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CONSULTATIVE GROUP MTG. - Nov. 1 - 2, 1972

IBRD

Dr. Kelley's papers



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CGIAR: Consultative Group Meeting - November 1-2, 1972 - Dr. Kelly's Papers -
Correspondence

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A. Centers currently supported
by CG

TABLE A (Revised)

INTERNATIONAL AGRICULTURAL RESEARCH CENTERS
1972-1977 Estimated Financial Requirements ^{1/}

(in \$ millions)

	1972			1973			1974			1975			1976			1977		
	Core	Capi- tal	Total	Core	Capi- tal	^{2/} Total	Core	Capi- tal	Total	Core	Capi- tal	Total	Core	Capi- tal	Total	Core	Capi- tal	Total
IRRI	2.5	.4	2.9	3.0	.2	3.1	3.1	.1	3.2	3.3	.1	3.4	3.5	.1	3.6	3.7	.1	3.8
CIMMYT	4.0	1.0	5.0	5.2	1.2	6.0	5.4	.2	5.6	5.6	-	5.6	5.9	-	5.9	6.2	.1	6.3
IITA	3.2	5.2	8.4	4.5	.3	4.8	5.6	.4	6.0	6.1	.5	6.6	6.3	.4	6.7	6.4	.4	6.8
CIAT	2.8	3.3	6.1	3.5	(.7)	4.2	3.8	-	3.8	4.2	1.0	5.2	4.7	-	4.7	4.8	-	4.8
ICRISAT	(starter fund)		.5	1.2	2.1	3.3	1.4	3.9	5.3	1.9	5.8	7.7	2.5	1.5	4.0	3.0	-	3.0
CIP	.6	.3	.9	1.1	.3	1.4	1.5	.3	1.8	1.7	.2	1.9	1.8	.2	2.0	1.8	.2	2.0
-	13.1	10.2	23.8	18.5	4.8	22.7	20.8	4.9	25.7	22.8	7.6	30.4	24.7	2.2	26.9	25.9	.8	26.7

^{1/} Based on information provided by CG Secretariat on 8/3/72

^{2/} Totals for 1973 are adjusted to reflect earned income of Centers.

Revised 9/5/72
10/3/72

TABLE A (Revised)

INTERNATIONAL AGRICULTURAL RESEARCH CENTERS

B. Proposals made by
TAC for CG consideration
in November, 1972 1/

ACTIVITY	1973			1974			1975			1976			1977		
	Core	Capi- tal	<u>2/</u> Total	Core	Capi- tal	Total	Core	Capi- tal	Total	Core	Capi- tal	Total	Core	Capi- tal	Total
ICRISAT-Africa <u>2/</u>	.1	.5	.6	.5	.3	.8	.8	-	.8	1.0	-	1.0	1.1	-	1.1
Genetic Resources <u>3/</u>	.4	-	.4	1.0	.1	1.1	1.0	.1	1.1	1.0	-	1.0	1.0	-	1.0
AVRDC <u>4/</u>	-	1.1	1.1												
	.5	1.6	2.1	1.5	.4	1.9	1.8	.1	1.9	2.0	-	2.0	2.1	-	2.1

1/ At this point we lack details of conditions under which these proposals are being supported by TAC, particularly level of funding beyond 1973. Additional information is expected within the next four weeks. ²⁻¹

2/ Figures for 1974-1977 are taken from the Doggett Report.

3/ Support for 1974-1977 may be somewhat less than shown based on reservations expressed informally during International Centers Week.

4/ TAC recommended support only for additional capital needed. By implication, consideration might be given later to general and routine budget support. AID has already committed \$3.0 million for the period 1972-1976.

TABLE A (Revised) continued

C. Proposals under consideration
by TAC 1/

INTERNATIONAL AGRICULTURAL RESEARCH CENTERS

	1973			1974			1975			1976			1977		
ACTIVITY	Core	Capi- tal	<u>2/</u> Total	Core	Capi- tal	Total	Core	Capi- tal	Total	Core	Capi- tal	Total	Core	Capi- tal	Total
IRRI (multiple cropping) <u>2/</u>			.75	.4	2.4	2.8	.7	-	.7	.8	-	.8	.9	-	.9
Africa Livestock <u>3/</u>			.75	.2	1.0	1.2	.5	1.0	1.5	1.0	2.4	3.4	2.8	-	2.8
1) Disease Lab.			.50	.2	1.0	1.2	.5	1.0	1.5	1.0	2.4	3.4	2.8	-	2.8
2) Production; Health <u>4/</u>				1.36	1.75	3.11	1.90	1.75	3.65	2.62	1.25	3.87	3.23	.7	3.93
AVRDC <u>5/</u>				1.2	.2	1.4	1.3	-	1.3	1.4	-	1.4	1.5	-	1.5
Total			2.25	2.0	4.6	6.6	3.0	2.0	5.0	4.2	4.8	9.0	8.0	-	8.0
Grand Total			27.1	24.3	9.9	34.2	27.6	9.7	37.3	30.9	7.0	37.9	36.0	.8	36.8

1/ These proposals appear likely to attract CG support. At this point the time of initiation of implementation and levels of funding are very tentative.

2/ TAC feels that the initial proposal might be ambitious, thus a somewhat more modest budget may be anticipated.

3/ Figures given are based on those in the Pritchard Report. The estimated capital costs were arbitrarily allocated over a three year period.

4/ No costs estimates were available from the Tribe Team. Arbitrarily figures for the Disease Laboratory were used.

5/ The assumption is made that CG would start funding from 1974. CG probably will try to find capital costs needed in 1973 as shown under "B" above.

TABLE B (Revised)

A. Centers currently
supported by CG

INTERNATIONAL RESEARCH CENTERS ^{1/}
1972-1974 Financing by AID
(estimates in \$ millions)

	1972 (actual)	1973	1974
IRRI (ASIA)	.75	.78	.78
CIMMYT (TAB)	1.09	1.50	1.40
IITA (AFR)	1.03	1.20	1.50
CIAT (LA)	.675	.88 ^{2/}	.95
ICRISAT (TAB)	.10	.83	1.32
CIP (TAB)	.10	.35	.45
	3.745	5.54	6.40

^{1/} 1973 and 1974 cost estimates may still be revised a little in the light of further adjustments in the Centers' budget estimates,

^{2/} Adjusted to omit capital costs of original plan.

9/5/72

Table B (Revised) - Continued

B. Proposals made by TAC
for November, 1972

	<u>1972</u>	<u>1973</u>	<u>1974</u>
ICRISAT - Africa	-	.15	.20
Genetic Resources	-	.10	.28
<u>1/</u> AVRDC	-	-	-
Total		.25	.48

1/ AID already has commitment of \$30 million in support of AVRDC covering the 5 year period 1972-76. Additional AID support would not be anticipated.

C. Proposals under consideration by TAC

	<u>1972</u>	<u>1973</u>	<u>1974</u>
IRRI (Multiple cropping)	-	.19	.70
African Livestock			
1) Disease Lab.	-	.19	.30
2) Production Health	-	.19	.30
AVRDC	-	-	-
TOTAL	-	.57	1.30
Summary:	<u>1972</u>	<u>1973</u>	<u>1974</u>
A	3.75	5.54	6.40
B	-	.25	.48
C	-	.57	1.30
Total	3.75	6.36	8.18

	<u>Total</u>	<u>CIAT</u>	
Belgium	[.300]		(
Canada	[2.750]	.400	
Denmark	[.250]		
Ford	3.000	[.750]	
Germany	[2.486]		
IDRC	[.200]		
Japan	.200		
Kellogg	.350	.350	
Netherlands	[.375]	.125	
Norway	.152		
Rockefeller	3.000	[.750]	
Sweden	[1.150]		
Switzerland	.250	[?]	
U. K.	1.113		
UNDP	1.425		
U. S.	[5.534]	[.876]	[
World Bank	3.000	[]	[
Others ^{a/}			
Available	25.535	3.251	
Required	22.891	4.221	
To be found		.970	

a/ Australia, IDB, AsDB, FED.

b/ Core and capital support available

c/ Of which some is likely to be co

THRU : AA/TA, Dr. Joel Bernstein
AA/AFR, Dr. Samuel C. Adams
AFR/DS, Princeton Lyman
AFR/DS, John L. Cooper

Report Covering Fourth Meeting of Consultative Group (CG) African Livestock Subcommittee, held in Paris, France on October 23, 1972

The writer served as the US Representative to the CG African Livestock Subcommittee Meeting, convened at the European office, International Bank for Reconstruction and Development, 66 Au d'Iena St., Paris, France on October 23, 1972. This memorandum summarizes the activities which took place during the meeting.

Countries and organizations represented included:

<u>Countries</u>	<u>Organizations</u>
Canada	Food & Agriculture Organization (FAO)
Denmark	Ford Foundation
France	International Bank for Reconstruction and Development (IBRD)
Germany	International Development Research Centre (IDRC, Canada)
Netherlands	Rockefeller Foundation
United Kingdom	United Nations Development Programme (UNDP)
United States	

Belgium and the European Communities were represented at the Third Meeting of the Subcommittee, August 3, 1972 but they did not send representatives to the Paris meeting. According to the Secretary of the Subcommittee circumstances prevented the presence of a representative from Belgium but this did not mean any change in policy towards ILRAD

The meeting was opened by the Chairman, Mr. L.J.C. Evans at 1000 hours and except for a luncheon sponsored by the IBRD continued through until 1830 hours.

Report Covering Fourth Meeting of Consultative Group (CG) -

The agenda adopted included the following:

- I. Further steps to be taken for the establishment of ILRAD.
- II. Discussion of the report and recommendations of the International Task Force on African Livestock.
- III. Recommendations to the Consultative Group on future activities of the Subcommittee.

Recommendations and findings adopted for submission to the CG included the following:

I. Establishment of ILRAD

a. It was decided that the Chairman would request the President of the IERD to make a formal reply to a letter received by him from the President of Kenya in 1971 inviting the establishment of the International Laboratory for Research on Animal Diseases (ILRAD) in Kenya under arrangements negotiated with the Government of Kenya (GOK). This letter will point out that the development of an effective and efficient laboratory is believed important and that at some future time an integration or association may take place with an institute or center for developing livestock production in Africa. (Note: The UNDP representative abstained because he considered that to support the action he would be in conflict with the UNDP's continued support of its project at EAVRO.) Later the UNDP representative stated that the UNDP favors the establishment of ILRAD and plans to support it in the future. The above recommendation of the Subcommittee was based upon a majority view that: (a) a number of questions remain to be answered concerning the report of the International Task Force on African Livestock Development and the response of the CG Technical Advisory Committee and the action of the CG will not be known for a substantial period of time; (b) no doubt exists concerning the need for ILRAD; (c) the GOK extended the invitation, thus, the appropriate next step is for the GOK to decide whether,

Report Covering Fourth Meeting of Consultative Group (CG) -

in view of the decision of the East African Community (EAC), it wishes to continue ^{to} withdraw its previous invitation. (Note: The Chairman also stated that consideration would be given to having a senior level IERD official visit Nairobi and explore the situation with the GOK.)

b. The Chairman asked the Rockefeller Foundation representative if the Foundation was prepared to continue as the sponsoring agency for the ILRAD. The latter replied in the affirmative and the Subcommittee approved.

c. The Subcommittee decided that in the event the GOK turned down the ILRAD it would be appropriate to request the Rockefeller Foundation to explore other possible locations in Africa which would appear suitable for the laboratory.

d. The Chairman referred to the matter of funding in support of ILRAD and requested the representatives present to give as definitive an indication as feasible. The replies are summarized below:

1. Canada - At this time it is not possible to state more than a general intention of support. Canada is interested in ILRAD but wishes to see what comes into being.
2. Denmark - Interested but it is not possible to make a commitment because support is subject to parliamentary action.
3. France - Unable to make any specific commitment.
4. Germany - Interested in ILRAD but no commitments possible until the elections are over and funds are appropriated.
5. Netherlands - Interested but no firm commitment possible at this time.
6. United Kingdom - Cannot state a specific amount but hope to contribute when the situation becomes clearer.

Report Covering Fourth Meeting of Consultative Group (CG) -

7. United States - Situation remains as set forth in amended statement of January 21, 1972 meeting of the Subcommittee, namely, that with regard to the international live-stock development and animal disease research programs under consideration by the African Livestock Subcommittee A.I.D. has programmed up to \$500,000 depending on programs developed and subject to such funds being made available by the U.S. Congress. However, the Congress has not appropriated any funds during 1972, and it is not likely to do so before 1973. (Note: The question was asked by the Rockefeller Foundation representative if funds could be made available for ILRAD without at the same time making funds available for a livestock center. The answer given was that assistance could be made available for ILRAD separately but no specific amount could be specified at this time.)

8. Rockefeller Foundation - Is willing to commit the amount of \$500,000 minus funds already advanced in support of the Executive Committee (Pritchard team) which the Foundation sponsored.

9. Ford Foundation - Did not make any commitment.

10. UNDP - It will continue to support its project at EAVRO probably for two years.

11. IBRD - No specific amount was stated. (Note: The IBRD considers itself to be in the position of a residual supporter providing support as circumstances may make necessary.)

12. IDRC - No commitment.

13. FAO - No commitment.

Report Covering Fourth Meeting of Consultative Group (CG) -

e. The Chairman interpreted the above replies as indicating that the Governments of Canada, Denmark, Germany, Netherlands, United Kingdom, and the United States and also the Rockefeller Foundation are potential contributors to ILRAD. Further, according to the Secretary to the Subcommittee the Chairman also considers Belgium as a potential contributor because of statements made by its representative during the Third Meeting of the Subcommittee. The Chairman feels that the amount of \$500,000 will probably be necessary for the fund which will be needed to meet the initial requirements of the ILRAD project.

SUMMARY OF REMARKS RELATING TO ILRAD

The Chairman's introductory remarks summarized the ILRAD situation with emphasis being placed upon contacts with the EAS^c since the Subcommittee's last meeting. He further remarked that from the beginning parallel courses have been followed, namely, the development of a livestock production approach and an animal disease (East Coast Fever and Trypanosomiasis) research program with the understanding that there should be some degree of integration. The Subcommittee is authorized to proceed with the establishment of ILRAD. However, it is not possible at this time for the Subcommittee to take final action on the Tribe report because the Technical Advisory Committee (TAC) is responsible for making findings and recommendations to the CG on this document. The Subcommittee should limit itself to discussing the report and passing on to the TAC such informal comments as may be deemed to be appropriate. He further mentioned that the next meeting of the TAC is scheduled to begin on January 30, 1973. In concluding his introductory remarks the Chairman emphasized that although the ILRAD situation is delicate, we have gained some momentum and we should not lose it.

The IDRC representative asked if it really was possible to separate the Tribe recommendations from actions concerning ILRAD and suggested that perhaps we should not consider having two centers. The U.S. representative supported this view and emphasized that from the beginning we have thought in terms of one overall livestock research and development program. It is the U.S. view that there should be one institution with one board of directors. Should this not be possible at this time there should be a transitional board for ILRAD with the understanding that later the two programs will be integrated into one under a single board.

copy to: Baird
Granley

cc Kelley

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

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SEP 28 1972

September 25, 1972

TO: All Participants in International Centers Week
FROM: Executive Secretary
SUBJECT: Informal Summary of Proceedings of International
Centers Week

Attached for information of participants in International Centers Week is the Informal Summary of Proceedings of the International Centers Week which was held in Washington, D. C., from July 31 to August 4, 1972.

Participants having amendments or suggestions to the Summary are asked to give them to the Executive Secretary not later than October 22.

Attachment

9/28/72

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

International Centers Week
Washington, D.C.
July 31 - August 4, 1972

INFORMAL SUMMARY OF PROCEEDINGS

1. An International Centers Week was held in Washington, D.C., from July 31 to August 4, 1972, to discuss ongoing and proposed international agricultural research activities and the financing of those activities.

2. The meetings during the week were attended by representatives of 26 members and four observers of the Consultative Group on International Agricultural Research, by members of the Technical Advisory Committee (TAC), by representatives of international agricultural research centers and institutes, and by leaders of teams carrying out missions for the Consultative Group and TAC. A list of participants is attached as Annex I.

3. During the week, plenary sessions, informal meetings of the Consultative Group, meetings of TAC, and a meeting among Center personnel were held. A Schedule of Events is attached as Annex II.

4. This was the third International Centers Week. Previous meetings, which were organized by the Rockefeller and Ford Foundations, were held in New York in 1970 and 1971. This was the first meeting to be organized by the Consultative Group and the first to include TAC.

PLENARY SESSIONS

5. The plenary sessions were devoted to the presentation of programs and budgets by the representatives of the following Centers: the Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT); the International Rice Research Institute (IRRI); the International Institute for Tropical Agriculture (IITA); the Centro Internacional de Agricultura Tropical (CIAT); the Centro Internacional de Papa (CIP); and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). Progress reports were made by the leader of the Executive Team on the proposed International Laboratory for Research on Animal Diseases (ILRAD) and by the leader of the African Livestock Task Force. Texts of these presentations are attached as Annex III.

TAC

6. TAC held meetings on August 2, 3 and 4. An informal oral summary was made to the Consultative Group by TAC's Chairman, Sir John Crawford. It is referred to elsewhere in these proceedings; a text is attached as Annex IV. The report of these TAC meetings will be distributed shortly by the TAC Secretariat.

MEETING OF CENTER PERSONNEL

7. The meeting of Center personnel was held on the afternoon of August 3 to discuss personnel policies, budget practices and other matters of common interest. It was decided that Center Directors would meet again in Bellagio, Italy, in February 1973, to discuss, among other things, the question of coordination among the research activities of the centers.

CONSULTATIVE GROUP

8. Informal meetings of the Consultative Group were held on August 2 and 4. Mr. Richard H. Demuth, Director, Development Services Department, IBRD, was in the Chair.

9. The Agenda adopted for the meetings is attached as Annex V.

10. In opening the Consultative Group meetings, the Chairman pointed out that they were to be quite informal; it was not expected that the Group would reach final decisions during Centers Week.

Problems of Allocation and Disbursement

11. The Chairman, in introducing this subject, observed that the Consultative Group, during its first year of operation, had had to face the complexities of harmonizing the flow of funds coming from a number of different sources to the Centers. The differences and delays in allocating and disbursing these funds had caused some difficulties for the Centers.

12. A number of remedial approaches were suggested for consideration. One was that Consultative Group members might be prepared to indicate their intentions with respect to contributions to the Centers, not only for the immediately following year, but also -- at least on a tentative basis -- for a second year. A second was that donors, in their consideration of allocations to the Centers, might be prepared to take overall patterns of requirements into account, and to be flexible in their final allocations; it was also observed that unrestricted core grants permitted greater flexibility than grants tied to specific activities. A third suggestion was that a Group Account might be created from which temporary advances could be made to protect the Centers against shortfalls arising from delays in appropriations and allocations.

13. Referring to the necessity for the Centers to receive long-term commitments by the donors, some members of the Group said that they had already indicated specific amounts they were prepared to commit for some years ahead. Other members stated that their authorities were presently studying appropriate measures to indicate such long-term commitments which would range from three to five years. Most multi-year commitments were, or would be, subject to continuing review and to availability of funds.

14. Referring to the question of delays in disbursements, most members of the Group said that funds committed by them would generally be available promptly after legislative approval had been received. In many countries fiscal years do not begin, however, until three months or more after the beginning of the calendar year.

15. Few members were attracted by the idea of creating a Group Account for working capital purposes. One member suggested that while such an account might possibly be created, it should not be expected that all members would contribute to it. Another member suggested that the Bank might consider the possibility of establishing an account unilaterally and handling the working capital needs of the centers entirely by itself. Another member pointed out that, if difficulties persisted, the centers probably would be forced to build some provision for working capital directly into each of their budgets. Still others felt that the difficulties with cash flow were teething problems arising from the novelty of the Consultative Group operation, and that the difficulties were likely to be much less acute in the future. It was agreed that no conclusions would be reached on the problem at this time, but that the various suggestions for solution would be further explored and the issue would be raised again if the difficulties persisted.

16. Most members of the Group agreed that the financing of the Centers had to be coordinated and if necessary to be negotiated in a rational manner. It was suggested that at Centers Week a budgetary presentation should be made covering all the centers for which funding was expected. Subsequently, after negotiations among the donors, decisions should be made on the allocations for individual centers.

Review Procedures

17. In introducing this subject the Chairman said that, so far as the existing Centers were concerned, the work of TAC might need to be supplemented by additional review procedures to meet the requirements of the Consultative Group.

18. Members of the Group mentioned various kinds of reviews that had taken place at the Centers.

19. One was an annual in-house review at which the Centers' staff, for the ultimate purpose of a discussion by the Board of Trustees, examined the scientific program of the Center for the next year. This review was essentially a domestic affair which was organized by the Director of the Center. Its results were reflected in the Center's annual program and budget.

20. Another review was external in character. It was the so-called commodity review, where the Director and his Board, with the best advice and assistance they could get from outside scientists, examined in depth the research priorities and framework for a commodity or a commodity-centered program. This kind of review was sometimes held in the form of a seminar; it was not necessarily tied into a regular cycle, annual or multi-annual; and it might be a review of research problems and questions as much as a review of a center's own activities with respect to the commodity in question. Such reviews, it was suggested, should include not only commodities but also agricultural systems.

21. Mention also was made of long-term external reviews focused directly on an appraisal of all aspects, scientific and administrative, of the center itself, carried out at intervals not shorter than three years and perhaps as long as five. Reviews of somewhat this kind had recently been carried out by CIMMYT and IITA. It was generally agreed that these reviews were very useful, and that it was desirable for their results, as in the case of CIMMYT, to be made available to the Consultative Group and to TAC as well as to the Board of Trustees involved.

22. There was extensive discussion of ways in which members of external review panels might be chosen, and of the extent to which directors and trustees of centers, TAC, and the members of the Consultative Group might enter into the processes of nomination and final selection.

23. In addition, a need was expressed for an annual progress report on each center, to be prepared by Consultative Group staff, which would present the facts concerning the execution of the center's program and analyze the center's budget request in relation to the approved program.

24. The members of the Group recognized the need to reconcile two desiderata: (1) that all donors be kept as fully informed as possible of the activities of the centers and feel a sense of participation in their progress; and (2) that the directors and staffs of the centers not be diverted unduly from the execution of their research programs by a large number of uncoordinated visits from donor representatives. It was suggested that one procedure for this might be to ask each center to map out a program of review sessions which it would consider useful for its own purposes over a period of three to five years, and to indicate at which of these sessions representatives of donor agencies would be welcome.

25. The Group agreed that all of those questions needed further consideration and it asked the Secretariat to prepare a paper on this subject for the next Consultative Group meeting.

