest areas, building laboratories and a dam,

and recruiting staff. Experimental plantings began in 1969-70. By late 1971 the research trainee and research assistant program will be fully launched, with some 40 personnel who can later return to their own countries to spread research and extension work.

The network of these three institutes extends in many directions. Canada, for instance, will serve as a link between the triticale research at CIMMYT and the wheat breeding programs CIDA is sponsoring in East Africa, and the Dry Land Farming Program that is being operated by the Canada Department of Agriculture on behalf of CIDA in India.

Coordination of Agricultural Research

The intrinsic complexity and long-term nature of most research programs pose a problem of coordination. Canada, in common with several other countries and international organizations, has been conscious of the need for close international cooperation in order to avoid wasteful duplication of efforts, and to ensure that adequate resources are available to support the most promising lines of research. During 1971 an important international initiative was taken to meet this need for coordinating agricultural research. Under the sponsorship of UNDP/FAO/IBRD, a Consultative Group on Agriculture was established with members from both developed and developing countries as well as the Ford and Rockefeller Foundations and the leading international agricultural research institutes (CIMMYT, CIAT, ITTA, and the International Rice Research Institute). The group, of which Canada is a member, will consider proposals for new research programs in tropical agriculture and possible ways of financing them on a long-term basis.

The International Development Research Centre

After three years of planning, the International Development Research Centre was established in Ottawa in 1970 and held the inaugural meeting of its 21-member Board of Governors in October, 1970. Financing to the level of a minimum of \$30 million during the first five years has been pledged by the Canadian Government. The IDRC is an avowedly international institution: for 10 members of its board are non-Canadian, and its present small staff embraces several nationalities including persons from developing countries. Dr. David Hopper, IDRC President, has indicated that the Centre's most significant objective is "to assist the developing regions to build up the research capabilities, the innovative skills and the institutions required to solve their problems". For this reason, the Ottawa headquarters has recruited only a few senior research workers to identify projects for support, while a large proportion of the funds will be directed to supplementing activities in developing countries with equipment, training, and

money to cover the cost of international travel to ease collaboration and exchange between research workers in these indigenous institutions. Until now, the trend has been for them to travel only to metropolitan countries, rather than learn from each other through mutual visits.

To the inaugural meeting of governors, Dr. Hopper proposed a "program stress that seeks to promote the welfare of peoples, both farm and non-farm, living in rural areas throughout the world". In March, the governors approved a 1971-72 budget that would allow commitments of \$7.1 million for research that has "an especially rural thrust". The four initial program areas are: agriculture, food and nutrition sciences; population and health sciences; information sciences; social sciences and human resources. The Centre's first grant was for a study of the experiences of 5,000 Bajan women to discover why birth rates have declined remarkably in Barbados, a study which the governors believe could have relevance in many countries that have launched family planning programs. The Centre has allocated a significant part of its 1971-72 budget for travel by research workers of many countries to workshops and conferences, and to undertake specific projects under contract.

Chairman of the Centre's Board of Governors is Mr. Lester Pearson, while the 10 non-Canadian governors come from Thailand, the United States, Britain, Australia, Jamaica, France, India, Nigeria, Senegal and Brazil.

I

ORGANIZATION OF CAPABILITIES AT INTERNATIONAL RESEARCH INSTITUTES
OR OTHER CENTERS TO DEAL WITH SOCIAL AND ECONOMIC PROBLEMS
OF AGRICULTURAL DEVELOPMENT

A. T. Mosher

Since this is not the first time this topic has been discussed, one form the paper to open the present discussion might take would be to try to summarize previous discussions and then outline various lines of action that might be considered. I have been present in several of the earlier discussions, in the United States and Asia, but not in those that have undoubtedly been proceeding elsewhere. Consequently, I have chosen not to attempt such an overall review, but instead to outline the general situation we face as I understand it, and then to propose a particular possible response to it. Such a procedure admittedly runs the danger of being influenced by personal biases, but I assume that the subsequent discussion can be counted upon to deal with that.

I. The Situation

A. The Relevance of Economic and Social Research

Within the past few years there has been increasingly widespread recognition of the importance of economic and social research related to agricultural development. The relevance of such research is perceived at three points.

First, it is relevant to the rate of exploitation by farmers of new technology. Farmers' incentives to adopt new technology are affected by yield response and cost implications, by relative prices of farm products and farm inputs, and by land tenure systems.¹ Their opportunities have an impact also. The degree to which they know about new technology

¹Relative prices of farm products and farm inputs also influence the rate of development in the nonagricultural sectors of an economy through their impact on food prices in the cities and by the demands that price subsidies make on public revenues. Policies with respect to land tenure and tenancy affect the distribution of political power at the same time that they affect the economics of farming.

and how to use it, the efficiency of arrangements to make farm inputs locally available, the convenience and terms on which credit is available, arrangements for timely and efficient marketing and transport of farm products --- all of these affect farmers opportunities and all could be improved by appropriate economic and social research.

Second, economic and social research are needed in order to deal constructively with the economic and social effect of rapid changes in the pattern and amount of agricultural production. These rapid changes in production frequently create problems with respect to:

- trends in sizes of farms
- changes in employment opportunities
- changes in income distribution between farm owners, tenants and laborers; between farm operators in the same localities; and between farmers in different parts of the country
- changes in requirements for the processing, storage and transportation of farm products
- the erosion of long-established patterns of economic and social interaction among the populace of rural communities
- changes in requirements for rural social services such as education and health
- shifts in political power within the country
- changes in trade patterns within countries.

Third, there are urgent problems with respect to the organization of farming in many countries. What constitute appropriate adjustments to rapid rural population growth in the presence of extreme land pressure and farms already very small? What are the means whereby farm equipment can be made available to farmers of small farms? Knowledge of what has been happening within socialist countries in recent years is raising critical

questions about the advantages and disadvantages of various forms of farm organization and management and about their applicability within different social and political contexts.

Fourth, there is increasing concern about the process of agricultural planning itself. All of the foregoing types of problems have implications for planning but beyond those there are urgent economic and social problems with respect to planning itself. To what extent should it be production planning? To what extent should it be planning of public policies and programs only? How restricted or widespread should participation in planning be? Should it be left to professional planners and legislators alone? How far should technologists be involved? Public administrators of implementing programs? Farmers? Urban groups affected by agricultural policies?

Part of this increasing concern about planning has to do with its form: what are the relevant categories of planning, the most useful forms of disaggregation or aggregation within it, and the most useful criteria for establishing priorities. Another part has to do with the degree to which agricultural planning can be cast in forms that take advantage of current statistical, econometric, and computer technologies.

B. The Response of Technical Assistance Agencies

Various private and public, national and international technical assistance agencies are already giving attention to these problems, and that attention has increased in recent years. It has taken two forms. One has been directly to conduct indicated types of research, either

in-house or on contract.² The other has been to give technical and/or financial aid directly in support of specific research projects conducted by appropriate entities in each of selected countries.

The question before us for discussion today is whether the situation calls for setting up some new international arrangement to concentrate on dealing with one or more of these problems. Our announced topic implies that any arrangement set up should attempt to deal with this set of problems, but we should recognize that there have been several proposals to go the other route, selecting a single one of them for concentrated attention. My reading of the factors involved leads me to conclude that the former procedure is to be preferred and I hope this paper will demonstrate why I come to that conclusion.

Moreover, previous discussions have demonstrated that the question before us cannot be answered except when it is posed in terms of the proposed nature of such arrangements, their terms of reference and objectives, and, at least in general, their modes of operation. That is because any decision must be based not only on the importance of the topic or topics to be dealt with but also on the feasibility and likelihood of being successful in dealing with them through the arrangements chosen.

C. Salient Characteristics of Economic and Social Problems

Any new international arrangements that might be set up to deal with one or more of them will need to take cognizance of several salient

²The OECD employment study is one example. The study of the social implications of the green revolution by the United National Research Institute for Social Development is another. The FAO study of the spread of high-yielding varieties in the Philippines is a third. The contracts that the U.S. Agency for International Development has negotiated for research with respect to agricultural credit, the impact of relative prices, and new techniques of sector analysis are other examples. So are the 211(d) arrangements AID has made to build institutional competence to deal with problems of agricultural development in U.S. universities.

characteristics of economic and social problems.

The first of these is that the "solutions" to many economic and social problems depend for their effectiveness on their congruence with the economic, social, political and cultural environment in which they are introduced. Many of them are distinct to individual countries and must be studied and solved within each national context. But even within each country the national context keeps changing so that "solutions" at one point in time are no longer adequate shortly thereafter. Moreover, a satisfactory "solution" of certain problems in one country automatically creates problems for other countries, as when a country that has been importing a commodity becomes self-sufficient, thereby reducing the foreign demand for present exporting countries.

A second salient characteristic is that economic and social problems of agricultural development are not separable from related problems in other parts of each national economy. A rise in the price of a major food increases the incentives to farmers but simultaneously increases costs to industrial employers. A public subsidy of the cost of a farm input makes demands on public revenues that reduce the resources available for other development activities. Consequently, much more than the "agricultural sector" of each economy is involved in the social and economic problems of agricultural development.

A third characteristic is the dependence, particularly of economic research, on other disciplines for the alternative technologies between which it makes judgments. The end products of most economic and social research are not themselves technologies (except when these are technologies of an organizational or operational type). Instead, they are

analyses of situations and policy recommendations with respect to the ways in which, and the degree to which, biological, engineering and organizational and operational technologies could most desirably³ be applied and combined. Sometimes improved technologies do not exist. Economic and social research cannot create them but it can identify needs for specific types of new technology and stimulate the search for them. Information about alternative technologies that do exist is not all available in any one place. Consequently, economic and social researchers either must go to the sources of information about these technologies wherever they may be or have other effective means for drawing upon them.

A fourth salient characteristic of economic and social problems is that to give effect to an economic or social solution through governmental action depends on complex bureaucratic and political decision-making and implementation processes. Consequently, if the results of economic and social research are actually to be used, effective contacts of one type or another must be established and maintained with policy makers and administrators in each country, and even then the outcome is uncertain.

These salient characteristics of economic and social problems persist. They cannot be eliminated. Whatever arrangements are set up to deal with economic and social problems must take them into account.

D. Current Restraints to Conducting More, and More Pertinent, Economic and Social Research

Unlike the salient characteristics of economic and social problems that must be lived with, there are a number of current restraints to

³"Desirably" because value judgments about social goals are implicit in such decisions and these vary not only between countries but among different segments of the population of each country.

conducting more, and more pertinent, economic and social research that could be substantially relaxed by appropriate action. The most important of these, in my judgment, are the following. They are not listed in any order of priority; all of them are important.

One restraint lies in the number of trained research workers who are presently available. The absolute number of social scientists with advanced training in Asia, Africa and Latin America is small. Many of them are in teaching positions with only a limited amount of time for research. A few are in research institutes where they make little contribution to training additional research workers. Many of them get drawn at an early age into administrative positions where they have no time for research. Increasing numbers are being employed by business firms in the private sector. Yet a great many of them could put more of their effort into research, given adequate facilities and incentives, and many of them would like to.

A second restraint, closely related to the first, is the lack of effective personal interaction among geographically dispersed researchers. Only in the capital cities and major university centers is such interaction now readily feasible. There are persons with basic economic or social training in many other places in each developing country who are not now engaging in research but who would like to do so, and whose capacities could be considerably enlarged if adequate provision for effective interaction with others interested in the same problems were available along with provisions for financing cooperative projects involving the participation of widely dispersed researchers.

Another closely related restraint is the lack of effective

communication of research results among countries, even for researchers in capital cities and major university centers. Research workers in a developing country usually are much more up-to-date on what is happening in major developed countries as reported in professional journals than they are with respect to studies in nearby countries facing the same problems they are. This lack exists among the research centers of individual countries, as well. About two years ago, Dr. Castillo compiled a detailed review paper of economic and social studies completed by the University of the Philippines over the past fifteen years. Very little of this information is available at other centers, even in the Philippines.

Still another important restraint is the weakness of existing rapport between policy makers and social science research administrators. Partly this is because policy makers have not been impressed by the immediate value to them of past economic and social research. However, it is also partly because no one has given sufficient attention to bringing the two together.

Another restraint is the paucity of dependable data for economic and social research in most of the developing countries. Much of modern social science research, especially in economics, takes statistical data gathered by others as its starting point. The systematic gathering of such data is gaining ground everywhere, but much of it is not in a form social scientists can use, there are many questions about its accuracy, and the publication of what is compiled is often long delayed.⁴

⁴Dr. Koffsky, in an earlier memorandum, suggested that this problem should receive first attention by a new international program in the field being discussed in this paper.

Still another restraint, more fundamental in character, is the shortage of disciplinary theory with respect to certain important types of economic and social problems. For example, we are a long way from having an adequate understanding of the relationships between income distribution and economic development. Similarly, we are in need of much better theory with respect to the allocation of resources among intranational regions of differing growth potential. These are only two examples from a much longer list of theoretical deficiencies.