A Financial Framework

26. The question of a financial framework was touched upon during the discussion of several points on the agenda.

27. The Chairman of TAC, in his informal oral report, forecast greatly increased financial needs for international agricultural research. In addition to the requirements of existing centers, he foresaw that funds were likely to be needed for ICRISAT relay stations in Africa, for new research activities in the Near East and further activities in Latin America, for African livestock research, for the conservation of genetic resources, for further work in legumes, etc. Taking into account all the proposals under various stages of study and realizing that a very rigid selection of priorities had to be made, it was the opinion of the Chairman of TAC that as much as \$70 million annually might be required by the late 1970s for funding of priority activities, including outreach.

28. In introducing the agenda item on the question of a financial framework, the Chairman of the Consultative Group observed that in order to assure the Centers of the continuing support of the Group it would be desirable for members to indicate for some years into the future what the total of available resources might be.

29. Several members indicated that they were, or by 1973 would be, in a position to indicate the levels of finance they were prepared to consider for several years in the future, subject to the availability of funds and to a periodic review of allocations. One member repeated an earlier statement that his government was prepared, in principle, to provide up to 25 per cent of capital and operating costs of the Centers up to a maximum total contribution of \$7 million in any one year, provided that the other 75 per cent was forthcoming from other sources. If and when the \$7 million limit became inconsistent with the percentage approach, his government would be prepared to review this limit in light of the situation then prevailing.

30. The same member said it might be desirable to set a notional ceiling on the core budget of each of the individual centers, subject to two kinds of adjustments: (1) allowance for rising costs of given activity levels; and (2) the cost of additional activities undertaken by the center with the endorsement of the Consultative Group. Such ceilings should help to keep the activities of each Center adequately focused on one or a few major programs to achieve the critical massing of effort needed for significant breakthroughs. It would also help the management of the Centers correctly to anticipate financial availabilities a number of years ahead and thus facilitate efficient program and

financial planning. Finally, these efforts should facilitate working out an appropriate division of labor and avoidance of unnecessary duplication among the Centers. Considerable support was expressed for this view by other members.

31. Another member proposed that an expert staff be created in the Secretariat to study both the availability of funds and the requirements of the Centers. It should prepare a document analyzing the problems and making recommendations for consideration by the Consultative Group. This proposal also received considerable support.

Nomination to Board of Trustees of the International Potato Center

32. The Group agreed that it should accept the invitation of the International Potato Center (CIP) to nominate three representatives of the Consultative Group for election to CIP's Board of Trustees. Members of the Group were invited to submit names of qualified candidates to the Executive Secretary. The Group also agreed that the Secretariat would prepare for the next meeting of the Consultative Group a document suggesting a procedure for considering the nominees proposed and making recommendations to the Board of Trustees of CIP.

Preliminary Report by Chairman of TAC on Programs for 1973 to be Recommended for Consultative Group Financing

33. The Chairman of TAC, in summarizing the finding of his Committee on programs to be recommended for Consultative Group financing in 1973, made the following principal points:

(a) TAC would meet in the second half of January 1973 for a few days without an agenda to discuss the research priorities for the following years and formulate some recommendations to the Consultative Group on these issues. One question to be considered was how best to develop the expertise of framing and formulating the economic policies that were related to agricultural development.

(b) TAC would welcome an opportunity to meet with the economists of the research centers to discuss the role of economists at the centers.

(c) Speaking about Centers' Week in general, TAC welcomed this event as very valuable for its work. In the future, however, TAC would have its regular meeting the week prior to Centers' Week so that, during Centers' Week, it could confine its deliberations to the programs of the participating centers. It was hoped that TAC would have the opportunity during Centers Week to meet the Directors of the individual institutes for a face-to-face exchange on technical questions.

(d) As for the 1973 requirements of the existing research centers, TAC concurred with them in general. (Details can be found in the full statement of the Chairman of TAC which is attached as Annex IV.)

(e) Apart from the requirements of centers already being supported by the Consultative Group, TAC was recommending support in 1973 to complete the capital facilities of the Asian Vegetable Research and Development Center, for an ICRISAT network in Africa and for the conservation of genetic resources.

(f) TAC had also studied the request for support by the West African Rice Development Association (WARDA). While recognizing the importance of this institution, TAC did not recommend financial support at the present time but would prefer to study this question further.

Statement of Intention by Donors as to Their Possible Financial Contributions for 1973 and Subsequent Years

34. A table was distributed showing the estimated cash requirements of ongoing international agricultural research programs in 1973. A somewhat revised version of it is attached as Annex VI.

35. A number of members made preliminary statements of intention, subject to legislative and other approvals, regarding the funds they would make available to meet these requirements. The statements are reflected in the table attached as Annex VII.

36. Some members said that they would indicate the financial contributions of their governments at the November meeting of the Consultative Group.

Other Business

37. One member stated that it seemed desirable to give more study to the effect which socio-economic factors should have on the programs of the international agricultural research centers, and that consideration should also be given to an internationally supported institutional approach to research in the dynamics of growth and change in the agricultural sector. This would be designed to provide the developing countries practical help in agricultural sector analyses. He suggested that the views of the Chairman of TAC be sought on the latter question. A number of other speakers endorsed the view that increased emphasis was needed on socio-economic factors in connection with formulations of agricultural research programs and agricultural sector policies, and it was accordingly agreed that this subject would be included on the Agenda for the next Consultative Group meeting. Members were invited to send to the Secretariat for distribution to other members of the Group, any papers or

comments they wished to provide for the discussion of this item. It was also agreed that the Directors of the Centers would be asked to provide any information about their present or proposed activities in the socio-economic field which had not already been included in the documentation provided for International Centers Week.

INTERNATIONAL CENTERS WEEK

July 31 to August 4, 1972

LIST OF DELEGATES

African Development Bank

Mr. E. A. K. El Saeed
Head, Agricultural Section
Operations Department
African Development Bank

Belgium

Mrs. G. Iliff
Embassy of Belgium
Washington, D. C.

Canada

Mr. H. G. Dion
Technical Adviser (Agriculture)
Canadian International Development
Agency

Mr. Charles Greenwood
Director, United Nations and Research
Program Division
Canadian International Development
Agency

(only August 2 to 4)

Mr. George Krivicky
Program Administrator
United Nations and Research
Program Division
Canadian International Development
Agency

Mr. T. Willis
Coordinator of Agricultural Development
Department of Agriculture

Denmark

Mr. Klaus Winkel
Secretary
DANIDA
Ministry of Foreign Affairs

Mr. Lars Tybjerg
Financial Attache
Royal Danish Embassy
Washington, D. C.

European Communities

Mr. H. Eggers
Chief, Agricultural Services
Western Africa
European Development Fund
Brussels, Belgium

Food and Agriculture Organization of the United Nations

Mr. J. P. Huyser
Director
Investment Centre and FAO/IBRD
Cooperative Programme

Mr. Peter A. Oram
Senior Agronomist and
Secretary of the TAC

Mr. B. N. Webster
Assistant Secretary of the TAC

Ford Foundation

Mr. David E. Bell
Vice President
Ford Foundation

Mr. Lowell S. Hardin
Program Officer for Agriculture
Office of the Vice President

Mr. F. F. Hill
Program Advisor for Agriculture
Office of the Vice President

Ford Foundation (Cont.)

Mr. Norman Collins
Program Advisor, Agriculture
Latin America and the Caribbean

Mr. Dale Hathaway
Program Advisor, Agriculture
Asia and the Pacific

France

Mr. H. Vernede
Commissaire du Gouvernement aupres des
Instituts de recherche specialisee Outre-Mer
Secretariat d'Etat aux Affaires Etrangeres

Germany

Mr. W. Artopoulos
Alternate Executive Director
IBRD

Inter-American Development Bank

Mr. Alfred Wolf
Program Advisor

Mr. Jesus Munoz Vasquez
Director, Division of Analysis of Agricultural
Development Projects

Mr. Mauricio Herman
Director
Training Division

Mr. Thomas F. Carroll
Coordinator, Agricultural
Economics Section

International Bank for Reconstruction and Development

Mr. Richard H. Demuth, Chairman of the Consultative Group
and Director, Development Services Department

Mr. L. J. C. Evans, Director, Agriculture Projects Department

International Bank for Reconstruction and Development (Cont.)

Mr. H. Graves, Executive Secretary of the Consultative Group
and Associate Director, Development Services Department

Mr. James Fransen, Agriculture Projects Department

Mr. F. Kaps, Assistant to the Executive Secretary of the Con-
sultative Group, Development Services Department

Mr. G. F. Darnell, Agriculture Projects Department

Mr. M. E. Ruddy, Programming and Budgeting Department

International Development Research Centre

Mr. J. H. Hulse
Program Director, Agriculture, Food
and Nutrition Sciences
IDRC, Ottawa

Mr. L. Rousseau
Vice President
IDRC, Ottawa

Dr. H. Doggett

Japan

Mr. Nobutoshi Akao
Embassy of Japan
Washington, D. C.

Mr. Masanari Sumi
Alternate Executive Director
IBRD

Netherlands

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The Hague, Netherlands

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Ministry of Agriculture
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Rockefeller Foundation

Dr. John H. Knowles
President

Dr. Sterling Wortman
Vice President

Dr. John A. Pino
Director
Agricultural Sciences

Dr. Ordway Starnes
Field Director, Rockefeller Foundation
Indian Agricultural Program

Dr. E. J. Wellhausen
Associate Director
Agricultural Sciences

Sweden

Mr. Carl I. Ohman
Alternate Executive Director
IBRD

Switzerland

Dr. Rolf Wilhelm
Director of Projects
Swiss Technical Cooperation of the
Federal Political Department
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Mr. Peter Saladin
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(only July 31 - August 1)

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Mr. M. A. Huberman
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(only July 31 - August 1)

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U.S. Agency for International Development

Dr. Omer J. Kelley
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Dr. James H. Starkey
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Dr. Lyle Schertz
Deputy Administrator, International Economics
Economic Research Service
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Dr. Kenneth L. Turk
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Mr. Guy Baird
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Mr. John L. Cooper
Principal Agriculture Advisor
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b. Thailand

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b. Brazil

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Mr. Pedro Paulo P. Assumpcao
Second Secretary
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Mr. Clemente Rodrigues Mourao Neto
Third Secretary
Embassy of Brazil
Washington, D. C.

Representing the Middle East: a. Lebanon

Dr. Malek Basbous
Director General Plan Vert
Ministry of Agriculture
Beirut, Lebanon

Mr. Joseph Naffah
Secretary General
Research Council
Lebanon

Representing the Middle East (Cont.): b. Pakistan

Mr. Haq Nawaz
Food Attache
Embassy of Pakistan
Washington, D. C.

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OBSERVERS

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Dr. J. George Harrar

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Dr. Noboru Yamada

Professor Dieter Bommer

Dr. W. D. Hopper

Dr. I. E. Muriithi

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International Potato Center (CIP)

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Director, Outreach Programs

International Rice Research Institute (IRRI)

Mr. F. F. Hill
Chairman of the Board
(also listed under Ford Foundation)

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Dr. Frank Byrnes
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International Institute of Tropical Agriculture (IITA)

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Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT)

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Mr. Haldore Hanson
Director General

Dr. Robert Osler
Deputy Director

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

Prof. C. F. Bentley
Chairman of the Board

Asian Vegetable Research Center

Dr. Robert F. Chandler, Jr.
Director

African Livestock Task Force

Professor Derek Tribe
Leader

ILRAD Executive Team

Dr. William Pritchard
Leader

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

INTERNATIONAL CENTERS WEEK

SCHEDULE OF EVENTS

MONDAY, JULY 31

Plenary Session

Chairman: Mr. R. H. Demuth
Chairman, Consultative
Group on International
Agricultural Research

IMF Auditorium

9:30 - 9:45 a.m.

Opening Statement by the Chairman

9:45 - 10:45

CIMMYT Presentation

11:00 - 12:00

Discussion on CIMMYT

12:00 - 1:00 p.m.

IRRI Presentation

Plenary Session

Chairman: Mr. J.H. Huyser, Director, IMF Auditorium
Investment Centre and FAO/
IBRD Cooperative Program
Food and Agriculture Organization

2:30 - 3:30 p.m.

Discussion on IRRI

3:45 - 4:45

IITA Presentation

4:45 - 5:45

Discussion on IITA

TUESDAY, AUGUST 1

Plenary Session

Chairman: Mr. Myer Cohen
Deputy Administrator
United Nations Development
Programme (UNDP)

IMF Auditorium

9:30 - 10:30 a.m.

CIAT Presentation

10:30 - 11:30

Discussion on CIAT

11:45 a.m. - 1:00 p.m.

CIP Presentation and Discussion

TUESDAY, AUGUST 1 (CONT.)

Plenary Session	Chairman: Sir John Crawford Chairman of the Technical Advisory Committee, Con- sultative Group on Inter- national Agricultural Research	IMF Auditorium
2:30 - 3:15 p.m.	Discussion on CIP continued	
3:15 - 4:15	ICRISAT Presentation and Discussion	
4:30 - 5:30	ILRAD and African Livestock Progress Reports and Discussion	
6:00 - 8:00	Reception	

WEDNESDAY, AUGUST 2

9:30 a.m. - 5:30 p.m.	Informal Meeting of Consultative Group Members and Observers	IBRD Board Room
9:30 a.m. - 5:30 p.m.	Technical Advisory Committee (TAC)	Pan American Health Organization - Conf. Room C

THURSDAY, AUGUST 3

9:30 a.m. - 5:30 p.m.	TAC	Pan American Health Organization - Conf. Room C
3:30 - 5:30 p.m.	Discussion of financial, admini- strative and personnel problems among Center Directors, Chairmen, and staff. (It is expected that donors who wish to have individual discussions with directors of centers will be able to do so during the afternoon of this day.)	IBRD Conf. Room C 1006
9:30 a.m. - 1:00 p.m.	Meeting of the Subcommittee on African Livestock of the Consulta- tive Group. (The provisional agenda for the meeting has already been circulated to members of the Sub- committee.)	IBRD Board Room

FRIDAY, AUGUST 4

9:30 a.m. - 12:30 p.m.

Informal Meeting of Consultative
Group Members and Observers and
members of TAC

IBRD Board Room

2:30 - 6:00 p.m.

TAC

IBRD Board Room

Statement of Haldore Hanson, Director General of CIMMYT
(International Center for the Maize and Wheat Improvement)

Introduction

This meeting marks a second generation for the International Centers, in several meanings.

First of all, we are meeting in the World Bank, under sponsorship of the Consultative Group. Previous meetings back to about 1965 were held in New York, under sponsorship of private foundations.

CIMMYT would like to express to the Chairman of the Consultative Group and to the Secretariat our appreciation for the excellent documentation and early delivery. Getting out the documents early is one of the keys to success of a meeting like this.

The donors at this meeting also represent a second generation. There was a time when only two foundations were donors, and the total budget of all the centers in 1966 did not reach \$5 million dollars. Now we are at a stage when the combined budget is \$15 millions in 1972.

I doubt that the Centers, working individually, could have achieved success in a drive for \$15 millions this year. We would have been competing for the same donors. The Secretariat of the Consultative Group has done an effective and diplomatic job in soliciting new funds.

Now, if we turn to the Centers themselves, they also have entered a second generation.

The Directors General of the two oldest centers have retired in 1972. These two men did much to create the international respect for the Centers, which has made possible the present wide support for the Consultative Group. I hope the second generation of directors can do as well.

At CIMMYT half the original Board of Trustees retired in the last year, and successors are now being chosen. I hope we choose as well.

A second generation of programs is emerging at some of the centers.

When I first visited IRRI 10 years ago, that Institute was clearly focused on irrigated paddy rice, for monsoon Asia. Among the documents for this meeting, I find that IRRI proposes a major new program for Upland Rice, under dryland conditions. This is a second generation program, and its implications would certainly reach to upland rice fields in Africa and South America.

At CIMMYT we are also reviewing our program options, and I propose to comment on our discussions.

CIMMYT, as many of you know, was an old organization when it adopted the present name and an international mandate in 1966.

CIMMYT's predecessor organization began in 1943 as a cooperative crop research program, staffed jointly by the Mexican Government and the Rockefeller Foundation. CIMMYT therefore has a straight line history of 28 years of research in maize and wheat. Our first director, in this extended sense, was Dr. George Harrar, who is here today as a member of TAC. Dr. Wellhausen, my predecessor, gave 29 years of leadership to the program in Mexico. CIMMYT's wheat director, Dr. Borlaug, is now in his 27th year in that same position.

When CIMMYT's international program began, two of the earliest requests for collaboration came from India and Pakistan, and the dwarf wheats which had been developed in Sonora State, Mexico, for use in Mexico, turned out to be well adapted to the needs of India and Pakistan. These two Asian countries, as I recall, imported a total of 15 million tons of foodgrain in 1966. They constituted the largest food deficit in the world.

I will not repeat now the story of dwarf wheat in Asia, but one pair of statistics will remind us how successful the dwarf wheats have been.

India in 1965 had good rainfall and harvested 12 million tons of wheat. That was India's all time record up to that date.

This summer, in July, 1972, India is still threshing and measuring a wheat harvest which is estimated to be 27 million tons. In other words, India has doubled its production in seven years, with little change in land area.

I have not heard of any other country or region, anywhere or anytime, that has managed to double the production of so large a foodcrop in so short a time. The introduction of hybrid corn in the USA produced no such record.

Someone in this audience may possibly ask me: If the battle is already won in India, why is CIMMYT still spending over one million dollars a year on wheat research in Mexico?

That question would justify a long answer by one of our wheat scientists, but since they are not here I will risk a short reply.

Neither India nor CIMMYT has yet developed a general resistance to the races of rust in wheat, and there is no chemical control. Rust is the most unstable and disastrous epidemic disease affecting any basic foodcrop of the human race.

There was a recent reminder of this in Mexico. In 1971 the highest yielding Mexican variety of wheat, bred in the cooperative Mexico/CIMMYT program, was knocked out by a new race of rust, and planting of that variety had to be abandoned this year.

When a major outbreak of rust occurred 50 years ago, it was a disaster. But in 1971 Mexico was ready. Mexico has an aggressive wheat breeding program which is one step ahead of the disease by having a substitute variety ready, equally high yielding, but of different genetic parentage, and able to withstand the new rust.

India also has an aggressive wheat breeding program. Until the scientists develop a horizontal or generalized resistance to all races of rust, the continued breeding of new varieties with a wide diversity of parentage is the only safeguard.

Hunger fighting was the name which the press gave to the beginnings of CIMMYT's program in the 1960s. That job is not yet finished, but CIMMYT is already working on additional program options.

A second option is the world's protein shortage. Suppose we look at protein for a moment.

The human race is now getting most of its protein from three sources: 60% from cereal grains, 20% from legumes, and 20% from animal and fishery products. Those are rounded numbers.

The protein shortage is greatest in the hot, humid countries of the tropics in South Asia, in Middle Africa, and in much of Central and South America. All these countries live by a diet which consists heavily of cereals and tubers.

The international centers have been asked what they can do to help relieve the protein shortage.

CIMMYT is working on the protein problem in several ways. Our most immediate contribution is likely to be from Opaque-2 maize. This new maize has demonstrated almost miraculous cures of babies suffering from protein deficiency disease. I will describe our work on this a little later.

CIMMYT is also working with the hypoly gene in barley, which is a modifier gene found in Ethiopia by Swedish scientists a few years ago. The gene provides both a higher percentage of total protein, and an improved amino acid balance. We are probably 5 years away from any significant breakthrough in barley.

In wheat, CIMMYT has searched the world's germ plasm collection and found no modifier gene for protein improvement, comparable to the Opaque-2 gene in maize. But CIMMYT and its collaborators are manipulating the protein percentage in wheat by the timing of nitrogen fertilizer on the crop. In India, for example, the protein content of the wheat crop has been raised from 9-11% in 1966, to 12-16% in 1972, by the timing and amount of nitrogen fertilizer applied to the crop.

All the Centers at this conference have an important contribution to make to the protein problem, either in cereal breeding, or through food legumes, or through animal feeding studies.

Protein development is therefore our second program interest at CIMMYT.

A third option relates to the better distribution of new technology to farmers. This problem can be stated in the form of a question: How can an international center help to devise better delivery systems for new technology, so that small farmers and rainfed farmers are able to benefit more?

This question arose almost at the start of the agricultural revolution in Asia, because there is world wide concern for the welfare of the smallholder and the disadvantaged farmer.

In 1967 CIMMYT began an experiment in Mexico, called Plan Puebla. The purpose was to find how new maize production technology could best be spread among 47,000 smallholders around the city of Puebla. We wanted to learn from this experiment methods which would be helpful to other countries.

We have learned much from Plan Puebla. Adoption of new technology among the smallholders rose rapidly for the first three years, then levelled off. We are now studying why the adoption rate slowed down. It is clear that risk in dryland farming plays a large part. Nevertheless, many smallholders have already benefitted from Plan Puebla. The repayment of loans by smallholders has also been fully as good as by large farmers.

Plan Puebla has attracted wide interest in Latin America and has led to the launching of 10 similar projects in four countries.

Plan Puebla is ending as an experiment in 1973. CIMMYT has decided to launch an even broader inquiry into the problems of adoption of new technology by farmers in developing countries. We have asked our economics staff to undertake studies of the spread of new technology developed by CIMMYT, and to analyze who is getting the benefits, and how CIMMYT can better consult with Governments on the maximum spread of the new technology. These studies will cover at least eight countries in Asia, Africa, and Latin America.

One year from now, I hope it will be possible for the head of our economics staff to speak to the Directors during Centers Week, on what we have learned from these studies of farmer adoptions of new technology.

This study of delivery systems is our third program option.

Still another program concern is presented by the probability of another world food crisis in the 1980s, far surpassing that of the 1960s, and brought on by continued world population growth.

This new food crisis would be partly a crisis in distribution. We know, for example, that demand for wheat is rising about 4% a year, and so is wheat production, but the supply and demand are not in the same countries. Population growth continues to be greatest in the tropics, whereas production increases are greatest in the temperate zone. If present trends continue, the underdeveloped countries could be importing more food in the 1980s than they were in the 1960s.

To prepare for the next fight against hunger will require a revolution in every major foodcrop. The world will need IRRI's help on upland rice, CIMMYT's work among dryland maize farmers, CIAT's work on cassava, IITA's work on shifting cultivation, the research in Peru on potatoes, the sorghum research of ICRISAT, and so on.

In short, the new generation of programming which will be discussed here this week is a blueprint for the 1980s.

These four program interests have been under review at CIMMYT. All of them are important. A decision is needed how we assign our resources in the years immediately ahead.