Finally, I believe there is currently a serious problem of usurpation of the priority-setting function in research by external agencies either by supporting only externally selected types of research or by offering substantial honoraria to researchers who will work on international projects selected by the external agencies. Given the present low to very modest salaries of research workers in developing countries there is a strong temptation for them to put their time into those projects from which they can get the greatest personal financial return, regardless of their own judgment about the degree of priority that the topic should be given from the standpoint of the national needs of their own countries. What this suggests is that in any international arrangements set up in the future, great care should be exercised with respect to this. Priority-setting in research is an important facet of the professional competence that needs to be enhanced in each country. I am not suggesting that external agencies should not exercise discretion with respect to priorities and participate in deciding what research is to be supported, but there should be ways to do this without preempting the field.

As we proceed through this paper, it will be discovered that I take these restraints very seriously and suggest that relaxing certain ones of them should be given the highest priority. Our resources for economic and social research are severely limited; we should take steps to make the best use possible of those we have and here I believe a new international program could help. In the longer run other improvements can be made, but in the long run the primary focus of any international institute can change also.

II. General Propositions

Based largely on the review of the situation outlined up to this point, I would suggest six general propositions as guide-lines in determining what kind of an international agency or agencies it might be wise to set up at this time.

1. Because of various differences in priority problems and in present international arrangements in different parts of the world, and to facilitate interaction between a new agency and national agencies in each country, any new organization or organizations set up in this field should be regional in scope rather than having global responsibilities. These regions could be demarcated in different ways. One that would seem to make sense would be to have one for Latin America, one for South and Southeast Asia, one for the Middle East and North Africa and one for Africa south of the Sahara. These might be linked to each other eventually, but each should be largely autonomous within its region. They would not need to be set up simultaneously, nor would they need to operate in the same way or concentrate on the same activities, although they might.

2. Any international agency devoted to studying the economic and social problems of agricultural development should concentrate first and foremost on strengthening national efforts to deal with these problems. It is always agreed that ultimately the purpose of international research institutes is to strengthen the capacity of national agencies. Usually, however, it is assumed that the international agency must develop a full research program of its own first. That assumption has been found tenable in the case of basically biological institutes where research can be conducted in field plots and laboratories. But the situation is drastically different in the case of economic and social research. For it, problems exist in distinct national and intranational regional varieties. The data for studying such problems are different for each country. The problems need to be studied in close contact with their local variations.

Consequently, any international approach to studying economic and social problems should, from the very beginning, place its primary emphasis on developing national research within each country of the region to be served.

3. The present commodity-oriented international institutes are to be commended for including economic and social research in their programs. This aspect of their programs is important, both to determine and evaluate the economics of proposed new technologies and to examine broader policy questions particularly germane to the commodity or commodities studied. However, commodity-oriented research organizations are not an adequate base, even if they were greatly strengthened, for international efforts to deal with the broad range of economic and social problems of agricultural development. Many important problems cut across commodity lines. Others are almost independent of commodity production

patterns. There is considerable to be said for separate international regional arrangements to concentrate on the economic and social problems of agricultural development in addition to what can effectively be done by commodity-centered research organizations.

4. No new agency should be looked on as a substitute for present programs of existing technical assistance agencies, preempting the field. Diversities of approach are an advantage. Considerable economic and social research related to agricultural development is now being carried on by international technical assistance agencies. The relevant question is: are there important activities that could best be conducted by an additional new agency?

5. Whether by a new international institute or by individual technical assistance agencies, the range of types of national institutions in which the study of economic and social problems of agricultural development should be encouraged is quite broad. The national agencies that should be considered in these efforts include governmental research institutes, departments of faculties of agriculture, departments of general universities, research institutes of universities, institutes of business and management, and the research sections of operating agencies of national and state governments. That all of these are pertinent to strengthening economic and social research related to agricultural development is indicated by the fact that at least parts of the subject matter dealt with by each of these types of agencies are relevant to problems of agricultural development. In addition, when one lists the research workers on each continent who are actively conducting significant research related to agricultural development they are found scattered among all of these different types of organizations.

Some might argue that it is wasteful to have scarce competent researchers scattered among so many types of national agencies, and that efforts should be made to bring them together in fewer and distinctively research institutes. My reply would be that in order to give basic training to additional research personnel it is important that many economic and social researchers be in universities. Consequently, arrangements should be made to utilize their abilities where they are.

6. If the new organization were to be designated a "research" institute it is important that the word "research" be broadly construed. In an earlier meeting, Dr. Wortman made a number of comments that are pertinent to this point. He pointed out that frequently what is most helpful is not new formal research but getting past knowledge to those to whom it can be helpful. He remarked also that it is not the findings of formal research alone but whatever knowledge would be useful in planning about which we must be concerned. Certainly, structured social science research is important but so are the experience gained in experimental and pilot projects and other information that would not be covered by a narrowly construed definition of research.

III. A Specific Suggestion -- for Asia

Because my experience has been limited almost entirely to Asia, the remainder of this paper outlines a specific suggestion for a regional international institute or center for South and Southeast Asia, honoring the General Propositions stated above.

My suggestion is presented here as a set of four "activities" to be engaged in by the Institute, each contributing to and supporting the others.

Activity I - Strengthening National Research Programs Directly

Central to the program of the Institute should be a set of activities designed to strengthen national research on the economic and social problems of agricultural development directly, by involving researchers where they now are, strengthening personal interaction among them, helping them to help each other since although they are limited in number there are many highly competent persons among them.

That purpose could be implemented through a combination of three sub-activities: (1) sponsoring several series of continuing seminars and workshops on selected research topics, to increase personal interaction among researchers throughout Asia; (2) setting up arrangements for the widespread distribution of research results and other pertinent information to those who could use them; and (3) organizing and financing selected research projects.

Seminars and workshops. Some of the seminars and workshops should be limited to researchers alone. Discussion in them would center on research priorities and methodologies, and on the formulation of project plans for specific research projects that might later be undertaken either with national financing or financed in whole or in part by the Institute.

Other seminars and workshops would be made up of a combination of researchers and policy makers, both in individual countries and from different countries, to discuss research findings, identify unanswered questions with respect to particular topics, examine the degree to which current research is responsive to the needs of policy makers, and suggest priorities for future research.

Still other seminars and workshops would concentrate on problems of teaching in Asian universities because of the urgent need to train

more researchers and to give them better training than they now receive.

An outside organization has an advantage in sponsoring such seminars both within individual countries and internationally because it can select the most appropriate persons for the seminars without regard to internal hierarchies or organizational responsibilities. Consequently, invitations to participate in all of these types of seminars should be issued to individuals by the Institute itself, rather than by asking governments to select representatives. This is necessary in order to get the right persons: professionally active researchers interested in particular topics wherever they may be located at home, and policy makers and research administrators who are themselves decision makers, rather than their assistants.

Distribution of research results. The second part of Activity I would be arrangements for distributing research papers and other pertinent materials to interested researchers and teachers throughout the area served by the Institute. This could be done on the basis of highly classified mailing lists, so that individuals would get the documents in which they have a special interest.

Research projects. The Institute should stimulate and in some cases finance projects of social and economic research with preference given to international projects but not ruling out some projects in individual countries. These might or might not be projects that had been developed in Institute seminars or workshops. Past experience indicates that a number of projects developed in seminars and workshops might be picked up for national implementation without Institute funding. Projects funded by the Institute would not be limited to a list of priority topics selected by the Institute in advance, but the Institute

would influence the nature of research topics submitted in the future for financial support through its selection of topics for seminars and workshops.

Activity II - Library and Documentation Center

Important as Activity I alone can be in fostering better utilization of research resources now available, it would need to be enriched by new resources. Highest in that category I would put a first class agricultural development library and documentation center.

It is a tragedy that there does not yet exist anywhere in South or Southeast Asia a really first-class library and documentation center on the economic and social aspects of agricultural development. There ought to be at least one first-class center of this type in each country. Building up a library and documentation center for the Institute would immediately make one such facility available for those who could travel to it and it could aid in strengthening national library facilities by making copies of important documents available.

Activity III - Participation in Research

Keeping its primary effort focussed on contributing directly to the strengthening of national research efforts, the Institute would need a small professional staff of its own (beyond what would be required to perform the purely administrative tasks connected with Activities I and II) so that it could, as an Institute, participate professionally in selected research projects as well as in the seminars and workshops of Activity I.

Activity I would be made central to make more effective use of research personnel already in place in individual countries. Those present research personnel are, and should be, scattered in numerous locations in each country. They are, and should be, responsive mainly

to presently perceived national research priorities.

The professional staff of a regional international Institute ought to supplement and interact with those national resources in two ways. One would be by adding to the presently available research personnel in the region. The other would be to provide, at one location, a strong multidisciplinary staff of social science researchers who are not constrained by presently perceived national priorities.

Consequently, the function of this Institute staff would differ, in a subtle but important way, from that in the present international institutes. Here its function would be to participate professionally (1) in all phases of Activity I, (2) being simultaneously engaged directly in selected research projects, and (3) participating critically in the determination of future priorities for Institute activities.

In order to serve those functions, the amount of direct research in which each member of the Institute's staff participates (whether individual, or in cooperation with other Institute staff members, or in cooperation with national research workers) should be limited to what he can accomplish in one-half of his time each year. The other half of his time should be devoted to consulting with researchers, policy makers and administrators in individual countries and to participating in the broader program of the Institute.

In addition, having a professional staff to undertake these tasks would enable the Institute to play a significant role in the training of additional researchers. That could be done by having selected graduate students do their dissertation research at the Institute under the direction of one of the Institute's staff members on the basis of appropriate arrangements with their respective universities.

This professional staff should be composed of from perhaps eight to twelve social scientists representing different disciplines or fields of specialization, recruited from anywhere in the world.

Activity IV - Visiting Research Scholars

Finally, I would suggest that the Institute make provision for the support of perhaps six to twelve visiting research specialists at any one time, each working at the Institute for from three to perhaps twelve months. He might devote full-time to his own research, outlined in advance, or he might serve as an additional member of a research team made up partly of members of the Institute's own research staff. Persons chosen as visiting research specialists might be in mid-career, or they might be persons who had recently completed graduate study and were awarded what would be, in effect, post-degree research appointments. Within this program it could be made possible for a visiting research specialist to bring one or two of his own graduate students with him, combining their dissertation research with his own study while at the Institute.

A question that could well be asked is why I do not propose establishing a larger Institute staff in Activity III. My judgment on this is based partly on the consideration that the major thrust of the Institute's program should be on stimulating and facilitating national research rather than on conducting a large amount of in-house Institute research. It is based partly on a preference for securing a larger and constantly revolving staff for the Institute by adding Activity IV rather than by having more continuing full-time staff members. In its total program, the Institute would, at any one time, have a staff of fourteen to twenty-four, with six to twelve of them being temporary

visiting research specialists.⁵ If more members were to be added to the full-time staff, consideration should be given to stationing each of these additional staff members at an appropriate national institution somewhere else in the region and not at the Institute itself in order to have more day-to-day contact with participating national institutions.

Provision of Facilities for Quantitative Research

In such an Institute as here proposed, it would be essential that facilities for conducting sophisticated quantitative research be available. Techniques of linear programming, recursive programming, systems of simultaneous equations, and simulation models employing various combinations of these and other techniques are now widely used in many countries and more are being developed every day. They are being applied to the study of more and more economic and social problems. All require computer equipment for their use. Consequently, it would be imperative, if an Institute were to be established with a research staff of its own and with visiting research specialists temporarily in residence that fully modern computational facilities be made available. Along with that, the "library" discussed as Activity II should be expanded to include the standardized computer programs that would be useful.

III. Concluding Comments

It should be recognized that in drafting this discussion paper I have set aside several earlier proposals that emphasized different specific problem foci for such an Institute. One of those was the proposal that the Institute concentrate on developing viable agricultural policies.

⁵This arrangement would facilitate giving effect to the suggestion of Dr. Edgar O Edwards of setting up temporary task forces to study particular problems.

Another was that the initial thrust be an attempt to expand the agricultural data base, country-by-country. A third was that international arrangements be developed specifically to study the so-called second generation problems.

The focus suggested here does not rule out activities related to any of these but concentrates instead on providing the facilities which would enable the economic and social researchers in each country of a region to be more productive, individually and collectively, working on problems growing out of the perceived and changing priorities of their own countries, and gradually growing in research ability as they do so.

My preference for this approach instead of adopting a specific problem focus for the Institute is based on several considerations mentioned at various points earlier in this paper:

1. that economic and social problems (even those of unquestioned crucial importance) are so numerous that for an Institute to concentrate on any one of them alone would be unduly restrictive;
2. that economic and social problems which are common to several countries involve sufficient differences because of different national settings that they need to be studied in each country rather than primarily at an international Institute;
3. that research priorities keep shifting from year to year, so that being limited to a specific problem focus would restrict the usefulness of an international Institute;
4. that determining research priorities is a function to be stimulated country by country, with international agencies concerned about it, contributing to it, but not dominating it.

It is conceivable that after a few years of operation a very few research topic foci might emerge as being the most important ones to deal with. But if that happened it would have emerged out of the process of the interaction among researchers, policy makers and administrators of

different countries -- an interaction that the proposed program of the Institute would have made possible.