Let me now turn to CIMMYT's current progress.

High lysine maize

I mentioned earlier that I would speak more about CIMMYT's progress with high lysine maize.

In 1972, the most important development at CIMMYT is likely to be the world wide distribution of an open pollinated maize carrying opaque-2 gene and flint-type kernels. Many maize producing countries in the tropics have been awaiting this development. This is the first of six high-yielding populations being developed at CIMMYT, all with opaque-2 gene.

To make these developments clear, it will be necessary to repeat some of the history of corn research in Mexico, and the story of the opaque-2 gene. I know this is familiar information to part of the people in this room but not to all.

A corn team in Mexico, composed partly of Mexicans and partly of Rockefeller Foundation staff, spent 23 years working on hybrids for Mexico, before CIMMYT was created. Good hybrids were developed and distributed. They were high yielding hybrids, as good as most varieties in the U.S. corn belt. But they were not widely used in Mexico. Hybrids have never been grown on more than 10% of the corn land of Mexico.

Mexico had problems with seed multiplication and distribution. Most farmers preferred to save their own seed from one season to the next, rather than to buy new hybrid seed every season.

Similar problems with hybrid seed have been encountered in most developing countries.

So, about the time when CIMMYT was created as an international agency in 1966, CIMMYT changed its focus from hybrid development to work on mixed or heterogeneous populations of open pollinated maize.

Mixed populations are not a new idea. This is what most farmers have always grown in the tropics. But the scientists are trying to improve the performance by mixing 10 or 20 different varieties, compatible with each other, and growing them in the same field, so that hybrid vigor is achieved from cross fertilization in the field.

This modified maize program aims to solve several specific problems:

(1) The tropical corn plant grows too tall, and has a weak stalk. When fertilizer is applied, the crop blows over in a strong wind. The plant needs to be shortened, and the ear must be placed lower on the stalk.

(2) The tropical maize plant takes too long to mature. The growing period needs to be shortened, and this reduction of growing days must take place before flowering, so that the plant still has the same number of days to fill its grain.

(3) The tropical maize plant needs to be made more adaptable to changing day length and changing temperature. The maize plant should be able to move, like the Mexican wheat plant, from Mexico, to Guatemala, to Peru, to Argentina. It should also be able to move up a mountain side, from sea level to 2000 meters, or even higher. No traditional maize plant has been able to move around like this.

(4) The tropical maize plant is attacked by more insects and diseases than its temperate zone cousin. CIMMYT scientists believe that the control of these diseases and insects should be genetic, as far as possible. Hence this is a job for the breeders.

(5) Finally, the tropical maize plant is much too low in yield. The typical yield of a corn belt farmer in the USA is 100 bushels per acre, or as the CIMMYT scientist would express it, 6000 kilograms per hectare. The typical corn crop in the tropics is 1000 kilograms per hectare, plus or minus 200 kilograms. In other words, the tropical maize grower, whom CIMMYT is trying to help, is still growing only 1/5th, or 1/6th the yield per land unit of the corn farmer in the USA.

Now let us see how far this program has progressed.

In June 1972 CIMMYT harvested its 7th generation of experimental populations under this new maize program.

Already the plant is one meter shorter, the ear is 30 centimeters lower on the stalk, and the maturity period is seven days shorter. That seven days was subtracted from the period before flowering.

The new populations are moving up the mountainside, between winter and summer crops, from sea level near Vera Cruz, to 1000 meters near Cuernavaca, to 2000 meters at our headquarters in El Batan, and some lines are growing well at 2660 meters near Toluca.

To get adaptation for day length, CIMMYT now distributes its maize nurseries to 50 countries and they are grown at more than 300 locations, and all this experimental data is flowing back into CIMMYT to guide the breeders.

On disease: Genes for resistance to many corn diseases and insects of the tropics have been identified, and some have been incorporated successfully into the new populations. The disease work is the slowest part of this program.

Yields are up to 5,500 kilograms per hectare in farmers' fields, within 10% of the corn belt average in the U.S.

If I sound enthusiastic about the progress, I am violating the instructions given to me by our corn breeders. They said: "Don't promise anything to those people in Washington. Wait until we finish the job. It is very easy to be wrong in this business of developing a new corn plant."

CIMMYT scientists are convinced they are moving in the right direction, and a major breakthrough, comparable to dwarf wheat, is not far off.

Now, let me turn to the protein problem in maize.

Traditional maize, both in the temperate zone and in the tropics, contains between 9 and 10% total protein, which is low for a balanced human diet. In addition, maize is not balanced in its amino-acid distribution, lacking sufficient lysine and tryptophan.

In other words, a human being eating a diet made up predominantly of maize will need to supplement his diet with other forms of protein, or he will develop a malnutrition disease. Babies weaned in South America or Africa from mothers milk to maize gruel, often develop the protein deficiency disease, kwashiorkor.

This trouble with corn has been known since 1914, when researchers in Connecticut put some laboratory rats on a strict diet of corn, and all the rats developed acute signs of malnutrition. Then the scientists added a little lysine and tryptophan to the diet and the rats recovered quickly.

From that day to this, one of the challenges to plant breeders has been to produce a corn which makes a balanced diet.

In 1935 a mutant gene in corn was identified which turned kernels opaque. The protein significance of this Opaque-2 gene, as it was called, could not be identified, because science did not then have sufficient laboratory techniques in biochemistry.

In 1963, a group of scientists at Purdue University unlocked the secret. Using methods of biochemical analysis, they found that corn containing the opaque-2 gene also contained 70% more lysine and double the content of tryptophan.

These findings were published in 1964. One of the scientists commented that if this mutant gene could be transferred into a high yielding variety of maize, mankind would have available for the first time in history a "super grain" which contains everything needed for healthy human growth except some minerals and vitamins.

This opinion was soon verified by feeding the maize containing opaque-2 gene to swine, which gained 50% faster than on traditional maize. The feeding value was also confirmed in feeding trials with mice, rats, chicks, and finally with human babies at a hospital in Cali, Colombia. Babies suffering from cases of kwashiorkor which were considered medically fatal made nearly miraculous recoveries.

All this excitement about a new maize turned to disappointment when scientists tried to incorporate the opaque-2 gene into high yielding varieties.

The mutant gene had been found originally in very poor plant types, with low yield. The kernel was soft, and this softness permitted easy access for insects. The corn also rotted easily in storage. Worst of all, people who eat maize as a direct human food have strong ideas about the color and texture they prefer in maize, and most of them would not eat this peculiar kernel.

Scientists at CIMMYT and their collaborators in the USA have labored on each of these defects for a number of years. One by one, modifiers were found. The last problem was the most difficult: how to change the soft endosperm into a hard, flint-like kernel. Once it was found that the opaque characteristics could be altered by modifier genes, it was no longer possible to recognize the Opaque-2 gene by its color, and all identification had to proceed chemically by the amino acid analyzer, which is slow and costly. Biochemists at CIMMYT have now developed rapid survey techniques which permit us to survey 200 samples a day.

On May 10, 1972 CIMMYT harvested the maize population it had been seeking for seven generations. This was one of CIMMYT's improved tropical corn lines, with shorter plant type, lower ear, shorter maturity period, genetic resistance to many diseases and insects, plus the Opaque-2 gene for high lysine, plus the hard flint-type kernels.

There was only 100 kilograms or four bushels of this first harvest. It passed all the tests in the CIMMYT protein laboratory, and was shipped for multiplication in 15 tropical countries around the world. By October or November 1972, that seed will be multiplied to 20 or 25 tons, and will again be distributed, this time for yield trials in thousands of farmers fields.

At the same time, this new maize is again going into feeding trials to reverify its biological value. All the trials on rats, mice, chicks, and swine have been rescheduled, and a group of 10 babies at the malnutrition clinic in Cali, Colombia, are being tested on this latest material.

Sometime in the next six months to nine months, CIMMYT expects to make a decision whether we are ready for a major public campaign to introduce this high lysine maize for the widest possible use in the tropical countries of the world.

Scientists at CIMMYT and elsewhere have made mistakes in the past on this type of forecast, but our staff are reasonably certain this time.

So much for the new maize. There are many other topics we could discuss here regarding progress under CIMMYT's program.

For example, durum wheat has now been dwarfed at CIMMYT and will be ready for world-wide introduction within two or three years. It will establish its own revolution for spaghetti and couscous eaters.

Triticale, the man-made cross between wheat and rye, will enter world production records as a feed grain, possibly in 1973. CIMMYT has been working on triticale since 1966, in collaboration with Canadian Scientists, and now has a substantial grant from the Government of Canada for this work. Triticale is not yet ready for use as a bread grain, because of a partially shrivelled grain, and further work on disease resistance is needed.

CIMMYT's outreach program now supports 23 staff members outside Mexico, assisting in national production campaigns for wheat and maize. Sixteen of these staff work in Africa, 6 in Asia, and one in Latin America. New staff assignments in 1972 are to Nepal, Iran, and Zaire.

About training: CIMMYT's program now provides special courses in maize and wheat production, as well as courses in research.

These and other developments at CIMMYT can be discussed during the question period, if you wish.

CIMMYT Management

Before I turn to our budget request for 1973, let me comment on CIMMYT's management.

When I came to CIMMYT at the beginning of this year, I found the two commodity research programs for wheat and maize had exceptionally strong leadership and staff. So did the laboratories. The economics staff so far contains only a department head, but he is highly regarded in his field.

The supporting services are not so strong, and our Program Review Panel urged that CIMMYT strengthen the computer service, the library, the visitors service, and start a scientific news letter, to replace one which was suspended in 1970. We are working on these problems, and within the next year we should report significant changes.

Our administrative services are in need of outside review. We plan an external panel review of administration in December of this year. The panel will be headed by Mr. Jose Drilon of the Philippines, who is attending this Centers Week as an observer for FAO. Mr. Drilon was for many years Executive Officer of IRRI. All documents of this review will be available to the Consultative Group.

Now a word about our headquarters. CIMMYT moved into its new, permanent headquarters just one year ago. We are located 45 kilometers outside Mexico City, near the town of Texcoco, and also near the Mexican national agricultural center, with its graduate school, its research center, and its headquarters for extension.

The buildings for CIMMYT's offices, laboratories, and workshops are most satisfactory. They are simple in appearance, functional in use, and exceedingly well constructed, and therefore low in maintenance cost. For all these qualities, CIMMYT owes much to my predecessor, Dr. Edwin Wellhausen, who employed the architects, and looked after construction.

The largest unfinished job in our capital program relates to the research stations which CIMMYT uses, at various elevations in Mexico. These stations still need extensive fencing, land levelling, and supplemental irrigation facilities. Most of the stations also need crop handling buildings, and three stations need hostel space for trainees, so that we can move the trainees wherever the CIMMYT scientists are working. At present we use commercial hotels to accommodate the trainees, but this is not an economic practice, in my judgment. So much for management questions.

Budgets 1973

Now I will speak about budget. The CIMMYT budget at this meeting of the Consultative Group has been presented in one folder of 31 pages. Half the folder is devoted to a program report, and half to the budget tables. There is a separate folder, available through the Secretariat, giving more than 30 worksheets which support the calculations in the budget. The worksheets are accounting documents, and I do not recommend them to you, unless you wish to see how the accountants put together each line item in the budget.

I am assuming that each of you has a copy of the CIMMYT budget for 1973, and I will not try to summarize the document here. But I will offer these comments.

First, we are asking a net of \$4.9 million from the Consultative Group.

Our recurring budget for 1973 is given on page 17 of the Budget document. The recommended amount is \$4 millions, and this is about 20% higher than in the current year.

The reasons for the increased operating budget can be divided into three parts. The first is the rising cost of present personnel and services, which we find to be running in Mexico at about 7% a year. The second is new personnel. We have listed eight new posts in the budget, and I am prepared to discuss the need for each of them during the question period.

The third consists of some new activities. For example, barley research, or increased postdoctoral fellowships under the training program, or studies by our economics staff into the reasons why some farmers adopt new technology and some do not.

Each item can be discussed, if you wish.

The capital budget is given on page 18 of the Budget document.

CIMMYT is recommending \$1.2 millions for capital expenditure in 1973. This is part of a 10-year development program for CIMMYT facilities in Mexico, which will be approximately 75% completed at the end of 1972. And if the recommended funds are granted, the development program will be 90% completed at the end of 1973. The balance is requested over a four year period.

Our budget was reviewed this year, first by the External Review Panel in April, then by our Executive Committee in May, and finally by our full Board of Trustees in June. Changes were made at each step, and the budget comes to you now in a form which has had careful study.

Donor/centers relations

Before we leave the subject of budget, I have some comments on donors.

The Centers have until now enjoyed the best of all worlds. Under the leadership of private foundations, the Centers had security of financial support, up to a fixed ceiling. They had great flexibility of staffing and programming. They had a minimum of burden to answer questions about their budgets.

In this new generation under the Consultative Group, many donors are supporting this program for the first time, and they need to know much more about the Centers. They are asking more questions. We understand this need, and we want to help.

At the same time, our scientific staff at CIMMYT is concerned that the visitors are taking up a great deal of time, and the scientists fear that the new donors will interfere with research plans.

This uncertainty is mutual. Let me therefore speak openly of problems which CIMMYT feels it is having, and I hope that candor will encourage some donors to speak of their problems with CIMMYT.

The first money problem of CIMMYT arises from late pledges. On January 1, 1972 CIMMYT began this fiscal year with pledges for only 65% of its approved budget. Therefore we cut back our program by 35%.

During the first half of the year, some changes of pledges occurred each month, and by July 1, when half the year was gone, we had pledges for 95% of our approved budget. But one donor who pledged 10% of our budget reported that funds would not be available before November or December, the last two months of our fiscal year. Two senior officers of CIMMYT, including the Deputy Director and the Controller, spent most of the first six months revising the CIMMYT work plans, to fit the changing funds. We understand the legislative problems of donors. But we also feel that this is not an effective way to manage a research program.

Our second money problem relates to cash flow. Most donors are dividing their payments into quarterly installments, which they send during the first month of each quarter. The result is that CIMMYT has chronic cash flow problems to meet its bills at the start of each quarter. We think that the Consultative Group is right to study ways of evening out the flow of cash to the Centers. CIMMYT is also developing a revolving fund for this purpose.

Our third money problem relates to restricted grants. CIMMYT this year has received approximately 60% of its total financing in unrestricted grants, and 40% in special grants for which the donor specified the purpose. The special grants were all negotiated by CIMMYT for purposes

which we strongly support. We are not complaining about them. We have not been pressured by any donor. At the same time, the large amount of funds in restricted accounts has about reached a limit, and further special grants will make it difficult to preserve financial flexibility. We think the Consultative Group is right to continue to press for a large part of the Center budgets in unrestricted funds.

Our fourth problem with money relates to the pledging of funds on a one year basis. Long before the end of each year CIMMYT finds it necessary to make program commitments which run into the following year. Yet we have no assurance of financial pledges before the Consultative Group meets in November. We think the Secretariat is right proposing a 2-year rolling commitment by the donors.

If we turn this telescope around, we can ask what are the problems which donors are having with the Centers.

I suppose the most important question on the minds of the donors is: How should a center like CIMMYT keep the donor informed.

This year we have had experience with several different methods.

In February and March 1972 CIMMYT was visited by nine different visiting groups from donors. I gave most of my time for two months to those visits, and so did some of our scientists. It is possible that such visits in the future could be organized better.

In April we had the one-week visit by an external review panel. We did not invite donors to that panel review, but by hindsight we think we should. It was the most educational one-week period at CIMMYT this year.

The Chairman of our Board of Trustees, Dr. Barco, invited all CIMMYT donors to send representatives to a one day review of CIMMIT's program on June 16, during our Annual Board Meeting. Three donors sent staff, and we believe the meeting justified the time of the visitors. We wish more had come.

Finally, the documents prepared for this Centers Week are for the information of donors. If there are suggestions on how to improve these documents, we shall welcome them.

I started by saying this is a period of uncertainty between Centers and donors, on both sides. I have no doubt that in another year we shall learn how to strengthen these relationships, with least burden to our scientists, and maximum information to the donors.

In any case, I shall welcome visitors, and my time is available to any of you who have time to come.

In closing, let me refer to one conversation at our Annual Board Meeting last month.

Our Trustees believe that Management should tell them, "What are your problems, and what are the issues, on which you want the Trustees' judgment for the coming year?" That same question can properly be asked here by the Consultative Group.

The No. 1 question at CIMMYT is: when will CIMMYT stop growing?

The CIMMYT operating budget has expanded every year since 1966, and so has our operating staff.

The answer we gave our Trustees about future growth was this: CIMMYT Management believes that CIMMYT is approaching, or has already reached with this budget, a plateau in both expenditures and staff.

We believe that our permanent senior staff should level off at about 40, which is the level reached in this budget. About 10 senior additional staff are charged to special grants.

We believe that our core operating budget should level off at about \$4 millions, plus an annual incremental factor of 7%.

We believe that CIMMYT staff outside Mexico may continue to grow, probably to a level of about 35 staff, all supported by special grants, within the next five years. The present level of outreach staff is 23.

Finally, we believe that our capital expenditures have passed the peak, and will decline every year for the next five years.

CIMMYT has no plans to extend research to new commodities, beyond those mentioned in this budget. And we have no plans for additional research stations.

In short, our aim for the next five years is not to spend more, but to get more for what we spend.

July 31, 1972

Statement by Dr. Ralph Cummings, Director General
of the International Rice Research Institute (IRRI)

IRRI has just celebrated its 10th anniversary from the date of dedication. Approximately 12 years have elapsed since the Institute was incorporated, and only 10 years since its physical plant was completed and was dedicated. At the anniversary symposium in April, the work of the first 10 years was very well reviewed and summarized. This has now been published in a book which is being distributed and brings the record pretty well up to date.

I think that IRRI's record stands for itself as a record of exceedingly outstanding contributions to the science and the actual practice of rice production, particularly in the Asian area where rice is the major staple food.

There are a number of different classes of conditions under which rice is grown: (1) Much rice grows or matures in very deep water, starting from almost a dry land situation, but with increasing depth of water, the rice plant lengthens as the water deepens until it has a very long stem at maturity, with its top leaves and panicles above water. (2) In another very important sector, water is rather regularly and precisely controlled as to amount, depth and application. This is the sector in which new dwarf varieties and high yield technology have performed most spectacularly. A very large portion of the world's rice acreage is grown under what is referred to as upland conditions, being dependent upon the rain which falls during the growing season. (3) This may, however, be impounded and held on the surface by dikes around the field. Such culture is commonly referred to as rainfed. (4) In the true upland type of rice culture the soil is not bunded, and the water is not retained on the surface. The low moisture tensions that are so necessary for the rice plant are obtained by frequent rain showers.

During IRRI's first decade a heavy concentration of effort went onto producing some real breakthroughs in rice production with a heavy emphasis on the second of these four categories, namely, that sector in which it was possible to maintain reasonably precise control of the water level and the water supply. This has resulted in some very revolutionary concepts in rice production.

The amount of the total area represented by this varies from one part of the rice-growing area to another, but it is estimated that in the Philippines where the Rice Research Institute is located, this represents roughly a fourth of the total rice area. Roughly half of the rice area in the Philippines would come in the third category that I mentioned, namely, the upland area in which the water is retained by dikes around the field but in which there isn't a precise control of water, and under which periodically there may be periods of moisture tension which will affect different varieties to different degrees. Roughly the fourth -- the percentages could vary a little bit from this -- would come under the category of upland rice. The amount of deep-water rice in the Philippines is not as great as it is in some other areas, although because of the floods that we have had in the last few weeks in the Philippines, a lot of it that has gone under very deep water conditions but has not necessarily been deep-water culture.

I want to use a few slides by way of illustration to point out the progress made in improvement of rice culture, and I might say that in my presentation today I am planning to present this really in two parts. One represents what we would call the core continuing program in which I hope to present the present status of progress with respect to this sector and some of the directions in which this is moving at present.

The second part which will be less precise in its budget implications is one in which we are dealing with rice as a part of cropping systems in which other crops come into the picture under upland conditions.

The first picture shows the buildings of the Rice Research Institute, and the second shows the plant breeders out in the field taking notes on the various large numbers of selections that have to be made in order to get out the small number of varieties or lines which prove superior and can go further into the production game.

On the following picture I tried to set forth some of the characteristics that we think are important in the improvement of rice and what were established or what we recognize now as some of the initial goals.

First, with respect to plant type, the height has been a very important consideration. Most of the rices which were grown in tropical regions in the past have been relatively tall-growing varieties, and when one attempted to establish conditions that would be conducive to high yields, they didn't have the ability to stand up. In the initial stages, we were looking for a type which was short to intermediate in height. A second factor is leaf angle. An erect or semi-erect leaf angle permits the sunlight to penetrate down through the plant, reach the lower leaves, and this improves the efficiency with which the sunlight is used in photosynthesis.

With respect to tillering ability, much of the rice is transplanted and one needs to have a rice plant which will tiller rather profusely and produce a large number of spikelets for each plant that is put in the ground.

Seeding vigor needs to be very good in order for it to get off to a good start and to give strong competition with the weeds. The plant needs to be resistant to lodging so that as it matures, it can stand up and hold up the grain and one does not lose this photosynthetic period as the rice crop is maturing.

In yield potential, if we look at the rice yields in the tropical areas, we find that throughout Asia they have run between 1.1 and 1.9 tons per hectare. Under the traditional methods of culture, it has been difficult to get more than three to three and a half tons. The yield potential, however, which is set as a goal initially runs from 8 to 12 tons, and this has been attained under favorable circumstances.

With respect to grain quality, one is looking for a medium-long or long slender grain, translucent in character, with an amylose content appropriate to local preferences, since this determines its cooking quality, whether it cooks as a dry, separate-grain rice or one which is sticky. If one wants a separate grain, dry-cooking rice, a high amylose content is necessary. If the demand is for sticky rice, then a low amylose content is sought. So there are variabilities that one is looking for on this.

A high head rice recovery, or the recovery after milling, of unbroken grains is desired.

With respect to eating quality, it's a matter of preference, and one is looking for very good eating quality.

And with seed dormancy, one is looking for a rather strong seed dormancy. Otherwise if the crop matures during a period when the rains are coming, the grains may germinate in the field and one loses then a good part of the grain before harvest.

Disease resistance is a very important factor, and I put down here four of the major diseases. These are by no means all of the diseases one encounters, but certainly these are among the major ones. The tungro virus is a disease which spreads from plant to plant carried by the green leaf hopper. For grassy stunt, the brown planthopper is the vector. With respect to bacterial blight, some of the early varieties have now become obsolete because of very serious infection particularly during the wet season. Blast is a disease which occurs periodically throughout many of the rice-growing tropical areas.

With respect to insects, the stem borers are very significant and important causing the white heads or the dead hearts and reducing yield. In certain areas the gall midge causes a reduction or a sterile seed head.

As for growth duration, one wants to have a relatively short growth duration so that we move rapidly and do not put a major portion of the photosynthetic product into the vegetative portion of the plant but to put the photosynthetic product into grain promptly and open up the land for other crops or other generations of rice within the growing season.

Photoperiod sensitivity is an important factor. There are certain circumstances in which one wants a photoperiod sensitivity so as to have the grain mature at the right time with reference to the weather pattern. But if one is looking to a high intensity of rice culture, then one wants one which is insensitive and will go ahead and flower within a definite period of time, irrespective of the season of the year in which it is planted.

Drought tolerance becomes a very important factor when one gets into the upland or rainfed rice areas. We find that there are very marked differences among the different varieties in this.

Some other things that we should mention are unfavorable soil conditions. There are reducing conditions which occur. There are various mineral deficiencies that rice is subject to, and we find there is a substantial variation within the native germ plasm with respect to those characters. Protein content has been mentioned recently in the past discussion. Fortunately rice does possess a very good distribution of the amino acids. Normally its protein content runs between 7 and 8.5 per cent. There are lines which have been shown to have as much as 25 per cent improvement in the total protein content, and there is an active program under way at the Institute attempting to develop rice varieties that will have a higher protein content, but at present there are no very promising lines in the pipeline close to being released which combine this high protein content with the other characters that we are looking for here, and particularly with high yield.

This picture shows what happens if one has a plant and the weak stem. It falls over. As a matter of fact, a few years ago when I would go through the rice-growing areas in Asia, near harvest time one would find most of it actually flat on the ground and this is a factor which has changed very materially in the last few years.

The following picture merely illustrates some of the newer selections. This was in a date of planting test, but with rices which are relatively short which will stand upright and withstand wind and rain even when fertilized and producing a heavy load of grain.

With respect to grain type, the first variety released by IRRI was the IR-8. You will notice that was a relatively short broad grain and you will notice the chalky appearance on the side of the grain. This was one which had a relatively high amylose content. It cooked dry, but its appearance was against it. When one mills this, there is a great amount of breakage and the chalky color is not favored.

The IR-20, 22 and 24 on the other hand are somewhat longer and slenderer grains, translucent in color, and this objectionable chalkiness has disappeared from these later strains.

With respect to cooking quality, the IR-8 cooks relatively separate grains and dry whereas with varying amylose content, one gets up to IR-253 with very low amylose content and one which cooks very sticky and glutinous in character.

This picture illustrates the problem one encounters when there is no seed dormancy in the grain. When it lodges and the rains come, then one gets quite some germination.

This is the tungro virus, one which in Central Luzon and other parts of the Philippines last year and in varying parts of Asia has proved a very destructive disease. When it attacks the plant early, it causes a yellowing and stunting of the plant and in the severe cases almost a complete loss of yield.

Going through the various materials to find a line which is resistant to this, one has to screen many materials. This picture shows one of the nurseries in which most of the materials were susceptible, but you will see one line in there which was resistant. And this is the type of thing that has to be sought out, crossed onto the varieties that have the desirable type and the resistance to the disease and in some cases resistance to the insect incorporated.

The next picture shows a field that illustrates the difference between IR-22 which is a variety with a very high yield potential, excellent grain quality, but happens to be highly susceptible to both the attack of the green leafhopper and the tungro virus, and IR-20 which has a high degree of resistance to both the virus and the insect vector.

Apart from the virus disease, the hoppers themselves, if they build up to a high population, even without the disease can cause rather serious destruction as indicated by this plot on the right which was susceptible in comparison to the one on the left which was resistant to the brown planthopper.

Bacterial blight, as I mentioned, is a disease which occurs more particularly during the rainy season. And IR-8, while more resistant than some happens to be sufficiently susceptible in many areas that it does not stand up. That is one of the reasons that it is being replaced and will be replaced in the future by varieties that have higher resistance. IR-20 in this case does have a better resistance to bacterial blight. IR-22 has high resistance to bacterial leaf blight but unfortunately is susceptible to the tungro virus. Blast is another disease which is very important.

The stem borer is a larva of this moth which lays its eggs in masses under the leaf. The borers hatch and bore into the stem causing the hollowing out of the stem.

This is one of the moths emerging later on from the stem. This is an adult coming out. This will be winged and will fly and will feed and will lay its eggs and produce the next generation.

Here shown is the gall midge damage caused by a small insect that is locally quite serious in some areas. There are some lines which are resistant to this. At IRRI we do not have the gall midge, so that the work on resistance to this is carried out in areas where it is important.

In India, for example, there have been important advances in getting lines which are resistant to the gall midge.

Coming again to the initial goals we see something of a record of progress. First with Peta we had a plant which was tall. It did have erect leaves. It had high tillerine ability, good seedling vigor, but it was susceptible to lodging. Because of this tall habit and susceptibility to lodging, its yield potential was of the order of 3 to 4 tons per

acre. With respect to its grain quality, it had some limitations, medium-long, bold grains, chalky in character, high amylose content which made it cook well, but a low head rice recovery, acceptable eating quality, and a moderate degree of seed dormancy. It is resistant to tungro and to the green leafhopper, but you can see that it is susceptible to the others. It had a relatively long growth duration but was insensitive to photoperiod. IR-8 was a great advance in this. You will notice the plant type incorporated the short, erect leaves, the high tillering ability, very good seeding vigor, and highly resistance to lodging, and the yield potential with these characters went up very substantially. You will notice there were deficiencies in the grain quality. It was only medium long, bold grain, chalky in appearance, as I mentioned earlier, with a low head rice recovery, but it had acceptable eating quality and moderate dormancy. If you look at its reaction to the diseases and insects, it is only moderately resistant to blast and susceptible to the others listed here. It was moderately susceptible to the stem borer, somewhat resistant to the green leafhopper. It had a growth duration of 125 days. It was insensitive to photoperiod.

IR-5 was the next one, and it sacrificed a little in height and in lodging susceptibility, a little in yield. It had a little longer duration and was a little more sensitive to photoperiod. It did have a greater resistance to blast, and it had a little more resistance to bacterial blight. It has found a place in many areas where IR-8 didn't fit quite so well, but still had a number of weaknesses.

With IR-20, you will notice we are still retaining all of the plant characters and the yield potential on this, and we are greatly improving the grain quality and incorporating more and more of the characters relating to disease and insect resistance.

The IR-22 unfortunately has had susceptibility to the tungro and the green leafhopper which has been one of its worst weaknesses, but it's a very attractive variety otherwise.

If we go on further, starting back with IR-8 and going on to IR-24, we are incorporating more and more a different combination of these different characters. The characteristics of three other lines that are in the breeding nursery are also shown for comparison. One or the other of these may eventually come out as a released variety, but we are not sure. This has not been decided yet, and there are large numbers that are still back in the pipeline.

I don't know when or how soon one will find the ideal variety. I am sure it's going to be a long time down the road. But one of the great pushes for the program in the immediate future for this sector of rice production is the push toward getting a higher number of these desirable characters in the plant and in the grain, a greater range of resistance to the important diseases and pests, retaining also the relatively short duration. Once we get into the question of drought resistance or adaptability to the other less favorable conditions under which rice is grown, under deep water, under the upland conditions, under the truly rainfed rice conditions and the upland conditions, we will hopefully make it possible to extend the advantages of improved dependability in rice production

to a larger and larger segment of the rice-producing farmers and have a greater influence on rice production.

In addition to the lines which have been released from IRRI, IRRI has attempted to be very generous in sharing the germ plasm and the combinations of germ plasm pools with rice scientists in other countries.

In addition to this, there have been many of the lines which have been shared with other countries and which have been crossed into their breeding programs resulting in the development of large number of additional varieties in other areas.

As time goes on we are finding that as we go out from IRRI onto the farms and determine what is happening there, that there are shortfalls in the yields which are obtained when the technology which has been proved satisfactory under experimental conditions is supposedly applied. I think one of our next directions will be to examine those conditions in a little more microscopic detail. We know that there are shortfalls in the results we are getting. We are not quite sure what the shortfalls may be in the actual application of the various facets of the technological practices that have been proven satisfactory in the experiment station.

If we can identify out on the farms the shortfalls in the application of technology, then the next step would be identification of the reasons why farmers find it difficult or neglect to apply the full package of practices that are necessary to get the predicted yields on a dependable basis. Then we would be on the road toward finding the solutions as to how to improve the dependability of the technology as it is applied on a broad scale. There is a tremendous amount of progress that has been made in that direction, but a long way yet to go.

This is the direction that we are taking with respect to the current program. I would say from the standpoint of the budget implications, for the next year they are only minor in character with respect to this part of the program. As a result of certain shifts we are reducing our staff of agronomists by one, increasing the staff of our editorial office by one, bringing a net difference in the senior staff of zero for the coming year. We failed to get subscription of about \$80,000 in our core budget this year and have had to postpone some of the capital projects that we had in mind for this year. This is carried forward. We are finding that there is a rapid inflation taking place in the cost of living in the Philippines, and we are studying this to see what adjustments we have to make. We have put in a contingency item in the budget proposal which we think will be required to make the necessary adjustments, once this study is completed. It's a very complex problem in studying the pattern for our local staff. We find that in certain of the categories we may be lagging behind, perhaps a little more than in others. So we feel that if we make an adjustment over and above the normal promotional adjustments and merit increases, that it shouldn't be a uniform one but should be selective and based on a careful study.

I failed to mention the mechanical or the engineering side of our program at IRRI where the emphasis is on developing small equipment that will improve the precision of application of technology, but which are adapted to the small farmer. Examples are the small table thresher, a seeder for direct seeding of rice, a 2-wheeled tractor power unit for preparation of the rice paddies, and a simple water pump for low lift of water powered by a treadle operated by a person and which will lift at quite a substantial rate for a short distance.

Let us now turn to cropping systems. These have to be adapted to the climate pattern and soils which prevail in various local situations. At Los Banos the rainy season begins in April and extends on through November.

The length of time is long enough for more than one crop if one can utilize the entire season. Since in much of this area rice is the only crop that is grown, rice planting is delayed until enough water has fallen that the soil can be puddled. This may delay it a month or six weeks after the beginning of the rains and by that time too much time has been lost to grow a second crop. If one can utilize that first part of the season to get a crop started and then can overlap with another crop, even within the rainy season, it is possible to get at least two crops. The rainy season is one that is characterized by relatively low light intensity and high moisture. The dry season is characterized by a lack of moisture but a high light intensity and the high light intensity is favorable if one has the water for a higher rate of production of food products.

If irrigation is available, under normal conditions of puddling, one could product two rice crops. But by careful planning and management, one can manage the soil to bring in legumes, higher protein crops, other carbohydrate crops and very greatly increase the total production within the 12-month period.

The next picture illustrates one of the problems that must be met, particularly in soils that are high in clay. If one puddles the soil so as to reduce moisture percolation, when this dries out, and the crop is harvested, the soil will be very wet and sticky underneath, and will cake up into large blocks and be very difficult to work. Seedbed preparation takes a great deal of time and a great deal of work for the next crop. If on the other hand one can manage the soil so as to retain a reasonable structure and arrange to plant in somewhat upland conditions with a reasonable structure one can even overlap the crops as indicated in the earlier slide.

The next few pictures illustrate some of the things that have been done in the multiple cropping unit of the Institute in which one plants the rice in furrows. If one puts three rows of rice with a ridge in between each three rows, then before the rice matures, something else can be put on this. The rice is taken out, and the next crop has already started.

This picture shows rice at a little bit later stage, and the next shows as it is coming up on vegetable crops planted on the ridge in between. The crops can get started and when one takes out the rice, they mature and one already has the crop well under way. A number of combinations have been tried such as corn, sweet potatoes, ground nuts and also cow peas.

I will now turn to our enlarged proposal for research to improve cropping systems for rice-growing areas of the humid tropics.

This proposal had its origin about two years ago in a recommendation that was considered by the Bellagio group and later also by the Consultative Group which suggested that research on farming systems for the humid tropics where rice is a component of this farming system should be undertaken as a major responsibility of the International Rice Research Institute. The proposal has been studied by IRRI's staff and trustees who have indicated that IRRI is primarily a rice research institute and keep its focus on the problems that are concerned with improving rice production in tropical regions. It was decided that if IRRI undertook an expansion beyond what it is doing to date in this field, it should not do it at the expense of assuring that the most rapid progress is made in solving the problems limiting rice production. We have put forward in this proposal what we think is a justification for having this work done. We recognize that the pressure on arable land and on the total food supply in the humid tropics and especially in South and Southeast Asia is already very high and that it will increase greatly with expanding population during the next generation. This is aggravated further by the serious shortage of high quality proteins and protective foods. Rice alone which is the staple food for most of the people is too low in protein to provide a balanced diet, and while we want to keep our emphasis on production of the necessary rice, we realize that this isn't going to be the entire solution for the food production of this area of the world in which the population pressure is so high and increasing.

There is a decreasing per capita supply of land. And this necessitates the development and introduction of technology that will greatly increase the productivity per unit of land and the efficiency of labor on smallholdings. If one does intensify cropping, one can utilize more labor, more productively, on smallholdings. We feel that any work on this done by the Rice Research Institute should be built around rice as the main crop during the wet season. Most of the land under rainfed conditions grows only one crop per year, and we know that under rainfed conditions much of the land can grow two crops, and with irrigation even three or four crops a year.

Following the suggestion put before the Consultative Group in 1970, we have prepared this proposal which would be an addition to the intensified program on rice production. It proposes an addition of approximately 8 senior scientists to the staff together with the necessary support. The

need is one which I can defend. The exact budget figures with respect to the costs both for the ongoing program which we estimated at \$495,000 for the first year and \$680,000 when in full operation, as well as the capital costs, I must confess, require a bit more staff work than we have been able to give it to date. We felt that in view of the suggestions which have been put before us previously, that we should at this stage bring to you a progress report on this, and quite frankly admit that it is not yet a completely finished document.

Statements of Dr. Herbert Albrecht, Director, and
Dr. John Nickel, Associate Director, IITA (International Institute of Tropical Agriculture)

Dr. Albrecht:

IITA was first staffed with a cadre of three in the latter days of 1965 but the project was suspended at the close of 1966 due to the political crisis underway in Nigeria. The project was reactivated in 1968.

With the cooperation of the Federal Government of Nigeria and with the continued interest of the original sponsors of the project, the IITA moved ahead regardless of the Nigerian political problems which we faced at the time. The Institute began with a very broad mandate; in fact it is referred to, along with CIAT, as one of the "comprehensive" institutes, but with the passage of time, we have begun to define our objectives more clearly and we have actually reduced substantially the project load as it was originally conceived back five or more years ago.

The construction project has been in progress all during these years, and it is expected that the construction and facilitation of the buildings will be completed by the end of this year. Delays in construction have made it necessary for us to defer initiation of certain of the disciplines and some fields of work since we didn't have the facilities available to adequately handle the total research and training responsibilities of the Institute.

Nonetheless, we did begin our research program in 1969. The training program was begun almost immediately thereafter, and our seminar series has been underway now for over two years. The latter has been a very major contributor to the improvement in communications among scientists throughout West, Central and East Africa.

During the past four years we have had to establish an institute out of the jungle, to relocate some 3,000 people, and to initiate a research and training program. Thus we have done almost everything except publish, and now that we have an editor, we hope we will get into that business fairly soon.

Perhaps this year the IITA's aims and purposes are more clearly defined than ever before, as a result of some rather intensive soul searching through the past several years, culminating in long discussions and decisions made during the Board of Trustees' meeting last month. These are outlined in our 1973 Program and Budget Presentation.

I do have some slides from which I would like to make my presentation, and then call on John Nickel to carry this further, and I will use the slides as reminders of things that I am supposed to tell you, so if we do seem to jump around a little bit, it will be on a crop-by-crop basis and a function-by-function basis relating to buildings and scenes from the site.

In this rather important Board meeting which followed our second external annual review, a lot of time was spent in defining the IITA's particular purpose in farming systems research. And as was the original intention back in the beginning, 1965 and 1966, our systems work reflects back to the predominating crop production systems of the lowland and humid tropics, shifting cultivation. What is being attempted is a crop production and soil science research program which gets at the basic components of farming systems research, not necessarily

for the purpose of developing packages of practices which might uniformly fit one circumstance or all circumstances, but rather to pick out various components of the prevailing farming systems and then to investigate their role and potential usefulness. In other words, our program will seek not only to minimize if not eliminate the need for the bush fallow, but will at the same time attempt to find ways and means to produce the foodcrops of the humid tropics more efficiently. The improvement is intended to be not only quantitative but qualitative as well.

With the aid of some slides I would like to give you some idea of the IITA as it stands today. IITA is located in Ibadan, Nigeria, about 90 miles from the sea in the humid lowland tropics which is our first zone of interest. We have immediately above us a transitional zone that merges as we slip gradually into savanna. Since we are working with a number of crops, which are grown also in less humid areas, we hope we can be useful to the other institutes in the world-wide network of agricultural research centers.

IITA is located on about 22 to 23 hundred acres of land, and has a rather extensive building program underway.

The first of the two lab buildings which we have occupied, houses the physical and chemical aspects of our program. The soil sciences, plant physiology and agronomy are located in this laboratory. The second laboratory houses mainly the biological sciences: entomology, plant pathology, nematology, weed control, microbiology.

The F. F. Hill Hall is our Administration building. It also houses our non-lab facilities, such as training, conferences, publications, information, and statistical services.

The IITA training program has been slowed down because food services have not been made ready. The dining and social center and guest house will be functional by October or November.

There are two dormitories on the site. Only ten of these rooms are occupied at the present time with a minimum number of trainees because of the food service situation. By the end of the year we should be rather fully occupied with our training program. Our training officer who has just joined us is, fortunately for us, bilingual and has had long experience in Francophone Africa.

The IITA library is to be as fully useful to Francophone African trainees and scientists as Anglophone. Now that the building is available acquisition of books, journals and other periodicals is being accelerated.

Delays in housing completion has been another reason why we have had to defer on the employment of staff. Although the first scientists were employed in 1969 we are still seven scientists short of our intended complement.

The final buildings to be started on the IITA site are the plant growth facility, head house, screen houses and greenhouses and radiology laboratory. These too should be completed by the end of 1972 or shortly thereafter.

As was mentioned, IITA recruited its first scientists in 1969: a soil fertility specialist, a nematologist, and an entomologist. Most of our work had to be done outside because we didn't have space for work indoors. For the

most part our work is still mainly in the field but we should be fully equipped for laboratory and other indoor work by the year's end.

One of the most important crops that the IITA is working with is upland rice. It should be emphasized that we regard our work with rice quite regional in nature and we look to IRRI for the basic backstopping of our work in rice improvement. We have plans for a larger program with upland rice than with irrigated rice. Nevertheless, we have 13 acres of paddy under water at the present time. We have in our maximum yield investigations harvested up to four tons to the hectare of upland rice and eight tons of paddy rice. We are therefore quite encouraged as to the future of the crop throughout West Africa and Central Africa. The rice improvement project offers a good tie and an opportunity to participate in the work of the West African Rice Development Association (WARDA) which is now under way.

With maize, we rely upon CIMMYT for backstopping. Our breeders have completed the second three-generation cycle of recurrent selection on one maize composite and have incorporated opaque-2 and a good bit of Central American germ plasm into the maize composites that are being developed for West Africa.

I should mention that the interest in rice and maize is rather extensive throughout West Africa. Our first contacts with cooperative work under way has been largely with these crops in countries like Zaire (where we are joined with CIMMYT), Sierra Leone, Dahomey, and Liberia.

I should mention, too, that 1971-72 was the first time that our irrigation facilities were adequately-enough developed that we could operate our plant breeding program on a year-round schedule. This will speed up rather substantially the work with cereal crops, grain legumes, and the root and tuber crops.

Cassava is another crop for which we assume only a regional responsibility; here we reflect back to CIAT for backstopping assistance. Here, however, somewhat different circumstances apply in the case of this crop than in Latin America or in Asia, which indicates the need for institutes of this type to work together closely on the production of new varieties of such crops as are grown on several continents. For instance, this year we arranged for a massive import of material from Latin America and Asia and found that almost to the last plant all this material was completely susceptible to cassava mosaic and we will get almost nothing out of it.

The IITA does not look at its "regional" activities as duplication of research already on-going elsewhere. Rather, we look at them as necessary for the achievement of highly desirable goals reachable only through inter-institute cooperation.

In the case of yam and sweet potatoes, since the IITA is alone in the field, it will accept an international responsibility for these root crops. A major stress with all these crops is in plant physiology because of special problems in induction of flowering, seed production and storage. As a matter of fact plant physiology will be a major IITA effort overall because of the many and varying environmental influences which affect crop production in the humid tropics.

Soybeans is another crop where the IITA is to assume more or less a regional responsibility. Since there is here no international institute to reflect back

to, we will rely upon institutions such as the University of Illinois and others which have had extensive experience and have been highly productive in scientific research with this crop. It is a crop which has an exceptionally great potential in West Africa. We have been able in maximum yield work to harvest up to 3,000 kilograms of soybeans per hectare.

The IITA assumed international responsibility for research with the cowpea. Harvests up to two tons of cowpeas to the hectare have been obtained in maximum yield trials at the IITA. It has been possible to speed up this program rather substantially under irrigation which can enable the breeders to grow out five to six generations in one year's time. The IITA cowpea program has had a special interest and attraction to the staff because of the fortunate associations with several British research institutes, which the grants received from ODA have made available. The cooperative research resulting has enabled us to carry on certain physiological, nutritional and soil physics research for which we ourselves have not yet been competent, speeding up substantially our progress in these important fields of research.

The other grain legumes with which we are concerned include the pigeon peas with which we assume we will be backed up by ICRISAT. We are also on an exploratory basis giving study to a number of other grain legumes -- more or less to try them out and to test their potential in the area. These include such legumes as the winged bean, jackbean, rice bean, lima beans, yam beans, and others which are particularly promising since they seem to be bothered by far fewer insects and diseases than some of the other more major crops.

The root and tuber crops which are considered as exploratory are the cocoa yam and possibly the Irish potato.

The IITA farming systems research program attempts to find ways and means to improve production by peeling apart the different practices to see which ones are likely to be most useful in maintaining soil fertility and soil tilth and also weed control. We are studying these from the standpoint of plant populations, cultural practices, fertilizer usage including minor elements. As for the latter, not too much has been learned yet except that great responses have been realized from applications of sulfur in the case of maize.