My other concluding comment is that the need for strengthening and extending the training of social scientists remains and must be dealt with. No substantially enlarged program can be mounted, either nationally or internationally, unless that is done. There is great need for revising undergraduate programs, for subsidizing the production of teaching materials, for strengthening graduate training in Asian universities, for involving graduate students in major research activities, and for expanded programs providing graduate assistantships at Asian universities and fellowships for Ph.D. study, both within and outside of Asia. This is a major need that in my judgment cannot adequately be met by a new Institute devoted primarily to research on economic and social problems, although it can help. As with the present international institutes, there would be an opportunity for graduate students of various universities to do dissertation research in conjunction with the new Institute and the Institute would undoubtedly mount special training programs for its own, but it could not meet the major part of the need. The continuation and strengthening of other activities of technical assistance agencies will be needed in each country to that end.

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AIDE-MEMOIRE

BELLAGIO V CONFERENCE ON INTERNATIONAL AGRICULTURAL DEVELOPMENT

The Bellagio Study and Conference Center
Villa Serbelloni
Bellagio, Italy

May 17, 18, and 19, 1972

AGENDA

Theme of the conference: Approaches to accelerating the agricultural development process

Sessions: A.M. - 9:00 - 12:30
P.M. - 3:00 - 6:00

Wednesday, May 17, 1972

Session 1, A.M.

Chairman: Joel Bernstein, USAID
Subject: The status of international agricultural development:
situation and outlook
Discussant: Montague Yudelman, OECD

Session 2, P.M.

Chairman: Sterling Wortman, The Rockefeller Foundation
Subject: Progress and evolving roles of the international agricultural
research and training institutes
Discussant: F. F. Hill, The Ford Foundation

Thursday, May 18, 1972

Session 3, A.M.

Chairman: Alfred C. Wolf, Inter-American Development Bank
Subject: New experience and concepts in organizing efforts to assist
small landholders
Discussant: Roberto Osoyo A., Government of the State of Mexico, Mexico
Second Discussant: Andrew Mercer, IBRD

Session 4, P.M.

Chairman: Ralph Melville, Overseas Development Administration
Subject: Research and development gaps
Discussant: Guy Camus, ORSTOM; The French model for identifying and
resolving research and development gaps

Friday, May 19, 1972

Session 5, A.M.

Chairman: W. David Hopper, International Development Research Centre

Subject: Organization of capabilities at the international research institutes or other centers to deal with social and economic problems of agricultural development

Discussant: Arthur T. Mosher, Agricultural Development Council

Session 6, P.M.

Chairman: L. J. C. Evans, IBRD

Subject: Resume of the conference

List of participants in Bellagio V Conference on International Agricultural
Development, May 17-19, 1972

Ewert Aberg, Royal Agricultural College, Sweden

Joel Bernstein, Assistant Administrator for Technical Assistance, USAID,
Washington, D.C.

D. Bommer, Institut für Pflanzenbau und Saatgutforschung der Forschungsanstalt
für Landwirtschaft, Braunschweig-Völkenrode, Germany

Guy Camus, Office de la Recherche Scientifique et Technique Outre-Mer, Paris

E. DeLanghe, University of Ghent, Belgium

H. G. Dion, Canadian International Development Agency, Ottawa

L. J. C. Evans, International Bank for Reconstruction and Development, Washington, D.C.

Lowell S. Hardin, The Ford Foundation, New York

F. F. Hill, The Ford Foundation, New York

W. David Hopper, International Development Research Centre, Ottawa

Omer J. Kelley, Office of Agriculture, Bureau for Technical Assistance, USAID,
Washington, D.C.

Sture Linner, United Nations Development Programme, New York

A. R. Melville, Overseas Development Administration, London

Arthur T. Mosher, Agricultural Development Council, New York

Peter A. Oram, Food and Agriculture Organization, Rome

John A. Pino, The Rockefeller Foundation, New York

G. P. Tiggelman, Landbouwhogeschool, Wageningen

Alfred C. Wolf, Inter-American Development Bank, Washington, D.C.

Sterling Wortman, The Rockefeller Foundation, New York

Montague Yudelman, Organisation for Economic Cooperation and Development, Paris

Consultants: Andrew Mercer, International Bank for Reconstruction and
Development, Malawi

Roberto Osoyo A., Government of the State of Mexico, Mexico

Bellagio V. Conference on International Agricultural Development

Bellagio, Italy - May 17-19, 1972

RESUME OF THE CONFERENCE

Session 1. The Status of International Agricultural Development: Situation and Outlook

Chairman: Joel Bernstein, USAID

Discussant: Montague Yudelman, OECD*

1.01 General agreement was reached that with respect to agricultural development, important achievements, and changes in the last decade as well as continuing concerns include the following:

- (a) Major scientific and technological breakthroughs in the production of cereals, notably wheat and rice. Elements of these advances, despite limitations, are now in use on an estimated 5 million farms in the developing nations. These advances clearly contributed to India's capacity to deal with the feeding of an estimated 10 million refugees in the crisis of Bangladesh. Yields per unit land area have been rising in some areas as much as 3% annually over the last five years. If this rate could be achieved elsewhere and maintained where such levels now exist and coupled with a 1% increase in land area cultivated, the goal of a 4% annual growth in agricultural output could be achieved.
- (b) Positive attitudinal changes on the parts of many national policy makers in the developing nations with respect to the potential contribution of the agricultural sector to overall development.
- (c) Increased farmer enthusiasm for change in regions where profitable innovations have been successfully developed.

* Dr. Yudelman's paper with underlying analysis and supporting data will be circulated by him to all participants.

- (d) The productive presence of more trained, skilled people and functioning agriculturally-related institutions in many of the Less Developed Countries.
- (e) An increase in the support for agricultural development by both national governments and external assistance organizations (in a period when overall development assistance was not rising in real terms).
- (f) The overriding presence of ever larger, younger, hungry population in the LDC's. Even though farm-level crop yields appear to be increasing, the population pressure leaves no room for complacency.
- (g) Continued relative deterioration in the export demand or terms of trade for agricultural products from the developing nations. While product quality and standardization may be contributing factors, international trade prospects, amongst food products, appear to be most promising for milk and meat.
- (h) Rising concern about the relevance of the two-sector concept of development (Sir Arthur Lewis's neo-classical "subsistence to modern" theory) in many of the low income nations today. Mounting evidence indicates that:
 - (i) High rates of growth of the labor force are likely to continue for many years.
 - (ii) In the modern sector (including agriculture) output is increasing more rapidly than employment, in part due to the use of capital-intensive processes.
 - (iii) Population is exploding in the urban areas. Even in this modern sector growing numbers are unemployed and pressure is rising "to keep the people in the countryside."
 - (iv) Rural populations are continuing to increase absolutely despite heavy out-migration.

(j) Mounting concern about the welfare of the less advantaged (the 20% or more bypassed by modernization). If reliance cannot be placed on older development models, how can nations do more about (reconcile where necessary) the multiple objectives of:

- (i) further expanding output (growth);
- (ii) generating productive employment and increased real incomes for small holders, landless laborers, and marginal populations;
- (iii) improving income distribution;
- (iv) producing and moving into consumption higher quality, more nutritious foods (Special note was taken of increasing research, education, and policy work on human nutrition. Emphasis was given to expansion of research on protein quantity and quality in cereals plus the need for expanded work on food legumes.);
- (v) Making public services more generally available (especially in the rural areas).

Session 2. Progress and Evolving Roles of the International Agricultural Research and Training Institutes

Chairman: Sterling Wortman, The Rockefeller Foundation

Discussant: F. F. Hill, The Ford Foundation

2.01 International network of agricultural research activities

A large number of nations, perhaps 70-80, still are burdened with extremely low productivity of agriculture, particularly of those food crops and animal species which are the sources of livelihood for high proportions of rural people. Many of these nations are relatively new and small; all have limited resources with which to meet diverse and urgent developmental needs, of which agriculture is but one. While these nations

vary in their abilities to meet present food needs or raise farmers' incomes, increasing numbers are seeking to markedly accelerate agricultural output through rapid creation of modern, intensive, science-based farming systems. One prerequisite is appropriate technology for a complex of crops, seasons, and ecological regions - technology which in large part eventually must be generated within the nations themselves, on a continuing basis.

2.02 Factors limiting rapid increases of agricultural production per unit area per unit time, include:

- (a) lack of new, complete, highly productive, profitable combinations of production technology for regions where yields are low and static, and the use of which can clearly be made understandable to farmers through appropriate trials and demonstrations in their own farming areas;
- (b) lack of access by farmers to inputs (i.e., fertilizers, seed, credit, vaccines, feed supplements) required for intensified crop or animal production;
- (c) lack of markets, or of product/factor price relationships which would provide incentive to farmers to increase output.

2.03 To meet, simultaneously and individually, the diverse needs for technology of so many nations, is presently beyond the combined capabilities of the nations and of assistance agencies. The situation must be considered serious if agricultural output, of the poorer countries generally, is to be raised from 2.8% per annum to the targeted 4.0% level - a level which would cover demands of growing populations, with only modest increases in food supply or incomes on a per person basis.

2.04 The concurrent acceleration of agricultural progress by many nations will require continuing, concerted efforts of the nations themselves and of the assistance agencies which would help them. This can best be accomplished through:

- (a) a combination of rapidly strengthened national organizations;
- (b) a limited number of international research and training centers to which nations can turn for assistance specifically tailored to their needs;¹ and
- (c) increased support by centers of specialization of the technically advanced nations.

2.05 A worldwide network of scientific, technical, and action programs is needed which will:

- (a) link together all relevant institutions and individuals able to contribute significantly to the goals of the nations being assisted;
- (b) provide for appropriate division of labor among all cooperators;
- (c) allow for maximum benefits to nations assisted, including rapid development of capabilities of individual nations to sustain their own progress at desired rates;
- (d) allow expertise, wherever it exists, quickly to be brought to bear wherever it would be useful, and to permit problems, wherever they occur, to receive prompt attention by specialists able to solve them.

2.06 Presently, the Consultative Group has agreed to support four established agricultural research institutes (IRRI, CIMMYT, CIAT, IITA). An International Potato Center, the International Laboratory for Research on Animal Diseases (ILRAD), and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) are being organized. Additional institutes, in all probability, will be required. However, care must be exercised that multilateral and bilateral aid to nations and to international centers is kept in appropriate balance, since the measure of success of the total effort will be the advances in the nations to be assisted. Centers to be added to the network must be established to attack problems which likely

¹ Examples include IRRI, CIMMYT, CIAT, IITA, plus ORSTOM and the GERDAT institutes of France.

could not be resolved in any other way in the time period available. Consideration should be given to creation of short-term specific programs, whenever possible, to funding of such programs at existing institutions, and to use of workshops or seminars.

2.07 Major and rapid progress has been made with wheat and rice in raising productivity of farms, large and small, in favorable growing areas of Mexico, India, and Pakistan, with scattered successes elsewhere with various crops. In many regions, especially where crop-growing conditions are more difficult, new technology either has not been applicable or has not been developed, if indeed it can be. In many regions, especially in parts of Latin America, population density is high, landholdings are very small, and the farmers are yet to benefit - a situation considered serious, if not explosive, by the nations concerned. This demands serious attention by all who can contribute to identification of effective remedies. These marginal producers - in less favored areas or with small landholdings - require help, and research efforts to the extent appropriate must be oriented to provide suitable technology for them.

2.08 As financial support for international agricultural institutes is broadened, both the institutes and the donors must exercise care to maintain the unique characteristics of the centers which have made them successful. These include apolitical and autonomous boards of trustees; speed and flexibility of action; focus of research and clear-cut goals; highly qualified, internationally recruited staff; long-term assignments for key staff; and stability of support. Broadening of financial support to include private or industrial sources may be explored by the institutes individually or collectively.

What does this refer to?

Session 3. New Experience and Concepts in Organizing Efforts to Assist Small Landholders

Chairman: Alfred C. Wolf, Inter-American Development Bank

Discussants: Roberto Osoyo A., Government of the State of Mexico, Mexico
Andrew Mercer, IBRD, Malawi

3.01 The conference had presentations by Roberto Osoyo about small-holder development in the State of Mexico and by Andrew Mercer about the International Development Association-financed rural development project at Lilongwe in Malawi. Common characteristics of the two situations include: small farm size; non-irrigated farming; importance of maize; low educational level of farmers; scarcity of capital and need for farm credit. Common to the approaches used in each case are: reliance on self-help to supplement official aid; necessity of recognizing farmers' self-respect, of gaining their confidence, and of securing their participation in decision-making; and provision of credit in kind at interest rates close to commercial rates. In each case different organizational and institutional arrangements have been devised to suit different circumstances. Other differences include: the use of farmers as demonstrators and extension agents in Mexico, which was not successful in Malawi; on the other hand, a significant role for women in staff positions and as committee members in Malawi, which is not appropriate in Mexico; and the need to provide almost all infrastructure, such as roads, at Lilongwe.