The IITA is most concerned, of course, with research in soil and water relationships and with irrigation since it was found quite some time ago that the dry periods of the wet season are actually very penalizing to crop yields, and in work with maize, we have been quite distressed at the effect of high soil temperatures on yield. Consequently this is leading into work with cover crops and mulching methods and other efforts which would help to give the soil some protection. Many soils of the humid tropics are highly erosive; consequently, the IITA is concerning itself with soil conservation measures. The potentials for production of hydromorphic soils found on slopes down toward stream bottoms and which are generally left to brush are being investigated. These studies with hydromorphic soils should help us to find some clues to continuing production or at least the extension of production into the dry season. Some crops like sweet potatoes have a particular promise in this regard. We aren't too persuaded that extensive opportunities for irrigation are going to be possible in many areas in the tropics. So perhaps by modifying cultural practices, we can help to enlarge the productive capacity of many of these areas.

A series of run-off plots in the IITA soil physics and water relations program has been established to learn which practices might be most effective in the holding of soils against the heavy rains of the wet season in the humid tropics. Certain combinations of crops and grain legumes such as cowpeas when planted solidly have been very effective in holding moisture and retaining soil under conditions of slopes at 2 percent, 5 percent, 10 percent and 15 percent. The big test came this year when we had a 5-inch rain in less than four hours, 1.5 inches of which fell during the first 15 minutes.

In the presentation of the IITA budget, the request for the year 1973 is somewhat in excess of those of 1972. It should be stressed that the IITA will be fully functional for the first time in 1973. Whereas up until now most positions have been budgeted on a part-year basis, for the first time it has been necessary to budget the entire program fully staffed on a full 12-months status. The budget also provides for the acquisition of equipment and apparatus which will be required in the near future; the development of the remainder of the IITA site (about two-fifths of the land and holdings) and for certain buildings.

I will now ask John Nickel to proceed from this point and to discuss in somewhat more detail our farming systems research program.

DR. NICKEL:

I would like to discuss and place some stress on the IITA research strategy. The IITA has done a great deal of soul searching during the past several years, culminating this year in the extensive discussions, first of all, internally with our own staff research committee, then the external review panel, the research committee of the Board of Trustees and finally in the Board of Trustees. We were determining to more clearly and sharply focus onto our objectives in order to do fewer things very well instead of a lot of things in a mediocre fashion. We have agreed that it is necessary to clearly define and circumscribe what we plan to do and to limit our activities to certain sharply focused areas.

As Dr. Albrecht has indicated we are concentrating in two basic areas and our staff is approximately equally divided between these two areas. One is farming systems, the other, crop improvement. With the latter, the IITA will develop a new highly productive technology for a few carefully selected crops important in the humid tropics. In the case of the former, the IITA will develop farming systems which will more efficiently utilize the land, manpower, soil and water resources of the humid tropics than is possible with the shifting cultivation system and which will be more compatible with the new technology developed in the crop improvement programs.

It is felt, however, that this is not enough. One can still cover a multitude of broad and nebulous activities under those two general categories. That's why I would like to define for you how we and our Board have felt we should define these two general areas more clearly.

First of all, in the area of farming systems. Farming systems is somewhat like the word "democracy" which can be used by many people in different ways, and it is being used and misunderstood in many ways, or at least what we mean is understood differently by different people. I thought possibly the simplest way to let you know what we mean by farming systems is to tell you what we think is the problem which needs solving and how we plan to go about trying to solve this problem. As you know, a large portion of the earth's

exploitable land resource is in tropical rain forests which are either unproductive or very low in productivity of food-crops. With populations growing in these regions, there is need to produce more food crops and to more efficiently utilize this resource. At the same time, as people are moving into these rain forests and clearing the jungle, it is essential that we try to develop the technology to avoid long-term damage to the resources in this environment. This is one of the main aspects to which IITA has been dedicated.

Farmers in many parts of the humid tropics, particularly in West Africa, have developed a system of shifting cultivation which has evolved over centuries as an effective means of restoring fertility to the soil and to regain its structure. As you know, in the shifting cultivation system a piece of land is cleared of its largest trees, farmed for a period of one to four years until its fertility is well depleted and then left for a period ranging up to 30 years. It then comes back once the fertility has been restored and it can be farmed again. This is the only system which is known to work at the present time.

The only problem with this system is that it is very low in productivity. It uses a lot of manpower and a lot of land in an inefficient fashion. The IITA considers that it is essential that while it is necessary to intensify productivity in the humid tropics it must be done without destroying the environment.

As this happens, certain specific problems develop; one is loss of soil fertility and organic matter, another is soil erosion. Another is adverse changes in the physical properties of the soil -- compaction, loss of tilth, unfavorable water-holding capacity. Serious uncontrolled weed growth develops as land is farmed for long periods. Often pests and disease problems increase substantially as one changes from shifting cultivation to continuous monoculture type farming.

Some of these problems can be overcome by purchased inputs, such as loss in fertility. However, even these cannot be purchased unless farmers have access to remunerative markets for their products.

Various soil conservation practices required to prevent erosion on continuously cultivated tropical soils require different types of machinery and energy application.

The solutions -- if and when solutions are found towards these problems -- must also be compatible with the existing cultural and social situations. IITA proposes to attack this very complex problem in an interdisciplinary fashion with the following disciplines.

First of all, in the farming systems program there are two professional positions for agricultural economists. One of the studies is to lead to an understanding of the present systems so we know what is going on now before we try and change it. For instance, studies are under way to understand more about the decision-making processes, cash flow, labor use in shifting agriculture. As new technology is developed agricultural economists will, of course, evaluate the economic viability of any technology or any systems proposed. The agricultural engineer for mechanization will be studying means of providing supplementary energy or increasing the efficiency of labor. He will also place emphasis on

designing of machinery especially that which can be manufactured locally and with employment generation rather than employment substitution in mind.

Another agricultural engineer specializing in soil and water will be working on various tillage practices to prevent erosion and conserve water, and working together with the agroclimatologist and the agricultural economist evaluating the economic viability of various irrigation possibilities.

An agroclimatologist will be studying the dependability of rainfall and the intensity of vapor transpiration for various periods in relation to crop and varietal recommendations and the economics of irrigation. By knowing the micro and macro climatological patterns over various areas of the humid tropics and relating it to studies in selected areas, he will be able to indicate the universality of results obtained at Ibadan and other key locations in which we developed cooperative efforts.

In the same way the soil pedologist working on soil classification and land use will establish the bench marks by which cooperating experiment stations can apply the IITA systems studies to their particular soil types. In the same way as the climatologist will indicate which types of climates are representative of various agro-ecological areas, the soil pedologist will indicate bench mark sites and will also be working and suggesting and testing different types of land uses. For instance, as Dr. Albrecht has indicated, work on hydromorphic studies is important because I am told that there are regions in Ceylon and India, for instance, in which the climate and the soils are very similar to West Africa but in which quite different farming systems are employed in which hydromorphic soils are used to a much larger extent. This is the type of work which the soil pedologist will do.

The soil chemist will be concentrating on certain aspects related to the iron and aluminum oxides as they affect cation and anion exchange capacities on phosphorus availability and on the soil chemical environment of root growth. It appears, for instance, that the movement of ions to the roots is quite different in tropical soils than it is in temperate soils, and these can be understood through research in soil chemistry.

A soil fertility specialist will be working particularly on factors important to maintenance of soil fertility under continuous cultivation. These must be related to the different soil series; many of the fine soil studies which have been done in West Africa have been done only on the soil series which are utilized largely for plantation crops rather than for food crops. These studies need to be enlarged to include the soil series on which food crops are grown. The soil fertility specialist will also be studying the use of high analysis fertilizers and slow release fertilizers in order to try to find a more economical means of maintaining soil fertility under continuous cultivation in the low humid tropics.

The soil physicist will study water management phenomena to understand what happens to the surface and sub-surface movement of water, nutrients and sediments. He will also study the stability of various types of tropical soils, particularly in relation to soil erosion. He will be studying root development. We find that in the Ibadan area most of the food crops are limited to the top 30 centimeters in which the available moisture held lasts for only five to seven days.

Root development is limited severely, and we feel that these are related to soil temperature, moisture stress, and mechanical impedance, and the relative importance of each of these factors must be studied in order to make root development more effective.

The effect of soil temperature seems to be very important. We have found that in maize mulching alone will increase yield 100 percent. The studies indicate that most of this is probably due to the effect of mulching on soil temperature during the early stages of the maize growth. The effect of temperature on growth and how to control this temperature through intercropping will also be studied. With the climatologist and agricultural engineer for soil and water, the soil physicist will also study soil and water relationships.

A soil microbiologist will need to work on microbial decomposition of organic matter and the role of micro-organism in nitrogen fixation and denitrification in continuous cropping patterns.

Weed science agronomists need to determine which period during crop growth is the most critical for the application of weed control measures. Studies with herbicides are also very important since they are related to minimum tillage practices which appear to be very promising for the prevention of erosion. Herbicides offer even the smallest farmer an opportunity to utilize modern technology at minimum cost for equipment.

A nematologist will need to study the effects of various farming systems and rotation patterns on nematode populations. Studies so far have indicated a tremendous change occurs in the numbers and kinds of nematodes in the change from shifting to continuous cultivation. The species composition is changed very rapidly and very dramatically. The farmers over the centuries have unconsciously been practicing nematode control through rotation in their shifting cultivation. If this system is to be disturbed, other means of nematode control will have to be found.

An agronomist in soil and water conserving crops and in diversification crops will be testing other crops, not those necessarily with which the Institute is working, but other crops, tree crops, soil conserving crops, vegetables, as to how they might fit into a farming system, the conservation of water and soil and in diversifying the economy.

Finally, a systems agronomist will put all these components together and test various systems both at the IITA and in cooperation with researchers in other agro-ecological areas.

The other principal research effort is concerned with crop improvement. I will not go into any detail as to what is being done in each of these programs. However, in terms of research strategy, it is important to describe their general nature, especially as they relate to the farming systems research program. The three crop improvement programs are the root and tuber, cereal and grain legume improvement projects. Each of these is made up of an interdisciplinary team: a breeder, an agronomist, a physiologist, an entomologist, and a plant pathologist, and in those cases in crops for which we have international responsibility a bio-chemist, to work together on producing a package of practices of new technology on a few carefully chosen crops for the humid tropics.

The IITA believes that its farming systems program is dependent for its success on the availability of new, improved varieties of the key crops of the humid tropics. For instance, when one changes from shifting cultivation to continuous cultivation, resistance of crops to insects, diseases and nematodes immediately become more important. In order to fit a certain crop into a certain system related to the rainfall patterns and related to the particular soil moisture-holding capacity, one needs to ask the breeders to develop new varieties which will have a certain number of days to maturity, and to fit the various climate patterns, labor peaks, cash flows, and cash requirements and so on. The breeders need to help develop the technology under which the crops will be grown -- thus they become a part of the farming systems research team. Naturally, if there is to be a change from shifting cultivation to more intense cultivation, this involves purchased inputs which require much more highly productive crops which will have higher potential to respond to these inputs. Therefore, the IITA considers it essential that it engage in some crop improvement work. On a few other species which are highly important in West Africa and the humid tropics the IITA will lean heavily on its sister institutions in the international network.

This very briefly and perhaps insufficiently covers what we consider our research strategy. I only want to add a few words about the budget.

The best way to study our budget, is to study the various appendices because this is where the strategy of each particular research program is indicated, and this is the way the budgets were developed. This is truly a grass roots budget which has resulted from a great deal of soul searching as to what our research strategy should be in each particular program. Having decided what we would do and what we wouldn't do and what would be our priorities, we developed the various sub-programs. These were projected for a 5-year period as to what it would take to do this job. These then were summarized into program budgets. The program budgets were then assembled into an overall research and training budget with the necessary ancillary and supportive services and administrative services added on and resulting in the overall tables. These tables were developed in this fashion from the strategy through the research scientists up, and it will be in an administrative and decentralized fashion and should be understood in this way. They do represent a considerable increase over previous estimates. We think they are very realistic in terms of the job we have to do and represent the type of support which we feel a thin line of highly skilled research scientists supported by adequate staff, trainees, will require to do this important task.

July 31, 1972

Presentation by Dr. J. Grant, Director General, CIAT
(International Center for Tropical Agriculture)

The letters CIAT represent the abbreviation for the name of our organization in Spanish -- Centro Internacional de Agricultura Tropical. In English -- the International Center for Tropical Agriculture. The mission of CIAT has been defined as to help accelerate the agricultural and economic development of the lowland tropics, and initially we are concentrating on selected areas of the lowland tropics of Latin America.

The development and operation of CIAT has followed, from the beginning, the guidelines set forth in October 1966 in the original proposal by Drs. Roberts and Hardin, as follows:

"The Latin American Institute would not be concerned with a single crop or enterprise. It would concentrate on the identification and solution of tropical crop and livestock production and distribution problems and on the training of people in a problem-solving research and educational environment. It is recognized that the institute should focus its major efforts in crop improvement on only a few crops that are vitally important from the standpoint of nutrition rather than dilute its forces on a large number of crops."

Later on, the proposal, after discussing the potentialities of the various crops and emphasizing the importance of food legumes, rice, corn and root crops, indicated that in the proposed institute:

"Livestock work would concentrate on ruminant animals, with emphasis on the study and prevention of diseases, nutrition, forage production, utilization and range management, genetics and reproduction, and the economics of various systems of husbandry under tropical conditions."

With the land resources available in Latin America, we seek ways to make more effective use of the some 30 percent of the area presently in unimproved pastures, plus developing the technology which will permit doubling or tripling the amount of land devoted to the economic production of cultivated crops.

We selected the site for our headquarters adjacent to one of the principal research centers of the Colombia Institute of Agriculture (ICA) and one of the faculties of agriculture of the National University. Fortunately, the government later decided to put the new international airport, Palmaseca, nearby, with the airport entrance being just five kilometers from the entrance to CIAT.

Our strategic location between Central and South America facilitates interaction and cooperation with national, regional, and international institutions. We are developing operational procedures so as to maximize the development and carrying out of programs with and through existing institutions, and, in the process, to contribute to their growth and development.

In return, the institutions help identify those problems and issues which they individually or collectively are not able to undertake for various reasons. Over time, we expect the national institutions to become even more involved in helping CIAT to determine the nature and priority of our programs.

Some observers frequently express concern about CIAT as a multi-commodity institute with too many programs to staff and manage. The facts are, however, that CIAT has only two principal main thrust, commodity efforts -- in beef and cassava. Beef and cassava represent approximately 50 percent of our 1973 operational budget of \$3.3 million.

Unlike certain areas of the world, however, the agriculture of Latin America is diversified. We do not have a monoculture in production; and the food consumption patterns and tastes are diversified. Typical farm and ranch operations involve several crops and usually two or more species of animals. As a consequence, we have limited programs in two commodities important to the diets and frequently part of farming operations regardless of size. These are swine and, more recently, field beans. These are limited in the sense that we restrict drastically the range of problems in the production system on which CIAT actually works. Further, these commodities are important in Latin American diets, particularly for their protein contribution, and seem uniquely suited for production on small farms. In fact, most of the swine and beans presently are produced on small farms, but at low levels of management and yield.

Our experience with small swine farms, as well as the cow-calf operations on the north coast of Colombia, indicates that the improving of any production system involves coping with a wide range of agricultural, engineering, economic, and social problems. CIAT works on the immediate technical problems of the commodity to find answers which may have application in other situations. But we also try to stimulate interest among the relevant national organizations to undertake the broader system and frequently community-wide program concerns.

While CIAT has, in one form or another, only six commodity programs, most national institutions have many more. For example, ICA in Colombia has 41 and Ecuador 22, and we have only 6 of these.

We are concerned with identifying and helping to find solutions for the principal problems limiting production of specific commodities, and with assisting national agencies to adapt the findings so as to develop systems for producing the commodities in specific environments. The principal difference between a main thrust and a limited scope program is how much of the total production system research, development and testing that CIAT actually undertakes.

It is important that our donors and the people and institutions served by our programs understand these program restrictions so that expectations with respect to our output will be realistic in relation to the breadth and depth of the input.

Within the past 18 months, along with others, we have begun to explore the utility of studying existing overall agricultural production systems to

determine ways and means of improving total farm productivity or to develop an improved system of farming for an area. This work requires certain inputs about the commodities presently or potentially involved, including many not represented in the programs of CIAT. For the year ahead, CIAT's work in this area will continue to be developmental and exploratory with a leader, yet to be appointed, to direct the explorations. He will draw upon relevant inputs from other members of the staff.

CIAT serves as an adaptive and relay station for the rice program of IRRI and the maize program of CIMMYT. It has seemed both logical and efficient to manage such IRRI and CIMMYT outreach functions in this way. This also assured effective interaction between these programs and the other efforts of CIAT. For instance, swine nutrition trials have involved maize, rice and cassava, as well as other feedstuffs commonly found in the tropics. As another example, crop production specialists learn how to apply production principles with several rather than a single crop. Over all, the work is limited, the budgets are relatively small, and we are providing IRRI and CIMMYT with effective outreach, at least in our opinion we are.

Another analysis of the relative scope of the various programs of CIAT is in terms of the full-time equivalent of senior staff time assigned to each commodity. Nearly 50 percent of the total staff complement of all 41 people in 1973 will be working on beef and cassava. In the immediate future, we expect the numbers on cassava to increase with some reduction likely in rice, maize and swine -- if not in numbers, certainly in percentage of the total.

Under the limited staffing arrangements of CIAT, certain staff members, particularly in the supporting professional groups such as soils, crop protection, economics, engineering, and training do not work full time on a single commodity. Ten of the 17 staff members working full time on commodities are assigned to beef and cassava. This distribution of senior staff time also helps to delineate the differences between main thrust and limited scope programs.

CIAT's ability to carry these programs, given limitations of budget and staff, derives from our operational philosophy to get as much done as possible through cooperative work in national institutions throughout Latin America, and particularly through the collaboration possible within Colombia, particularly on ICA's stations at Palmira, Turipana, and Carimagua. Through cooperative research and training projects at these locations, CIAT pools its limited resources with the scientific staff of ICA, the equipment and facilities on these stations, and the land, crops and animals. Such cooperation provides CIAT with access to tropical agricultural production problems in radically different environments than exist at headquarters without incurring the attendant capital and overhead costs.

It would be difficult if not impossible to place a monetary value on this substantial contribution from the Government of Colombia.

Other aspects of CIAT-related work not reflected in either the core budget or the staffing are the AID-supported hemoparasite work being conducted by Texas A&M University personnel, the Canadian-financed cassava

and swine research projects at the University of Guelph, McDonald College and the Prairie Regional Laboratory, and a number of separately financed outreach projects in various countries.

Finally, over time we expect to identify more possibilities for co-operation with the other international centers on research, germ plasm, exchange, training and other projects. Staff members from the various centers are getting together frequently.

With this background, let us look briefly at some of the work under way at CIAT in the various programs.

I realize after a long while that very often when we go into a session like this and begin to present the highlights and to reduce the work for a year or so with 41 staff members, that it all sounds alike again. But, I would like to remind you that we are putting a definite emphasis and the emphasis is different on these various commodities at the present time. First, I would like to discuss the beef program, since CIAT's initial and major thrust is in the development of beef production systems, particularly for the vast areas of Latin America primarily growing grasses and a few forage legumes.

Throughout this area, beef cattle production levels are low. Calving rates average around 40 to 50 percent. Steers are normally marketed at 4 to 5 years of age; mortality is high, ranging from 10 to 15 percent in calves and 4 to 6 percent in adults. In comparison, each beef cattle unit in the United States produces four times as much.

The primary areas of concentration in our beef cattle program are: Nutrition through providing an adequate year-round feed supply, health, and economical systems of production. The final outputs are viable systems of beef production, and specialists capable of establishing, managing and studying such systems as well as teaching others how to operate them, and I place emphasis on the latter.

Our beef program concentrates on two major soil areas in Latin America, the more fertile recent alluvials, and the low fertility latosols which predominate in the interior of South America. This encompasses an immense area of approximately 250 million to 350 million hectares in Venezuela, Colombia, Brazil, Bolivia and Paraguay and this land is being used very little at the present time.

On these latosols, plant nutrition and, in turn, animal nutrition, are the limiting production factors. Consequently, we are seeking ways to determine the nutrient requirements to establish improved grasses and legumes. At the same time, we study management techniques which will maximize the returns from native grasses which contain, at best, not more than 6 percent crude protein and are extremely low in calcium and phosphorus that animals grazing on these pastures have very thin bones and frequently break a leg. Results in trials involving continuous vs. rotational grazing indicate better gains from continuous grazing. This is a preliminary item. We are not sure of this.

Molasses grass, a promising indigenous species has been successfully established without mechanical seedbed preparation. Molasses grass does well under low fertility conditions, is easily established and in our trials, to date, cattle grazing on the areas that have not been fertilized are doing as well as on the fertilized plots.

Another grass, pasto negro, is well adapted to the latosols, and at this stage of growth, the crude protein percentage is about 10.

In grazing trials on alluvial soils, pangola grass has been superior to para, with animals averaging 500 to 600 grams of gain per day. At the present time on this trial we have 9 to 10 animals on this hectare.

Ultimately, we expect to identify an overall improved quality forage for year-round grazing. Grass, alone, particularly in the dry season, is low in protein, energy, and minerals. Even a small amount of a legume in the mixture improves the nutritional quality in the dry season.

Consequently, we are making a major effort to identify, screen and propagate for large-scale grazing trials a rather wide range of the more promising tropical forage legumes. These are first evaluated and propagated in a legume nursery at CIAT.

Most promising in preliminary trials is *Stylosanthes guyanensis*, a native of South and Central America. In looks and analysis, this Stylo resembles alfalfa. It has a good protein level and dry matter production. Of particular note is Stylos' ability to perform on relatively low levels of phosphorus, and its apparent lack of need for potash. Its response to phosphorus peaks at a relatively low application rate.

Extensive stand establishment and grazing trials depend first upon developing ways to multiply the seed. This work is going on in the Llanos as well as at CIAT headquarters. Concurrently we have had considerable activity in soils and soil microbiology. A freeze-dried collection of rhizobium cultures for most tropical legumes of interest is now being supplied collaborators in national programs. When we have nodules such as these full of hemoglobin then we have an effective legume.

Weed and brush control in pastures is a serious problem being studied on the alluvial soils, while weeds, particularly foxtail, pose a serious challenge in the Llanos.

The primary goals of the animal health work are the control of disease and parasites so as to improve reproduction and growth performance and to reduce mortality. Presently, we are sampling herds to establish base line health and nutritional status. These surveys are being made at Carimagua, on private ranches in the Llanos, and on the north coast, the latter effort in conjunction with the on-going livestock production specialist training program. In the Llanos, more than 1,000 animals are under observation. Results of these surveys will help establish our research priorities and provide a basis for making general herd health practice recommendations for the lowland tropics.