3.02 The conference noted that at a seminar on rural development held earlier in the week at the OECD Development Center in Paris, it had been recognized that rural development schemes depended for success inter alia on political support, populace participation, and heavy input of skills, including good management. On the basis of experience reported in the Mexican and Malawi cases and elsewhere, the conference concluded that:

- (a) rural development projects are not likely to conform to one organizational pattern, but would take different forms in different places and at different stages;

- (b) the prevention of land fragmentation is essential and land consolidation is sometimes required; ✓
- (c) an appropriate melding of agricultural production and social development is essential; ✓
- (d) plans need to be flexible and planners need to look ahead to the stage beyond the end of the official "project"; ✓
- (e) it is possible to devise ways of extending credit to small farmers, and small farmers can be good credit risks provided there is a sound technical and financial basis for their farming; ✓
- (f) a satisfactory economic rate of return can usually be demonstrated for properly conceived rural development projects, notwithstanding that the methodology of cost benefit analysis needs to be improved in relation to the estimation of social benefits. ✓

3.03 The conference felt that the accounts of experience in Mexico and Malawi, and experiences reported elsewhere, are encouraging. (It was recognized, however, that there are situations where a particularly harsh environment or political or institutional constraints may defeat efforts to find a workable approach.) It was recognized that approaches need to be devised for particular situations but that a sharing of experiences of different situations and further comparative analysis (such as that done by Carl Gotch) would be extremely useful. The importance of developing approaches which would reduce the cost per family was stressed.

3.04 Reference was made to two important aspects of the Plan Puebla in Mexico: It not only benefited small farmers in Puebla and the State of Mexico by demonstrating how technologies developed at CIMMYT could be applied by them; it also benefited CIMMYT's maize research work and helped to correct any unintentional institutional bias in the research in favor of larger scale farming. The significance of linking Puebla-type projects to research centers was emphasized, and the conference also recorded its

recognition of the importance of extending and improving rural development approaches in view of the urgent need to find ways of alleviating rural poverty amongst many millions of people in the poorest segment of society.

Session 4. Research and Development Gaps and Linkages

Chairman: Ralph Melville, Overseas Development Administration

Discussant: Guy Camus, ORSTOM

4.01 The conference received papers by Guy Camus outlining the structure of the French system of scientific and technical assistance in developing countries. The general characteristics and functions of the organizations constituting the system and the processes by which research boards, committees, or ministries define objectives, identify needs, and shape programmes was explained. Points emphasized were the flexibility of the system, the high-level scientific coordination, and the effective collaboration of French and African nationals in the system.

4.02 The importance of training of specialists of many countries was stressed and also the continuous replenishment of the staff of ORSTOM by annual recruitment to fill vacancies, for which the competition is keen. ORSTOM's permanent staff of 550 research scientists includes 150 economists and social scientists. 111

4.03 The conference discussed the ways in which research gaps may be identified. It was noted that the various sources from which suggestions for research might come to the Technical Advisory Committee include inter alia: members of the Consultative Group (comprising donors, sponsors, and representatives of developing countries), meetings such as this at Bellagio, or from members of TAC itself. The procedure by which the ICRISAT proposal had been taken from initiation to final approval was favorably commented upon. Tributes were paid to the outstanding work which TAC has achieved in a comparatively short time.

4.04 The question of the scope of TAC's work, especially in relation to nonbiological research, such as research into problems of unemployment or agricultural credit, was mentioned, and a number of different opinions were expressed. The question of whether TAC should be asked to consider research in industrial crops was discussed. No conclusion was reached, and the conference decided that this question merited further discussion at a future meeting in the context of "research gaps."

4.05 The value to the international centers of their program committees and independent review panels was mentioned by some speakers. Mention was also made of the responsibilities of donors for satisfying themselves about program and budgets of institutes which they supported; it was felt that procedures for achieving this might usefully be discussed at a Consultative Group meeting.

4.06 The conference expressed considerable interest in the question of linkages between research bodies. It was agreed that:

- (a) Appropriate linkages should be built to tie together relevant research activities being undertaken in LDC's, DC's, and at international institutes. Linkage in a network system should enhance the effectiveness of relatively small and scattered efforts by relating them to activities elsewhere.
- (b) International agencies, donors, and international institutes should take initiatives in encouraging and supporting the building of effective linkages.
- (c) In some cases it may be desirable to devise machinery for coordinating or monitoring related research activities of different bodies, to arrange for the exchange of information, and perhaps in addition to identify gaps and suggest how to fill them. Such functions might appropriately be undertaken by an international institute; new centers should not be created simply to undertake such functions, but appropriate means of achieving suitable linkages should be found.

- (d) The matter of linkages is, in the opinion of the conference, important and complex but much remains unclear. A further meeting would be useful to consider the matter, on the basis of papers which would have to be prepared describing examples of existing linkage and network arrangements and experience to be derived from them. The meeting should aim to reach conclusions about linkage arrangements generally and make recommendations to meet the needs of any particular situation where absence of appropriate linkage was judged to constitute a serious gap.

Session 5. Organization of Capabilities at the International Research Institutes or Other Centers to Deal with Social and Economic Problems of Agricultural Development

Chairman: W. David Hopper, IDRC

Discussant: Arthur T. Mosher, Agricultural Development Council

5.01 The conference expressed considerable interest in this subject, on which a paper was presented by Arthur Mosher. It was noted that the next meeting of TAC was scheduled for August 1-4, 1972, and it was decided to defer further consideration of the matter until a reaction could be obtained from the TAC chairman; a copy of Arthur Mosher's paper would be sent to him by Peter Oram together with a copy of a detailed note which Peter Oram would send to all participants of the conference recording the various views expressed in the course of discussion.

6.01 Future Meetings

It was agreed that it would be useful to have another meeting, at which there could be further discussion of:

- (a) linkages (referred to in paragraph 4.06) and
- (b) research gaps (paragraph 4.03)

It was suggested that one day would be needed to discuss linkages and two days to discuss research gaps.

6.02 The Rockefeller Foundation agreed to plan and organize such a meeting and will arrange for appropriate assistance from The Ford Foundation, IDRC, Inter-American Development Bank, and other agencies, especially in relation to the documentation which will need to be prepared for the meeting.

6.03 It was agreed that it would be desirable to plan for such a meeting to take place in the period December 1972 to March 1973. Possible meeting places suggested were Bellagio, New York, IDRC headquarters or at an international research center such as CIMMYT. John Pino undertook to notify prospective participants (including perhaps some representatives of developing countries) when location and timing had been arranged.