Through the AID-funded Texas A&M University project, a field research project on the efficacy of a complete parasite control program has just been completed. This included control of internal, external and blood parasites. This photo dramatically illustrates the difference control makes. Parasites were not controlled in the small animal, while varying types of control programs were used with the other three. Results indicate a definite economic return for a complete parasite control program amounting to an advantage of 20 percent of the sale value of the animals at the end of the experiment. Most important, however, was a reduction in mortality from 3 to 12 months of age, which is the critical period.

Economists and animal scientists are describing the beef cattle sector, analyzing costs of production, evaluating various practices, and studying the efficiency of the marketing system. Maybe I should say inefficiency. In addition, they are working closely with the leader of the beef production systems to integrate practices and to test production practices using nine beef cattle production herds of grade Zebu native to the Llanos. This study, using 324 heifers and approximately 2,500 hectares of pasture, will permit comparison of production systems of varying intensity over a five-year period.

The principal variables are various combinations of native and improved grasses, continual back crossing with Zebu bulls vs. rotational cross breeding with Zebu and San Martinero bulls. I might pause there to say we are not entering into a major breeding program but we have to breed these animals and get calves to have animals to work with, therefore we are doing some studying in that direction; also mineral supplementation and effect of continuous vs. seasonal breeding on calving percentage.

To exchange information and experience with scientists in national programs, we are planning a seminar on beef production in the tropics for 1973. In this, we will discuss problems, potentials and alternate strategies for increasing beef production in the lowland tropics.

Now, I want to turn to our second major thrust which is cassava. Cassava has developed rapidly this past year, despite the serious setback in 1971 by an attack of a bacterial disease, *Pseudomonas*, in the germ plasm collection. To eliminate the bacteria, all experiments were destroyed. Although there are isolated cases of bacteria in the germ plasm collection, it is no longer a severe problem because of the changes made to provide greater distances between plants and between collections. Also, we have had a break in the weather and have had some dry weather and that helps. The net result has been an extreme shortage of planting material for our experiments.

The germ plasm bank now has more than 3,000 cultivars, most of these relatively free of bacterial diseases. We continue to classify the cassava on such characteristics, as differences in size and shape of the leaves, a factor which may be directly associated with productivity.

Because quantity reproduction of a plant that essentially is vegetatively propagated is difficult, we are studying a number of techniques so as to make maximum use of available seed stocks. This has included

propagation trials where we have obtained as high as 90 percent success with two nodes per stake, as contrasted with the usual practice of using a multi-noded stake.

Because of the contradictory reports in the literature of the maximum yields possible with cassava, we now have in the ground a rather extensive maximum yield trial using the variety Llanera.

Directly associated with our efforts to ascertain yield ceilings are other studies of various agronomic practices including spacing, which you see here in these wagon-wheeled type trials to determine the practices associated with economically optimum yields and optimum lengths of time to leave the crop in the field. We have just a little bit of difficulty in deciding when this crop is ready for harvest.

Efforts to keep the research close to the problems of the farmer include studies of present production methods as well as trials on farmers' fields and cooperative work of ICA stations in various parts of the country. These trials include inter-tilling of other crops with cassava, especially crops high in protein, such as cowpeas, or soybeans. With these particular varieties, the growth of cowpeas was more compatible with that of the cassava. It is a little surprising to see how those soybeans essentially did not let the cassava grow. To facilitate cassava research at other institutions and to enhance the compatibility and collation of results, a manual on cassava field experimentation techniques has just been published and will be distributed world-wide. As extremely weedy cassava fields are common, we are evaluating how seriously weeds reduce yields. Various methods of control, including herbicides, and the toxicity of cassava plants to various chemicals are being studied.

A number of insects, particularly the horn worm and the shoot fly and the damage caused by the shoot fly are being studied. We are developing techniques for screening varieties for shoot fly resistance.

Developing a varietal resistance to the principal diseases of economic importance is also a goal. These include bacterial blight, phoma, and cercospora. This photo shows reaction of three plants to bacterial blight and illustrates that we can find varieties ranging from highly susceptible to highly resistant.

For the small farmer, one of the advantages of most varieties of cassava is that it can be left in the ground for comparatively long periods, being dug for use as needed. This fresh root was in the ground at least five months after the top growth was removed. Within hours after digging, however, rapid deterioration begins unless the root is rapidly dried.

Agronomists and engineers at CIAT have designed a low-cost chipper capable of being powered by a human or motor, for the on-the-farm chipping of roots. Once chipped, the cassava can be sun dried and kept for feeding animals or transport to market. Several designs of an on-the-farm solar drier are being evaluated by a research fellow as a doctoral dissertation topic.

Other significant work in cassava currently under way includes several studies in economics, and a cooperative effort with the Canadians to establish a world abstract center on cassava literature.

CIAT and the Canadian support interests cooperated in holding this past January a Cassava Program Review Conference in which some 35 world leaders in cassava production and utilization research participated. This conference helped us to sharpen the focus on our cassava program, and stimulated interest among individuals and institutions scattered world-wide in working more closely on future cassava improvement programs. The summary of that conference is available for you here if you wish to have a copy.

Now, a little about our swine program. This program illustrates, to me at least, that our very well-circumscribed programs on commodities leave a little to be desired in really solving the problems of these farmers. I think that we are going to have to give some thought to what it takes to improve the lot of the small farmer around the world. I think I can illustrate it here with the slides.

CIAT's swine program is limited to identifying and developing ways to use locally available feeds, to develop on-the-farm sources of protein, and to develop and test swine production systems.

Current activities provide useful and exciting insights both into the complexities as well as the potentials of work with small farmers on a production system basis.

In one project this past year, we have studied intensively the problems of swine production on a number of typical small farms in the lowland tropics. These are subsistence farmers, few with more than 4 to 5 hectares, and some with as many as 16 children. Traditionally, they interplant three crops with low yields on all -- corn less than 1,000 kg/ha, cassava 4,000 to 5,000 kilos, and yams, 1,000 kilos.

Little of the crop production is sold for cash, a major portion of the limited cash income comes from the sale of pigs which are grown extensively and roam freely in the village. Under this system, more than 10 kilos of corn at two pesos a kilo are needed to produce one kilo of pork worth eight pesos. As uneconomical as this is, the practice has persisted for a long time, and it is probably going to continue for some more time. Evidently, the value of having pigs to sell for cash when it is needed is more important to these farmers than the losses they incur in producing them.

This illustrates, as well, how closely we must look into various aspects of a production system before recommending changes.

The local pigs are black, hairless, have wattles, are poor in conformation and poor producers of meat. Farmers feed the pigs by throwing them small amounts of corn and perhaps some household scraps. On this diet, lacking in vitamins and minerals, pigs rarely reach a market weight of more than 60 to 70 kilos, and this only after 14 to 20 months.

In a recent trial, four pigs were fed the traditional corn diet and allowed to roam. Another four were confined in a concrete lot, treated for internal parasites, and fed for 42 days a diet adequate in vitamins, minerals and protein. The pigs on the traditional diet gained an average of 4 kilos each, while each of those on the improved diet averaged 40 kilos of gain.

Experiments are under way to maximize the use of locally available materials both for feeding the pigs and providing low-cost farrowing pens, simple corrals, and feeding floors. Already some 50 farmers in the research area have built one or more of these. This is without our recommendation and without the recommendation directly of any other agency.

Recently, the agricultural economist working on the project introduced a simple scale to demonstrate the value of selling pigs by weight rather than by eye as is the current practice. Other demonstrations on use of scales are under way currently.

Major agronomic problems include local production of a crop, such as cowpeas, to supply protein as well as to increase the yield of the traditional crops grown.

Other problems include lack of a store where the farmers might buy vitamins and minerals, lack of a market transportation system, and lack of ready low-cost credit.

If the farmer could sell the 20 kilos instead of giving it to the pigs he could make a little more money but he can no more take that corn to market than he could take the pigs to market.

Beyond improving the diets and productivity of the pigs, an ultimate goal would be to provide a better life and improved diets for the people. This would involve working with crops, particularly field beans and other food legumes, as well as with the swine and other animals. These, and the other improvements needed, are most appropriately carried out by national agencies. Most of these agencies, however, have had little experience working on system-wide problems, although they express an interest in doing so.

These experiences as well as the several years of well-documented work on the use of feedstuffs available in the tropics for swine nutrition will be fully reported and discussed at the Seminar on Swine Production in the Tropics to be held at CIAT on September 18-21 of this year. Research workers in national programs in some 15 countries will have opportunity to become acquainted, to exchange data and experiences, and to develop continuing cooperative links.

Now, a word about our field beans programs.

The Board of Trustees in May directed CIAT to increase the scope of its program in food legumes to a regional thrust in field beans. Prior to this time, we had been working to a limited extent on other species. This

had included the screening of varieties of a number of species from the USDA collection of food legumes. The principal objective here was to determine their behavior under tropical conditions, and to increase the seed. I believe we were fairly effective in increasing the seed and getting some of it to the other institutes.

As the result of these observations, we believe it important, as we concentrate on field beans, to grow promising varieties of cowpeas and soybeans in comparison trials. This doesn't mean we are going to work on a meager program on those other species. There is considerable evidence that both of these species do extremely well under tropical conditions where field bean production problems are serious, and, further, they will have an important place in production systems as on-the-farm sources of protein for both humans and animals.

Since other food legume species are extremely important in other areas, we are pleased to learn that possibly other institutes will be working on some of them. We will be pleased to exchange data and to obtain seed of promising selections for test in the agricultural production systems which we are studying.

The most promising food legumes in our observational trials have been varieties out of the cowpea collection. Results indicate that the cowpea can be successfully grown at sea level under a soil pH of 5 to 8.5, in droughty soils, and in poorly drained soils.

Observations of soybeans indicate that there is available material resistant to many diseases and insects. Note the mature leaves without holes or disease symptoms. It is also possible to develop types which are of good height and appear promising for yield. Note the heavy terminal raceme.

Another interesting but less known plant is the pigeon pea. This particular variety is shorter than many. The pigeon pea has done well in our trials and has the advantage that it can be eaten by people in any of three forms -- green pods, green peas, or as dry mature peas.

In notifying the Technical Advisory Committee last year that CIAT was going ahead with a limited scope program in field beans, our Board indicated CIAT's willingness to undertake a major thrust with this species if adequate financial support could be assured. The decision to concentrate on field beans was based on the facts that (a) it is a legume which humans consume directly, (b) field beans are grown and eaten by many people at many places in the world, (c) the crop is produced under a wide variety of climatic and environmental situations, (d) yields generally are low, (e) many of the problems have been identified but not solved, and (f) there was a good possibility of mobilizing a network and to help strengthen the work of national institutions on these problems.

Our limited observations to date with field beans tend to substantiate the reports of low yields and serious production problems for which solutions must be found. This is an example of one of the better yielding

varieties currently in the field at CIAT. In a well-managed field the yields have been as high as 1.5 to 2.5 tons per hectare. By current standards this is another good yielding variety. One of the physiological problems is the long terminal vines which are unproductive when this type of bean is grown as a bush bean.

Abortion of flowers, pods and ovules runs high in field beans. We estimate that 70 to 80 percent of the flowers formed are lost either as flowers or, worse, as pods. A plant under field competition will produce 4 to 15 pods to be harvested.

Here we see two pods about to drop off the plant. In this case the plant was growing in a nutrient solution, so we can assume that nutrients and water were not limiting factors.

Another serious problem is inadequate nodulation.

Our microbiologist has established that there are clear varietal and race of rhizobium specificities. In nearly all of our trials, adding nitrogen fertilizers to field beans has increased yields. This probably means that we do not have efficient rhizobium fixing adequate nitrogen.

Diseases among field beans are such a problem that commercial bush beans cannot be planted densely enough to use fully the solar energy available. If we plant the beans more closely, we improve the environment for disease.

Field beans come in many different colors and shapes. Here is an example of a white mutation from a black line, the mutation resulting from irradiation trials carried out somewhere. For the moment, we are not too concerned about color, as we believe it more important to concentrate on developing a network with the other bean research workers in Latin America to find solutions to the major production problems. This will be one of the principal goals of the conference of bean research workers now scheduled for the last week in February 1973.

One of the concerns of this conference will be the serious disease problems. Some 26 viruses have been identified. Rust, blight, angular leaf spot and a group of root and stem diseases reduce plant population, leaf area, photosynthetic efficiency, and grain desirability. Weeds frequently serve as alternate hosts for viruses and insects.

With the Board decision in May to proceed with a limited scope program in field beans, we identified and employed a leader for the program, Dr. Guillermo Hernandez Bravo, who joined the staff in July.

We are moving ahead with a definite program, although limited, and we stand ready to expand these efforts into a third major program thrust if and when additional support becomes available. If this does not materialize, we shall contribute the results of our work and cooperate fully with more intensive efforts elsewhere if this proves to be the course of developments.

Now a word about our limited rice program.

Principal activities this past year in the rice program illustrate how CIAT is adapting and relaying the new rice technology from IRRI to Latin America and, at the same time, working to develop and strengthen existing institutions.

With seed of IR8, IR22, CICA 4 and locally named close relatives of these stiff-strawed, high-yielding rice varieties being widely distributed, it is now estimated that more than 30 percent of the flooded rice in Latin America outside of Brazil -- and most of Brazil plants upland rice -- is now planted to these improved varieties. I repeat, more than 30 percent of the total flooded area in Latin America.

Thus action was initiated a year ago to help the countries of Latin America, already acquiring the new varieties and new technology, to establish appropriate policies to manage the diffusion, production, and marketing of the crop. With the cooperation of the Interamerican Development Bank, CIAT in October organized a Seminar on Rice Policies in Latin America to introduce the new varieties to policy makers, to inform them of the production potentials and requirements, to create an awareness of the possible second generation problems, and to provide opportunity for them to consider ways to minimize these problems if they should decide to promote increased production.

More than 180 persons from 23 countries attended. As part of a longitudinal study of the impact of the seminar on rice policies, our staff administered questionnaires before and after the seminar to determine what information and opinion shifts would occur among participants as the result of their seminar discussions. We were able to match the before-and-after opinions of 62 participants from 20 countries.

Significantly, the greatest changes in opinion and belief resulted with respect to issues associated with the problems related to increased rice production and possibility of formulating new or revised policies and programs. On strictly informational items, there was a marked shift from neutral or no opinion positions in the before administration to definite opinions at the close, thus indicating a gain in information. Immediately preceding the rice seminar, 16 of the world leaders in rice pathology met with some 100 participants from Latin America to consider ways of fighting the problems of the rice blast disease by developing horizontal or general resistance.

This past May, 40 rice researchers from 15 countries (more than half of the persons being former trainees) met at CIAT for a four-day workshop on new developments in varieties, production technology, and diffusion techniques, including seed production.

Currently, 21 rice extension specialists from Rio Grande do Sul in Brazil are enrolled in a month-long short course at CIAT in rice production and extension techniques geared to help them become competent in moving to farmers new varieties, such as CICA 4.

Meanwhile our staff continues to identify, select and develop new varieties for Latin America with performance characteristics even superior

to CICA 4. We have been selecting and adapting an S-3 IRRI line for several years because of its extremely high-yielding capacity -- more than 11 tons per hectare in field trials -- and superior grain quality. Through selection, we hope to develop a variety with milling qualities superior to that of the selection when received as an S-3 from IRRI.

Scientist-to-scientist communication continues on national rice problems, the major one being rice blast disease. This disease problem is particularly acute in upland rice, and especially in areas such as the Llanos. We have also demonstrated that only a few varieties are tolerant of acid soil conditions when grown under upland conditions. This photograph illustrates the differences in blast resistance interacting with acid soil tolerance. I would call your attention to the fact there that IR 8 and CICA 4 are dead. This local variety will probably make at the rate of 2 or 2-1/2 tons per hectare under upland conditions. Some lower-yielding varieties, under these conditions, do better than new varieties such as IR8 and CICA 4. We are presently screening several thousand varieties for acid soil tolerance and resistance to blast under upland conditions.

Up to 90 percent of CIAT's work in rice breeding now focuses on combining blast resistance with superior plant and grain types. Much of this work is being done with and through the national rice programs in Colombia and other countries. In fact, most of our breeding work is being done on the IRRI station.

Despite the demonstrated need for research on the problems of upland rice, we are not prepared and do not plan to move beyond trials such as this which demonstrate the problems and the potentials. If a main-thrust upland rice program develops at IRRI or elsewhere, we could consider how we might introduce this into our other rice outreach activities.

Before leaving rice, I would like to emphasize how having this outreach program tied to CIAT directly helps us to accomplish our overall mission. First, it has furnished us early in our existence with a tangible product with which to interact with national institutions -- in germ plasm, technology, training, and conferences. Second, the rapid internationalizing of the program has demonstrated both to national leaders and our own staff a philosophy and pattern of operations we expect to follow with other commodity programs. Our experiences in the maize program have further helped us in this respect.

Now, I would like to say a little about our small maize program.

Maize is the single most important element in the subsistence diet throughout the Andean Zone and the Latin American tropics. This basic food crop must be included in most production systems for farmers across a range of altitudes and latitudes. In full collaboration with CIMMYT's international network of regional outreach centers, the limited CIAT maize program is oriented toward problems specific to the Andean zone.

In maize improvement, CIAT serves as the major center outside of Mexico for progeny testing of brachytic and short plant materials, both

opaque and normal populations, and other materials of specific interest to programs in the zone. While you can move these germ plasms, you still have to adopt them locally for conditions that you find and you are not going to find one or two or three maize populations, in my opinion, which are going to serve all the needs from sea level to 12, 500 feet. You still have to have some work done on the local scenes. Therefore, the need for outreach relay by CIAT, and then in turn to each of the national programs under their conditions.

We are coordinating the planting in the Andean Zone of the International Maize Trials from CIMMYT, the trials from Central America, and the newly initiated Andean zone uniform trials.

Excessive plant height is a serious limiting factor in the lodging problem. This is a chart shown a few hours after a 60-kilometer-an-hour wind passed over our station. A new short maize type, shown in background, developed in CIMMYT and tested at CIAT, will soon overcome this difficulty. The narrow adaptation of existing maize hybrids limits the commercial use of improved germ plasm. Under the same wind condition, you notice we have pretty good stability.

Studies of photoperiod and temperature are leading to a better understanding of these environmental factors affecting growth, and to wider use of new maize varieties.

A unique collaboration in Colombia among breeders and agronomists, human and animal nutritionists, and commercial processors has led to important advances in the study and use of opaque-2 materials.

The new selections from CIMMYT are growing in the field at this time. Nutritional trials with swine at CIAT and with children at the University of Valle will follow. We expect to have some interesting data to present at the protein conference to be held in Mexico in December.

An agronomic problem which is serious in the Andean zone is acid soil tolerance for the Llanos region of the interior. Screening trials are in the field in Carimagua to assess genetic differences to the low phosphorus conditions here.

A limited effort is being made to find genetic resistance to *Spodoptera* (cutworm) and *Diatrea* (stalk borer), to insect pests which cause serious damage in the Andean region.

The maize team in CIAT is helping to implement the use of maize in production systems for this region. In addition to the projects in the lowland tropics which involve other CIAT commodities, this concern and coordination includes the production programs in Rionegro and other sites in Colombia, the Cajamarca project in Peru, and programs planned for intensive maize production in Ecuador.

CIAT organizes and coordinates the Annual Andean Zone Maize workshop. This was held last November at CIAT and, although attended by 50 agronomists from 12 countries, our actual support expenses were less than \$2,000. This

reflects the interest and involvement of the participating institutions. The next workshop will be next March in Bolivia. We also publish an information newsletter for maize research workers in the area.

Training of young agronomists in maize production and production-oriented research continues to be an important part of our work.

Now I want to say a little about our so-called agricultural systems work.

Although certain efforts and activities of CIAT contribute generally to the development of a base for agricultural production systems, our work in this area remains exploratory and limited. We will not attempt to elaborate or illustrate it here. The information and discussion in the 1973 Program and Budget document describes the present state of developments and deliberations.

We plan to appoint a leader for this program by the end of the year. He will report to the Deputy Director General who will assist in the inter-commodity coordination. We expect much of the input to come from the commodity programs and the supporting professional groups. The training programs will be directly involved, and we must develop effective ways to cooperate with national agencies on the study and improvement of existing production systems on a community or area basis.

In the process of developing the program, we will evaluate critically the general program objectives which we now have established. These have been previously stated as follows: To increase the number of career opportunities in agriculture and thus reduce the migration of people to the cities; to provide year-round adequate diets; to increase the weekly or monthly supply of cash, and to improve the level of living and quality of life for those living on the land. With goals as broad as these, it will be necessary to enlist the aid and cooperation of many agencies, while CIAT's principal role will be to concentrate on helping to solve the agricultural problems involved.

Now, a word about our outreach activities.

Outreach activities with the goal of developing effective linkages with scientists and institutions in the various countries have been a basic part of the CIAT operational philosophy from the beginning. As new members have joined the staff, they have been encouraged to travel widely so as to become familiar with the people, programs, and problems in their field, and how these may vary in importance among countries. They have visited officials in the cities and farmers in the rural areas. Where possible, we have encouraged the development of cooperative and collaborative programs, with CIAT making the kinds of scientific or other inputs necessary to accelerate progress toward the solution of a specific problem. We have not tried to centralize the research work at CIAT, but rather to stimulate, facilitate and join forces with research efforts in national institutions. At the same time, as a result of these interactions with national institutions, we have identified numbers of young scientists and potential production

specialists for training. These training programs are designed to develop the research competency of the national programs and the technical, economic and communication competencies of the advisory and extension staffs.

Contrary to some expectations, our training programs are not directed to teaching a package of practices, or to the transfer of specific commodity technology. Rather, we focus on preparing young men and women to apply effectively and efficiently principles in research and production, and also we stress development of diagnostic skills.

Young scientists learn how to identify production problems requiring research and how to design and carry out a research project. They learn more efficient ways of doing research and communication of the results.

Production Specialists learn how to diagnose production problems in the field, where and how to look for solutions, how to test research results in local environments before recommending them to farmers, how to organize and teach in training programs and, perhaps most important of all, how to cope with the physical realities of production at the farm or ranch level as farmers or ranchers. If you don't believe it, try going on the northern coast as those trainees did in our livestock production specialists training program, living on those ranches, working with those people for six months in sielda full time and see whether you believe it or not.

Part of every training program involves working directly with farmers in the field, as well as conducting replicated trials on farmers' fields and organizing and conducting field days.

Providing this kind of training we believe makes a more lasting contribution than specific training in a package of practices. We hope, as a result, that our graduates in research and production are better equipped to study the problems back home to develop their own technology, and to move it into practice.

In those cases where specific skill training is required or requested, such as the general technology of handling the new rice varieties, we can adapt our programs to accomplish such training objectives. The current short course for Rio Grande do Sul is a good example of a specifically designed outreach activity.

Our associated conferences and symposia, already mentioned in connection with reports on swine, cassava and rice, are extremely important means for reaching various audiences: (1) Policy makers as in the rice seminar, (2) world authorities as in the cassava conference, (3) Latin American scientists as in the swine seminar or rice blast seminar, or (4) research workers and technicians as in the corn and rice workshops.

Contractual outreach projects in which CIAT is already engaged include the Cassava Virus Isolation Project with the Instituto Agronomico in Brazil, and a cooperative program just beginning to help the Government of Guatemala develop ICTA, an agricultural research and training organization.

In the years ahead, we expect increased activity in outreach programs as the demand develops in various countries for adaptation and institutionalizing of new technological developments. Further, the Board of Trustees by authorizing us to spend limited amounts of core funds in other countries to help get cooperative projects under way will stimulate and accelerate the outreach demand.

Now, finally, I would like to say a little about our physical plant.

Since April 1970, we have been operating out of minimally converted farm buildings on the 520-hectare farm near Palmira. The old dairy barn houses our administrative offices and classrooms; the old hacienda the Library, and a few other offices, while the little 3-room school is occupied by our Information Services staff and equipment. This is an architectural drawing of the principal structures in the capital development plan approved by the board. Already completed and occupied is Station Operations, much of this being used for temporary offices and laboratories. Other buildings in use include the screenhouse, swine unit, beef cattle unit, and small animal colony. The roof has now been completed on both of the laboratory buildings, and the contractor assured us that the construction completion schedule will be met. Under this, various buildings will be completed in the period from December of this year through March 1973.

Taking into account the likely delays in finishing details and the time necessary to install equipment and make it operational, the Board of Trustees has tentatively set October 12, 1973, as the date for the dedication ceremonies and an inaugural seminar. We trust that the projected schedules will be met and on behalf of the Board of Trustees, the management and scientific staff and employees of CIAT, I invite you to be with us on this day, at which time you will have an opportunity to discover for yourself more about CIAT and its programs.

August 1, 1972

STATEMENT BY DR. RICHARD L. SAWYER,
DIRECTOR-GENERAL OF CIP (INTERNATIONAL POTATO CENTER)

The Potato Center is a new center. This is the first year that other than planning money has been made available. However, there are things that we can talk about. There are things that we have inherited, such as portions of the outreach program, and Dr. Niederhauser, who is the Director of the Outreach Program of the International Potato Center, will later explain some of the programs.

I would like to take a few minutes to explain why we were established, our history of development, and present status.

We are the first center to be activated without a direct sponsorship of the foundations. Many of you have been through the process of starting a new institution. There is a period when an institution is being given life that the Director is also the janitor. I have only recently passed through that stage.

Part of our program of development has been the fact that as CIP was developing, so was the Consultative Group on International Agricultural Research. Funding, which seemed eminent two years ago, suddenly became unavailable as reevaluations were made by funding sources. Should they go with bilateral or multilateral funding?

As the drive to have all funding come to this Consultative Group for such new ventures, suddenly our life depended on being included a part of the family of centers. We are grateful for the funding which has been made available from the Consultative Group which is now giving us life in this first year of operations as a center.

A summary of the reasons why an International Potato Center has been established would include the following facts:

1. The potato is one of the world's principal food crops. In some regions it is a major part of the diet.
2. Since the introduction of the potato into Europe after the Spanish Conquest in South America, the cultivation of the potato has been extended to most parts of the world.
3. Recent FAO statistics indicate a considerable increase in production in developing countries not normally thought of as potato producers. India for example now has more area in production than Bolivia, Chile and Peru combined. The potato in India has followed the progress of wheat and is used as a short term rotation.

4. The Rockefeller Foundation International Potato Program has had many requests in recent years for help in potato improvement programs in Africa and Asia. Their early work had been confined mainly to South America.
5. The British have a potato team working in Kenya. AID has a scientist working on potato improvement in Uganda. The Germans have a team working in Argentina. These are indications of the increased interest in the potato as a food for developing countries.
6. The developing countries are mainly using the varieties which were developed for Northern latitude countries. These were built using less than 5% of the genetic variability which exists in the area where the Center is located. Average yields of potatoes in developing countries are about 25% that of Northern latitude countries. There is good evidence that this difference can be considerably reduced if varieties are developed specifically for the climate, latitude and disease problems of developing countries. There is good evidence that the adaptability range can be broadened to include areas of the lowland tropics. There is good research evidence that the protein quantity can be doubled and tripled with the same good balance that is in present varieties.
7. The potato is a more efficient producer of food than the cereals. It outranks all other major food crops in the production of calories per unit area per unit time. It outranks most other crops in the production of protein per unit area per unit time.
8. With the establishment of an International Potato Center, the same exciting progress can now take place with the potato which has been taking place with rice and corn and wheat.

Brief History of the Development of CIP

Some of the other Centers have emerged from the development of strong, national programs. A similar base was developed in Peru with the establishment of a potato commodity program through a USAID Contract to develop a strong national potato program in 1966.

In late 1967 a Peruvian Presidential decree established in name an International Potato Center. This decree indicated the interest of Peru and was the evidence needed to look for a sponsoring organization or institution.

It was quickly determined that the sponsors of the earlier Centers were running out of flexible money. They would give moral and possible financial support but could not take a direct sponsorship.

In January of 1971 an Agreement was signed between the Government of Peru and North Carolina State University in which Peru declared what it would provide in cooperation and facilities to the Center and North Carolina State University assumed the sponsorship role. USAID made planning money available for a two year period to North Carolina State University to help with this sponsorship.

The Agreement signed on January 20, 1971, guaranteed administrative and economic autonomy and similar privilege that other Centers have, such as exoneration of taxes, freedom of importations, and freedom of movement of scientists and plant materials. The autonomy and privileges granted in the Agreement are now being used. Foreign scientists have their official visas, their personal belongings enter Peru free from taxes, and their salaries are tax free.

The statutes of the Center have been approved by the Board of Trustees and were transcribed into Official Peruvian records on June 21, 1972. These statutes call for a governing board of ten members of which not more than two shall be from a given country. Three positions are for representatives from the Consultative Group on International Agricultural Research. Both the Agreement and the Statutes have been incorporated into a document which is in the final process of being made Peruvian law as a further guarantee for long term security.

A contract has been signed with the Institute for International Education for the contracting of CIP staff with similar terms as the other Centers. Except for one staff member assigned by the Rockefeller Foundation all foreign staff members are on IIE Contracts.

The Program prior to 1972

The only specific funding prior to 1972 was the planning money from USAID. A total of \$115,000 was made available for a two year period, mainly for the salary of a senior professional, a secretary and supporting costs for travel and communications. Some project funding was available for work with the germ plasm collection which the Center inherited from the Peruvian National Program as soon as planning money became available.

With planning money a prospectus was developed. The agreement between Peru and the sponsoring institution was developed, legalities for use of the autonomy were established, statutes developed and funding interest initiated and developed with several countries. The Government of Peru completed a facility for offices and laboratories during this period. Some planning money was utilized for the development of office space.

A maintenance program for the elimination of duplications and diseases was initiated with the germ plasm collection. A Peruvian

scientist working with the CIP collection was sent for advance training utilizing British support. When CIP inherited the collection it contained approximately 1500 entities. It now contains more than 4000 due to explorations and the addition of other collections.

The collection has been multiplied in order to have sufficient tuber material available for a number of resistance screening programs which have been initiated in cooperation with Peruvian scientists during the period the Center is being staffed.

Cooperation was developed with several foreign institutions who had projects which were also of major importance to potato improvement programs in developing countries. Some of these expanded their work load and encompassed phases of work which would specifically apply to developing countries with no cost to the Center.

During this period the Rockefeller Foundation agreed to make its International Potato Program a part of the Center starting in 1972, with 1972 being a transitional period.

The Program of 1972

The first money for the 1972 budget other than planning money was made available by the World Bank in late February. Some of the expected funding has still not been assigned. Some of the funding is unflexible such as the Rockefeller Foundation support for 1972. It is mainly to continue what was their International Potato Program as it goes through the transitional stage of becoming a part of the Center with the necessary evaluations to see what should be continued and how.

Despite the delays in funding assignment the program has moved ahead quite rapidly. In January the new building constructed by Peru for the Center was officially handed over. As fast as funds became available essential positions have been filled. As of July 1, CIP staffing in Administration included myself as Director General and a Peruvian Executive Officer and a Controller. The Executive Officer was formerly the top man in the Ministry of Agriculture directly under the Minister of Agriculture. The Controller comes to CIP with six years as a Senior Auditor with USAID. There is a senior pathologist (presently President of the Phytopathology Society of South America), a nematologist and the Director of Outreach Programs. Dr. Niederhauser is presently residing in Mexico conducting the late blight testing program and a training program during the present growing season.

In supporting roles as of July 1, are a virologist with a masters degree, a nematologist with advanced training in the Netherlands, and two germ plasm collection and maintenance technicians. One of these is on leave receiving advanced training in England.

The appointment of Carlos Ochoa, a Peruvian and leading potato taxonomist is being negotiated at the present time. As soon as final details can be worked out with the National Agrarian University he will be working with the Center.

Two post doctorates have been offered and accepted and IIE Contracts are being negotiated to have them in Peru by September 1.

All of the facilities needed for the foreseeable future at the La Molina-Lima location will be completed by the end of 1972 except for a refrigerated storage for tuber material. These facilities are shown in the back pages of the documentation and include offices and laboratories in the new facility, the construction of four large screenhouses, a field-greenhouse laboratory, and the storage facilities for equipment, supplies and vehicles.

In germ plasm, the program for 1972 is concerned with the elimination of duplications and diseases, multiplying the clones to the tuber number needed for resistance screening programs, and obtaining botanical seed from as many of the individual entities as possible. Seed balls have been obtained from over 1000 clones in the collection this year. These are being processed and packaged for storing and distribution. A program for categorizing each clone and classifying them for computer retrieval has been developed with the help of leading potato germ plasm collection experts. Until the material has been properly freed from diseases the Center will only distribute botanical seed - not tuber material. Tuber material has been furnished to a number of Peruvian projects.

The Pathology program has been mainly orientated around the germ plasm bank and the elimination of diseases and cooperative work with Peruvian projects in which the Center has an interest. A late blight testing program is presently being conducted in Mexico. The Toluca valley appears to be the best place in the world for testing for field resistance to the various races of late blight. This testing program is used by breeders all over the world. Late blight is one of the major problems for potato improvement in developing countries.

The Nematode resistance program is expanding with projects concerned with the variation in the Golden Nematode and plant resistance to this variation.

In order to quickly activate some priority programs in breeding and genetics during the initial years, three U.S. University projects have been linked to the Center using U.S. donor money. Segregating populations from work with the cultivated tetraploids, the cultivated diploids and certain wild species will be grown in the Central Sierra, and subjected to the ecological pressure of the lowland tropics of Peru during

the coming growing season starting in September and October. This material is presently being harvested at the U.S. locations. The botanical seed for this material was collected across the Andean region and crosses made in preparation for such a program.

In outreach, a training program is presently being conducted in Mexico by John Niederhauser. It includes potato workers from Chile, Ethiopia, Uganda and Poland. The program encompasses the period from when the potato was planted through harvest.

The Center helped make it possible for potato workers in East Africa to attend the Potato School conducted in Kenya in May by a British potato team working in Kenya and a USAID scientist at Makerere University working on potato improvement in Uganda.

At the present time, the Center has a seed potato specialist working as a short-term consultant in Pakistan to help with the development of plans for better seed production. He will also visit the Indian program.

The Center is providing three scientists to help with a training school in Chile in August. One of the scientists is from CIP, one from the Peruvian program, and one from the Argentinian program. This request for help came from the leader of the Chilean National Program.

The week of July 17, the International Potato Center conducted a symposium in Lima, Peru, on "Key Problems and Potentials for Greater Use of the Potato in the Developing World." Leading potato scientists around the world participated. There were country reports from program leaders in Chile, Colombia, Peru, Mexico, Kenya, Uganda, Korea, and India. There were status reports on major problems of potato improvement in developing countries by leading potato scientists from Germany, Sweden, Great Britain, Netherlands, Australia and the United States. The major reasons for the symposium were to announce to the scientific community what had been established and to take advantage of the competence gathered at the meeting to help with long range planning as the program of the Center is being activated. A committee of key scientists was asked to critically listen to the reports of program leaders from developing countries, the status reports of scientists working on priority problems, and review the program planned and underway as outlined in the documentation. Serving on the Committee was:

- a. The President of the Potato Association of America
- b. The Secretary and Editor of the European Potato Association
- c. The leader of the IRI Sturgeon Bay Project which is the most used potato germ plasm collection in the world
- d. The President of the Latin American Phytopathology Society
- e. A member of the Max Planck Institute of Germany
- f. The head of the Indian Potato Research Institute.

Following is a sentence from the preliminary report being circulated amongst committee members:

"The Committee gave its strong backing to the program presented in the documentation." They emphasized the need to continue the late blight testing program in Mexico, to concentrate on the collection of native cultivars and publish as frequently as possible a listing of stocks and screening data, and the desirability of having core projects done at locations other than the Center when technologically and economically feasible.

The 1973 Program and Budget

As indicated in the documentation, CIP is a new Center and growing. The program in the documentation is being developed as fast as funding is made available. There is no lack of trained people with potatoes which can be harnessed to help solve the problems of potato improvement. The International Potato Center has been developing funding from several sources which would include the assignment of scientists and their support to work on core projects. An attempt is being made to give a balance to individual country funding so that it includes flexible support, utilization of national scientists and linkage of national institutions for those countries where a major competence exists in potato technology.

Early in 1973, two German scientists will be joining the staff of the Center, a nematologist and a pathologist working with fungi. Negotiations are presently underway for the assignment of three and possibly four Dutch scientists, probably one in the field of breeding, nematology, physiology and virology. A British scientist will be joining the Center in April at the same time as the return of the Peruvian on study leave, to work in germ plasm collection, classification and maintenance. A training officer will be added to the outreach program and a supporting technician in seed production problems with developing countries. Supporting staff will be added as justified by the programs developed by individual scientists and in accordance with the budget presented in the documentation and accepted by the Board of Trustees of CIP at its meeting in May. Linkage projects will add approximately 15 additional senior scientists from foreign institutions to priority projects of the Center.

The facilities at the Central Sierra Station will be developed on land being provided by the Peruvian Government. This will include field laboratories, greenhouses, offices and storage facilities for equipment and the germplasm collection in tuber form.

Major growth in the program of the Center being activated will take place in the following areas in 1973:

A. Germ plasm and Taxonomy

With the return of the Peruvian in training, the addition of the British scientist, the use of Prof. Hawkes of Birmingham as a Consultant, and the linkage of the IRI Project of the USDA, the work with germ plasm will be expanded rapidly. The program for elimination of duplications and diseases will be intensified. Cooperation and exchanges between existing banks will be developed. The classifying of material for computer retrieval will be continued.

A workshop will be held in February and March to bring together the top potato taxonomists. It may be too much to ask for an agreement on a system of classification for Solanum but at least they should be able to establish a system flexible enough for an incorporation of major thinking. They should be able to classify a large amount of the material presently in the collection.

Already a request has come in from the Netherlands for cooperation in a potato plant exploration trip in 1973 in the Andean region. Most of the funding will come from other sources than the Center. The Center will cooperate and have CIP personnel along to collect duplicate samples. The Center will initiate a program of systematically collecting, as soon as possible, all existing potato germ plasm. This will take a period of years. Ing. Ochoa, a Peruvian and a leading potato taxonomist, says there are wild jungle tuber bearing species of Solanum which have never been collected. These we need for adaptation of the potato to the lowland tropics.

In Pathology, the late blight testing program in Mexico will be continued. There are presently a large number of late blight resistant clones which have been accumulated in Mexico from the testing of material from breeding programs around the world. The program of getting the best of these into adaptability tests in developing countries will be expanded.

The pseudonomas work (brown rot) will be expanded. Dr. Edward French, Head of the CIP Pathology Department, spent 1971 working under phytotom conditions specifically with this disease as a background for his work with the Center. He will develop cooperation amongst the various pseudonomas projects around the world, and develop adaptability tests to see if the clones which have proven so good in Colombia and Peru during the past three years are equally good against the strains in other developing countries. The resistant clones which are doing so well in Peru and Colombia come from a Wisconsin genetics and breeding project which is linked to the Center. This project has made major advances in determining the genetics of inheritance of pseudonomas resistance. This is one of the two major disease problems in both the highland and lowland tropics. Through his knowledge of South American pathologists, Dr. French will continue to develop cooperative projects in a number of countries with a large number of tuber pathogens.

The Nematology program will be considerably expanded with the possibly assignment of both a Dutch and a German scientist; The screening of tuber material for resistance will be conducted in the field and the greenhouse. Peru is not only the home of the potato, it is the home of the variability which exists with the pests of the potato also. Thus, a major program is being established to determine the variability which exists with the Golden Nematode and to obtain plant resistance. This is one resistance program which can definitely be conducted better in Peru than any other location.

In Physiology, a program for systematically determining the variability which exists in protein quantity will be initiated as a background for genetics work to develop populations with high protein concentration. Work at the University of Minnesota presently financed by the Rockefeller Foundation has given up to 24% dry weight within two generations using species other than those from which our European and North American varieties were developed. This is triple the protein content normally found in potato varieties.

A program for systematically evaluating the germ plasm material for cold resistance will be initiated. An objective measurement is available for use with advanced selections. This needs refinement and a mass selection method developed.

In breeding and genetics close cooperation will continue to be developed with institutions already involved with projects which are important to developing countries. The exploration of the cultivated tetraploids, the cultivated diploids and wild species for desirable characteristics for developing countries will be expanded. This includes the program being initiated in September and October for growing segregating populations in the highland and lowland tropics.

Short term training schools will be conducted in Mexico, Peru, East Africa and possibly in one location in Asia. Already a request has been received from an East African country for help in the planning of a seed production program. A seed potato production specialist with considerable experience in developing countries will be made available for such requests working out of the Center in Peru. The Center will cooperate with national training programs whenever it can be justified and funding is available.

A number of requests for post doctorates have already been received from developing country scientists. In accordance with the budget presented and funding, post doctorates will be filled as fast as principal staff are ready for them.

Several advance degree thesis projects are already being done at the center by students who have already completed their residence and course work requirements at foreign institutions. This program will be expanded.

An attempt will be made to isolate several good scientists from developing countries and bring them to work with the Center for a one to two year period. They will work with the genetic material on problems of importance to their country. This will establish long lasting channels of communication and exchange of material as they return to their national programs.

An economist will be added to the staff. Although there are many requests for help with potato improvement in developing countries, there is relatively little knowledge concerning the relative merits of an input into potatoes in comparison with a similar input into another food crop. We should not be promoting potato improvement if something else should be receiving the attention in countries where money is limited and food production is a problem. We need to be assessing economically, where should potatoes be improved and grown as a major food.

As we have gone through the program of searching for funding, we have been accused of asking for too little money. We have also been accused of asking for too much money. The budget has been presented in many ways to conform to the various specific requirements of certain funding sources as we have gone through the last two to three-year period.

I am grateful for the workshop conducted by the World Bank to bring uniformity to budget development and presentation. I am more grateful for the fact that as funding became available, we had been able to employ competent help. Next year, my job will be easier in the budget development and presentation.

Since we are a growing Center, our budget for 1973 is about double what it was for this year. We have not been totally funded for what we presented this year, due to the slowness of money becoming available and due to certain countries from which we expected money and which are still trying to make the decision, should it become bilateral or multi-lateral.

We feel competent we can level out at an annual cost of around \$2 million for reoccurring costs for core programs. We will have no major long-term overhead costs. We expect to contract where facilities now exist, whenever possible, in order to do the job in the most economical method, and leave flexibility for program adjustment to the needs of developing countries.

The documentation gives you anticipated costs. We have an experience of work in Peru to give us this. We have, however, only five months of history funded as a Center. We are fortunate that Peru has built us a major portion of our physical plant facilities and are providing the land necessary on the coast in the Sierra and in the jungle.

We, at the Potato Center, realize that we must conform according to what is acceptable to the donating agencies. We also feel that there is no sharp line between core and outreach. There is no reason for core unless there is outreach. We also feel that the structure and operation of the International Potato Center, and particularly of its outreach program, must be tailored to certain special characteristics of the potato.

Studying the pattern of other international institutes may be useful, but the potato has three fundamental characteristics that oblige us to approach production programs in a different way than that established for the grain crops:

First, the international movement of the potato is much more closely supervised and restricted by quarantines, and rightfully so.

Second, the potato is much more bulky, as well as semi-perishable, with the attendant difficulties in shipping large quantities internationally.

And, thirdly, the multiplication rate is slower for the potato than in the grains -- from 20 to 25 times as much seed by weight is needed to plant one hectare of potatoes as compared with wheat; with maize this difference is even much greater.

These three factors dictate the necessity of a greater degree of regionalization of our work, not only in the development of our outreach program, but in our core research program as well.

With that, I would like to terminate my remarks and, I would like to have the Director of our outreach program, with his enthusiasm, give you some of the program as a Director of the Rockefeller Foundation International Potato Program.

We are fortunate that we have inherited a program which is somewhat 20 years old.

Statement by Dr. Niederhauser
Director of Outreach Programs of the
International Potato Center

This is a rather momentous occasion for me for two reasons. First, it is my first attendance here at the International Centers Week, and I am honored that I have been asked to speak very briefly here to the Consultative Group and to the TAC. Second, this occasion has rather special personal significance; it was 25 years ago today, on August 1st, that I arrived in Mexico and began my tour of duty there with the Rockefeller Foundation. I was brought up in Mexico under the tutelage of Dr. George Harrar, who set us about our tasks with two principal guidelines; first, get a little support and get the job done; and second, what the New York office of the Rockefeller Foundation doesn't know won't hurt them. I think that Dr. Harrar may have retreated a bit from the second guideline in the last decade or two, but some of us maintain it still holds in the field.

During the past 20 years a Mexican potato production program evolved into what is now called the International Potato Program. Structurally this international effort was an interesting phenomenon because it was a one-man institute. It was something of a curiosity; it was the only International Institute that walked around! There was no grass to mow, no overhead costs. And I would say the personnel problems were minimal. But I doubt if you are interested in the structure of this program. I believe, however, that you would be interested in what was accomplished during this time, because the results and some of the projects, and even some of the philosophy, are now being incorporated into the outreach program of the International Potato Center.