INTER-AMERICAN DEVELOPMENT BANK
WASHINGTON, D. C. 20577

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CABLE ADDRESS
INTAMBANC

April 7, 1972

Projects Dept. Correspondence

ANS'D BY J. Franzen
DATE April 17, 1972

Mr. Lionel Evans
Director
Agriculture Project Department
International Bank for
Reconstruction and Development
1818 "H" Street, N.W.
Washington, D.C. 20433

Dear Mr. Evans:

Enclosed for your information is a document entitled "Report on Latin American Agricultural Research Institutions." This document is the product of a study designed to identify important food crops in the area which should receive priority attention on the part of national agricultural research institutions, linked in research networks with international centers, and the particular national institutions best qualified for the basic research in each crop. Also, the Report proposes correction of deficiencies in information about research institutions, training of necessary technical staff and adaptation of production systems for small farmers.

Also enclosed is a document entitled "Estaciones Experimentales Agrícolas de América Latina" published only in Spanish. This is a directory of agricultural research institutions in Latin America prepared for this study, utilizing information previously compiled and kindly made available by the Inter-American Institute of Agricultural Sciences. This document, although still incomplete, represents the most comprehensive directory to date.

The study was carried out under the leadership of the following consultants: Dr. Luis Marcano, Coordinator, and Dr. Carlos E. Fernández, Assistant Coordinator. Dr. Marcano is President of the Shell Foundation of Venezuela and Dr. Fernández is a staff member of the Inter-American Institute of Agricultural Sciences. IDB is grateful to both institutions for giving leaves-of-absence to their staff members to make this study. The Bank was fortunate to have the services of such well-qualified consultants. I wish to express the appreciation of the Bank for the cooperation of the Group of Experts who participated in this study and the representatives of other organizations who gave generously of their time and talents.

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COMMUNICATIONS
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ASSOCIATION

The study, as reported in the enclosed documents, was authorized and financed by a technical assistance project approved by the Board of Executive Directors. It represents the first of a two-phase program. It is hoped that the second phase can be initiated at an early date.

Your comments on the enclosed documents will be gratefully received and appreciated.

Sincerely yours,

A handwritten signature in blue ink that reads "Alfred C. Wolf". The signature is written in a cursive style with a large, looping initial "A".

Alfred C. Wolf
Program Advisor to the President

Enclosures

April 17, 1972


Mr. Alfred C. Wolf
Program Advisor to the President
Inter-American Development Bank
Washington, D.C. 20577

Dear Al :

Since Jim Evans is in Rome attending the TAC meetings, I acknowledge with thanks receipt of your letter of April 7 and the enclosed documents. We have not yet had time to fully review them, but note with interest that priority is given to research with kidney beans, cassava and beef cattle. It is of particular interest to us that the report suggests the initiation of regional cooperative programs on these three commodities and that they be coordinated by IICA and CIAT staff, including the establishment of working groups to prepare concrete proposals for presentation to the Consultative Group on International Agricultural Research for financing.

Once we have had time to fully review the principal report, we may wish to make specific comments as invited.

Sincerely yours,


James M. Fransen
Senior Research Officer
Agriculture Projects Department

J.Fransen/lb

cc. Mr. L.J.C. Evans

I

REPORT ON LATIN AMERICAN AGRICULTURAL
RESEARCH INSTITUTIONS

SUMMARY

The attached document, "Report on Latin American Agricultural Research Institutions," assesses the current status of agricultural research in the region and makes recommendations for the improvement of existing efforts. The recommendations for member countries and the Bank were made by a group of agricultural experts brought together by the IDB and Dr. Luis Marcano, a Bank consultant. All recommendations were based upon the experience of the individuals involved and an extensive study of the agricultural research situation in Latin America made by Dr. Marcano and Dr. Carlos E. Fernández.

The purpose of the survey was to examine what steps would be necessary to increase the contributions of important national research institutions both individually and allied in regional networks linked to international centers. The focus of the survey was on basic food crops vital to the nutrition of the population of developing member countries. A related purpose was to examine practical methods whereby national research institutions could take advantage of the technological developments in basic food crops popularly entitled "Green Revolution" as well as to contribute to future developments.

The report under review is a sequel to a prior document, "Agricultural Experimental Stations in Latin America," which is the basis for a complete directory of agricultural research centers. It is suggested that the Bank take the initiative to complete the directory and maintain it up-to-date through an arrangement with the Inter-American Institute of Agricultural Sciences (IICA) or with the Latin American Association of Plant Breeders, or with both organizations.

As a result of the Group of Experts meetings, nine food crops were designated as the most important for increased and improved production. It was suggested that the Bank concern itself with three of these on which there has been relatively little basic and adaptive research. Each one of the three production lines - kidney beans, cassava (yuca) and beef cattle - would be the subject of recommended regional cooperative programs, coordinated by IICA and involving the cooperation of the International Center of Tropical Agriculture (CIAT). A regional program requires a network of national institutions consisting of one or two national research centers for creative, basic research and national experiment stations in different countries to carry out local trials and adaptive research.

The report's recommendations include practical steps to initiate improved and expanded research in the three food crop lines. The first step in the organization of the three programs would be for the coordinating entities (IICA and CIAT) to establish a working group for each program. Each working group would consist of two or three persons, including at least one specialist in the particular production line. They would determine the capacities and resource requirements of the research centers recommended by the Group of Experts, and also determine their interest in a regional program. Furthermore, the working group would study alternative organizational methods and prepare specific research programs for cooperating institutions. In sum, the working group would prepare a concrete proposal for presentation to the Consultative Group on International Agricultural Research for financing.

One of the recurring problems emphasized by the experts is the shortage of trained personnel, particularly in top research positions. They recommend that the Bank make a study of future requirements for research personnel trained at the post-graduate level and of the possibilities for the establishment of national education loan funds to meet these needs.

Another type of problem, developing technology for the small farmer, also met with considerable emphasis. The experts propose the Bank sponsor a seminar to provide concrete means for dealing with this aspect of research, taking full account of the scarce and abundant resources available to the small farmer.

Other recommendations relate directly to the Bank's criteria for evaluating proposed loan projects in agricultural research. These criteria reflect the IDB consultants' views of the essential ingredients for any successful research program. Each of the selected criteria are discussed fully in the body of their report. A summary is as follows:

1. Research programs should conform to, and contribute directly to, national development plans. In this interest and for the best research results, programs should focus on one line of production and should cover all aspects related to the productivity of that crop or livestock.
2. Objectives should be specific and concrete. The means to achieve stated objectives should be well-defined, indicating the sequence of proposed steps.

3. The research program should be an integral part of a larger development effort, including such ingredients as credit, land reform, extension services, marketing, etc.
4. A particularly close coordination should exist between research and extension programs.
5. Socio-economic considerations should be adequately integrated into the program in order to assess the impact of new technologies on various population groups, employment, incomes, prices, etc.
6. Careful evaluation should be made of in-service training, technical assistance, real equipment needs (this is frequently not a constraint in larger stations), operating costs, library facilities and publications.