The purpose of this outreach program is to increase potato production levels and production efficiency in the developing countries. To reach this goal, three areas of activities and strategy have been employed. First is the building of strong national potato programs with the capacity to increase production. The second is training, both production-oriented and academic. And third, is research. I mention research here even though some may assign it administratively to a core program. But research, no matter how it is administered, has a vital role to play in an outreach program. Any research projects, whether sponsored by core or linkage funds, but which are done on a regional basis and are done in collaboration with the national program lend prestige to that program and strength to it. The strategy for building this national strength follows a tested formula: Concentrating and organizing the national commitment to potato production; defining the production problems and their solutions; training the expertise to staff the program.

One approach is to go to an area and grow potatoes in a field in which one can walk around and find out what the problems are. If one can get top yields, one is apt to reach a realistic conclusion that a plant breeder is not necessary; but if one can't sell the crop, one needs a marketing specialist. To implement this program, we need all the production factors working in concert. Not only the seed and soil and fertilizer are needed to do the job, but some effective organization of the potato growers. This organization is more important in the case of the potato than in many other crops.

I might say just a few words more about research projects because they have so much to do with outreach. They do not only give the prestige to the local program, but if correctly oriented they will directly affect the problems of national production of potatoes. They can also have regional significance. Research can often be best conducted regionally, and make a unique contribution to the core program because it can be done there better than anywhere else in the world. Late blight is not the only example of this; it just happens to be the problem that we have been working with the longest, and which perhaps has had the greatest impact on world potato production.

I divided training into two categories: One which is academic, leading to a degree; and the other we call production-oriented and which can last for almost any period of time up to one year. In 1972, we had two such production-training programs, one in Kenya and one in Mexico. A total of 21 scientists were trained, coming from 7 countries. I might add here that during the last 15 years, the leaders of the potato programs in Mexico, Guatemala, Costa Rica, Panama, Colombia, Ecuador, Peru, Bolivia, Chile and Argentina, as well as Turkey, Kenya and Uganda and certain high-ranking scientists of the Central Potato Research in India, have all been trained under this program or by Rockefeller Foundation scholarships.

Looking toward the future, one of the most exciting research projects is, in my opinion, the possibility of moving the potato into the warmer regions of the world. We do know that the germ plasm which has been exploited to evolve the species that we recognize now as *Solanum tuberosum*, came originally from the Andes. A very strict selection was conducted in the north temperate regions, resulting in a very specialized plant with comparatively limited variability. And now most of our efforts to produce potatoes in the tropics are based on shipments of that very narrow band of germ plasm back to the tropics. A lateral movement of this germplasm from the original source of germ plasm in the Andean Region, to other tropical regions at lower elevations, and selecting for environmental conditions there, has already indicated great promise for finding a potato variety with greater heat tolerance. There is an interesting idea on how to delimit the areas where potatoes can be grown in the tropical world. I would say this is just a rule of thumb, but it works on maps of certain countries like Thailand and Indonesia and

Mexico. Specifically, a maximum mean night temperature of 21 degrees Centigrade for the period from 4 to 6 weeks after planting apparently limits the area where you can grow potatoes at present. If we can push that tolerance up to 22 or 23 degrees, tremendous areas of the tropics would be opened into potato production. In attacking such a problem, I would compare the function of the International Potato Center to that of a lens. The institute is the lens, the sources of support are the light; through this lens the rays of light pass and they concentrate and get action as they focus on a certain point.

I believe the problems in the outreach production program should establish the guidelines for a flexible and realistic and well-supported research program at core on linkage. Thus national production problems, identified and confronted in the field through the outreach program, orient the research effort.

If we can import seed and spray for insects disease control and irrigate and grow during the right season, we can produce high-yielding crops, but the costs will be very high. This is not, in my opinion, the direction in which we can make the greatest impact with the potato in the tropics. It would only remain an expensive vegetable there.

If we learn how to produce seed in the tropics, if we get the needed resistances to the limiting diseases, if the potato becomes a rain-fed crop, and if we can increase the temperature tolerance -- and these are all, I would say priority research items for the Centre -- then we do have a valuable new weapon for the war on hunger in the tropical world.

The International Potato Centre promises today to provide the necessary depth to an international potato effort, to allow the potato to realize this tremendous potential it has to feed not only the people of the Temperate Zones, but the Tropics as well, where it is so desperately needed,

Yesterday we were again reminded by one of our speakers of the impending danger of widespread hunger in the 1980's. Only a few years ago one of the prophets of doom predicted famine in 1975. However, if by our past efforts we have indeed bought an extra decade to continue the battle against famine, then I feel confident that the better organized and more massive support being launched here by the Consultative Group, justifies at least cautious optimism, and I would nominate the potato as one of your best recruits in this war on hunger.

As the Director of the Outreach Program one of your international centers, and as a scientist who spent most of his professional life on the firing line, I should point out that even though much of the strategy and armament for this war must come from the laboratories and experimental field of the Center, I firmly believe that the decisive battles in this conquest of hunger will be fought in such places as altiplano of the Andes and on the slopes of Mount Kenya, and on the plains of India and Pakistan.

Presentation by Prof. C. F. Bentley
Chairman of the Board of ICRISAT
(International Crops Research Institute for the Semi-Arid Tropics)

This is not an age of miracles, but I am here to talk about a near miracle.

I would like to talk about a baby conceived 54 weeks ago, which had a gestation period of 50 weeks and tomorrow will be four weeks old.

It was mid July last year that the TAC of the Consultative Group commissioned a team to do a feasibility study concerning the needs for a research institute that would be concerned with upland crops and farming systems for the semi-arid tropics, and asked the team to prepare proposals for consideration. The team consisted of Dr. Ralph Cummings, Dr. Hugh Doggett and Dr. L. Sauger. The report of the team was dated October 19, 1971. It recommended the establishment of the International Crops Research Institute for the Semi-Arid Tropics, and proposed that this new institute should have two roles, the first to be a World Center for the improvement of sorghum, millet, pigeon peas and chick peas. The second role was to seek improved crop patterns and farming systems so as to optimize the use of the human and natural resources in the areas where the designated crops grow under such climatic conditions.

The Consultative Group accepted the report and its recommendations. Last December, the Group contracted with the Ford Foundation to act on its behalf to develop ICRISAT into a legal entity that would be self-sufficient. The Ford Foundation accepted that assignment on the understanding that there would be satisfactory indications of financing to support the institute in an adequate way for an initial five-year period. To start ICRISAT, a modest initial budget was provided by five countries or agencies each of which pledged \$100,000 for the initial year. So far eighty percent of those pledges have been received. It is uncertain whether the other 20 percent will be obtained during the current year. It should be mentioned that at the December meeting of the Consultative Group, Mr. McNamara also urged that there be prompt attention to the matter of adequate funding for the new institute.

The Ford Foundation arranged for Dr. Ralph Cummings to be the project development officer to carry out its mandate. Dr. Cummings proposed an exceedingly ambitious and rapid program for the development of the new institute. It is a great credit to Dr. Cummings personally, as well as to the Government of India and its representative primarily concerned in this matter, Dr. M. S. Swaminathan, that by virtue of outstanding work and outstanding cooperation, the first Board meeting of the new institute was held on the 4th and 5th of July.

A number of milestones in that brief period merit mention here. The first decision was that the new institute should be located in India. The logic of that choice is that India has a greater production of each of the four crops concerned than any other country. With the cooperation of the Government of India, an agreement was reached for location of the new institute near Hyderabad, India, on a 1,350-acre site. That agreement was signed on the 28th of March.

I would like now to show a few slides so that you will see something of the ICRISAT site. Hyderabad is located in south central India, approximately one thousand miles below New Delhi. It is at a location rather representative of one of the largest physiographic areas of India, the Deccan Plateau. The rainfall at Hyderabad is on the order of 700 to 750 millimeters per year. This is a view of the ICRISAT site, an area that has been only partly used during recent years because the land was acquired by the Government of India a few years ago for another purpose. Only part of the area has been cropped since then. There are a variety of land conditions on the site. At one place there is low-lying land with some palms. Here is another view showing part of the red soil area. Red soils are common in such climatic areas in Africa as well as Asia. This view shows land preparation for the plots that have been put in this year. This one shows clearing of land that had not been used for several years. Here soil that had not been cultivated for a long time has been treated with a ripper type of implement.

Profiles of the red soils are somewhat variable on the site. Here is one where the profile is reasonably uniform, being appreciably sandier near the surface than in the lower parts of the profile. The second principal kind of soil at ICRISAT is the black soil. These are vertisols, and there are about 500 hectares of such soil on the site. There are between three and four hundred hectares of the red soil. These black vertisols are subject to extreme drying and cracking during the dry season. This picture shows part of the profile of a black soil, and you can see that it is very high in clay therefore being subject to great swelling and shrinking. Here is a low-lying area, part of which is salt affected. There is also an extensive area in a tank or reservoir.

Although the Institute officially came into being on the 5th of July, some experimental plots had already been planted so as to commence the study of cropping patterns and farming systems during the present monsoon seasons. We now see three views of work that was done in June to prepare the first area for plots. There are now about 1,200 plots either planted or ready to plant.

That concludes the slides I have to show you.

Following the decision concerning location of the Institute and the formal acquisition of that site there were a number of other important prompt actions.

- . The Consultative Group meeting in Rome in April approved the suggested membership of the Governing Board and designated a subcommittee thereof to seek a Director and to make preparations for the first meeting of the Board.
- . There was an appraisal of architectural firms that might have the capability to prepare the plans for the new Institute, and a number of them were invited to indicate their potential interest in such an undertaking. A firm from the respondents was selected so that a recommendation for the appointment of architects could be made at the first meeting of the Board.
- . Dr. Cummings, assisted by a staff member from one of our sister institutes and the architect prepared estimates for the costs of the physical facilities to be required by the Institute.
- . Through the cooperation of the Ford Foundation and the Rockefeller Foundation, the part-time services of two people who are in the international scientist category were obtained for beginning the development of the experimental station and to start the first field experiments on cropping patterns and farming systems.
- . While the foregoing were proceeding, ICRISAT's constitution, a rather unique kind of document, was being developed. On July 5th, the constitution was signed by the International Bank for Reconstruction and Development, and FAO, with the concurrence of the Government of India.
- . The first Board meeting was held on the 4th and 5th of July with all members of the Board present.

The present situation is rather different. As you know, Dr. Cummings has become the Director of the International Rice Research Institute. In June he concluded his work as Project Development Officer for ICRISAT. Fortunately he continues as a member of the Governing Board. A Director has not yet been appointed, and I was invited to follow Dr. Cummings for a brief period as Project Development Officer. I arrived in India on July 1 to serve for a two-month period in that capacity.

The Ford Foundation has been asked by the Board, and it has agreed, to continue to assist with carrying on the affairs and development of the Institute, pending the appointment of the Director and the establishment of necessary support programs and policies. We hope that the Director will take up his duties on or before the first of the year. We have approval from the Board for the appointment of three staff members who would be among the international staff. They will be involved in the initial work of the experimental station development and will start the field work in agronomy.

At the moment our goals are to get the Director appointed at the earliest possible time and, at the same time to do everything possible to maintain the momentum that was built up during the first half of the year while Dr. Cummings was Project Development Officer. There are really three prongs to that program:

- . The first is to try and maintain the present momentum, by engaging architects to get on with the planning of the physical facilities at the earliest possible time.
- . Simultaneously, we need to proceed with the experimental station development. There is much to be done there because a considerable portion of the area has been unused for some time. There is need for some drainage work, some reservoirs require rehabilitation, some land should be brought under cultivation, and some recropping should be started. In addition areas for layouts of micro-water-sheds and similar studies need to be selected, roads must be built and temporary facilities must be provided.
- . The third part of the present program is to recruit some of the international staff and to expand the field experimental work at the earliest possible time.

If I were to try and put some targets on these goals, they would be as follows. We would like to begin construction of the physical facilities before or by the end of 1973. We would like to have a substantial area in field experiments by June of 1973, the outset of the monsoon period in that region. And we would like to have a substantial portion of the staff appointed by the end of 1973. The original proposal suggested that perhaps half of the 35 to 40 staff members might be appointed by the end of 1973.

If we can achieve those things, it would maintain the momentum that was developed during the first half of this year. That sounds pretty ambitious. It is. I think that the achievements so far justify such hopes. What I have been speaking of has really transpired since the submission of the proposal late last October. Alternatively you might recall that the survey team received their commission only 54 weeks ago.

Of course there are some problems. They have three parts:

- . We have received only 80 percent of the funds pledged for the current year, and with the tremendous rate of development that has taken place, the funds that have been provided are now fully committed. Therefore we cannot at the moment proceed with the engagement of architects. Moreover we cannot proceed to acquire or order any of the equipment that is necessary if we are going to achieve the goal of having consequential field experiments in 1973. So we need additional funding for the balance of this year. Our requirement is estimated at \$350,000, which would include the 20 percent originally pledged but not yet received.

- . Our second need is an adequate operating budget for 1973. The amount is based on the hope of being able to do what was suggested in the proposal: recruitment of approximately half of the staff by the end of 1973. That must await appointment of the Director as the Governing Board wishes to accord the Director the opportunity to select his staff.
- . Our third requirement, and it is the one that has caused greatest concern, is the initial non-recurring capital. Included in that category are physical facilities for the experimental station, development and site improvement of the experimental areas, and provision of the equipment that will be needed.

Since our architects have not yet had the opportunity of visiting any of the sister institutions, to see firsthand the type of facilities that we require, the budget, as it is outlined, is not as accurate as we would like it to be. But, under the circumstances, I think that is understandable.

As presented, our capital estimates are somewhat higher than had been expected. For example, it was estimated last December at the Consultative Group meeting that the ICRISAT capital budget plus the operating budgets for the first five years might fall in the range of \$16 to \$18 million. If I could voice a purely personal opinion, I think that was a rather serious underestimate. We should bear in mind the operating budget proposals presented yesterday and today by sister institutes of rather comparable size. There should also be consideration of the effects of continuing inflation, which affects both operating costs and capital over the years of construction.

There are, several factors that tend to increase capital cost at ICRISAT as we have presented them. We have aimed at realistic estimates. In discussion with the architects we have been told that they earnestly believe that the campus can actually be built at the costs indicated if we at once proceed with full scale planning promptly followed by construction. I am not, however, saying that nothing has been overlooked, or that galloping inflation instead of trotting inflation may not throw off some estimates. We have also included in the budget items such as basic stocks of spare parts and stores, because they are essential and are really a capital cost. Another factor affecting our capital requirement is the size and location of the Institute's rather large site of 1,350 hectares. The development of that area for purposes of extensive field experimentation will entail substantial costs. The site is 18 miles from Hyderabad and as there is no consequential urban development nearby, the Institute will need to be a fairly self-contained community. We are all aware of inflation, an unpredictable hazard. It is omnipresent. But, inflation has been somewhat more rapid in India than in the majority of other countries, whether the last three or the last ten years are considered.

Unless the operating funds referred to for the balance of this year and for next year can be provided in more or less the amounts indicated, and unless we can have capital, in the vicinity of the amount indicated, much of the present momentum is going to be lost. For example, unless we can very soon have the assurances for our budget for the balance of this year, and for next year, our ability to get extensive field work done next year, will be substantially reduced.

Long lead time is needed in ordering equipment, if it is to be delivered when needed. And land preparations must be done if we are going to get experimental plots planted for the principal crop season of 1973 which commences in June.

Thus, if we don't have both the operating funds and capital budget requested, we won't be able to follow an orderly planned development of the type that would be most effective. For example if we have protracted engagement of staff, or if we are lacking physical facilities two years from now for their support, their efforts will be less effective. In other words, in the long run, if those deficiencies occur, the ultimate cost will be higher and/or the results in quality will be lower.

We had a good discussion at the Governing Board meeting regarding the kind of physical institution we wish to have. I would say that the very emphatic view was that we do not wish an ostentatious show place. We do want a dignified institution of such a type and quality of construction that the maintenance cost will be low while maintaining appropriate appearance. I was disappointed yesterday when someone expressed concern over the fact that we hope to have facilities comparable to those of the other institutes. I don't think that is an unreasonable expectation. We are looking for an institute where elite scientists can do work of importance related to crops that are major dietary components for 10 percent of the human family.

Gentlemen, what I have been saying is that this four-week old baby is hungry. Its nurture in the months immediately ahead is going to have a tremendous effect on how this baby is going to grow and develop and, more important on how it will perform.

I have been talking at the rate of roughly \$500,000 a minute for about half an hour. That is pretty bold. I submit that the accomplishments of ICRISAT to date, under the circumstances I have been describing, justify our boldness.

The report submitted last October 19 was accepted because of its excellence and because it documented the urgent need for ICRISAT to be established and to become operational. It is our sincere belief that to maintain ICRISAT's momentum is the best and most economical way to meet those needs and to serve a very large part of the human family.

August 1, 1972

Presentation by Dr. W. Pritchard, Leader
of the ILRAD Executive Team (International Laboratory for Research on
Animal Diseases)

I will present a very brief status report on plans for the International Laboratory for Research on Animal Diseases.

This laboratory, called ILRAD, is visualized as a specialized kind of research laboratory to attack two major constraints on livestock production in the tropics: trypanosomiasis and theileriosis.

As you perhaps know, vast areas of Africa are rendered unsuitable for livestock production because of African trypanosomiasis. Also, livestock in extensive areas are placed under high risk by another disease, theileriosis (including East Coast Fever).

If significant progress is to be made in livestock production in Africa, these disease problems first must be brought under practical control.

Trypanosomiasis and theileriosis also are important constraints to livestock production in other parts of the world such as South America and Asia.

An Executive Team, composed of Sir Alexander Robertson of the United Kingdom, Dr. Rüdiger Sachs of Germany, and myself, was formed and placed in the field by the Rockefeller Foundation.

The Team was asked to review the present status of research on trypanosomiasis and theileriosis; review the recommendation that an international laboratory be established to accelerate research on these diseases; and, to review an invitation made by the East African Community that ILRAD be established in Muguga in Kenya, on land assigned to the East African Veterinary Research Organization.

The Executive Team, after consultations in the USA and Europe, went to Africa and conducted its study. It has prepared a report which has been made available to members of the African Livestock Subcommittee ("Proposal for the Establishment of an International Laboratory for Research on Animal Diseases [ILRAD]", dated May 8, 1972).

I will review briefly the major conclusions of the Proposal:

The Proposal recognizes that considerable research has been conducted on trypanosomiasis and theileriosis over the last 50 to 60 years, and that much research is presently in progress. It points out, however, that the total ongoing research effort is inadequate in view of the magnitude of the problem. It emphasizes that a number of investigators are

doing excellent research in various laboratories, and that this research must be continued. It concludes, however, that there is a real and urgent need to augment this research, particularly research on fundamental aspects that are difficult, if not impossible, to conduct in existing laboratories.

This conclusion has been reconfirmed not only by scientists working in the existing laboratories, but also by some of the leading experts on these diseases elsewhere in the world.

Another major conclusion of the Proposal is that there is a need to coordinate the world research effort on these two diseases and develop a more effective total force which will work together toward their eventual practical control. The team concluded that neither ILRAD nor existing laboratories could accomplish the objective alone. All available resources and effort will be required for this huge task.

The team confirmed the earlier recommendation that ILRAD be established and focus on the control of both trypanosomiasis and theileriosis as their main research effort, not only because of the importance of these diseases, but also because research on these two diseases is highly inter-related. Very likely research on trypanosomiasis will yield insights on theileriosis and vice versa.

The Proposal recommends that the focus of ILRAD be on immunologic and related aspects of trypanosomiasis and theileriosis rather than on all aspects of these diseases. This is the approach that most scientists agree should be vigorously pursued initially. We have recommended that the major emphasis of the research be on highly fundamental immunological studies that are vitally needed, and that are not presently being done. In this way, ILRAD will enhance the effectiveness of existing laboratories many fold and will not wastefully compete with them.

The proposal recommends that this be accomplished by bringing together approximately 18 scientists, who are highly skilled in certain rather specialized areas of immunology, such as immuno-chemistry, immuno-pathology, etc., and provide them with suitable facilities, equipment and support for an all-out assault on fundamental aspects of these diseases. Despite the fact that a great deal of progress has been made in immunological research in recent years, very little of this knowledge has been brought to bear on the solution of these important problems. This is envisaged as being the niche that ILRAD will fill.

A major objective of ILRAD will be the forging of effective cooperative linkages with the many institutions now conducting research on these diseases. We are optimistic that with the combined efforts of all institutions involved, practical control measures can be developed.

ILRAD also must play a role in training -- not only of new research scientists, but it also must conduct workshops and seminars, and in other ways provide for the advancement of the competency of investigators in national and regional programs.

Finally, we reviewed the invitation of the Community to establish a laboratory at Muguga. The executive team agreed that Muguga was a good place for a laboratory. The team worked out the general nature of agreements with the Community that would be necessary. The Proposal was discussed at a meeting of the Community Council on Veterinary Research on April 14. However, a decision was not reached at that time. The Community has considered the Proposal further in the intervening three months. A final decision was reached at a Council meeting held during the week of July 17.

We have been informed unofficially that the Community has decided that it is not possible to establish an autonomous international institution as part of the Community research program, and in effect, has withdrawn its invitation to establish ILRAD at Muguga. We have not as yet received the official notification of their decision. The official reply will be made soon by letter.

August 1, 1972

PRESENTATION BY PROFESSOR DEREK TRIBE
LEADER OF THE TASK FORCE ON AFRICAN LIVESTOCK

I am very glad to have this opportunity to talk to you about the work of the Task Force on Livestock Research, but as the Chairman indicated in his opening remarks, the timing of this meeting from our point of view, is rather unfortunate.

The Task Force has been in the field since Easter, but only now are we analyzing the mass of information that we have collected, and are we formulating our conclusions and our recommendations.

The general lines of our thinking, I think are now clear, but it still is much too early to say in any detail what our reports will contain. In fairness both to my colleagues on the Task Force, and to the Technical Advisory Committee, to whom we have to report by the end of October, I don't propose to anticipate what our detailed and specific recommendations might be. Instead, in the brief time available to me, I thought I would try to do three things. Explain to you what we have been asked to do, how we have set about doing it, and finally mention some of the general considerations which I think will form the basis of whatever we eventually recommend.

First of all, what have we been asked to do?

Formal terms of reference in fact run into several pages, but I needn't burden you with the details. It all concentrates on finding the answers to two basically general questions: first of all, would the establishment in Sub-Sahara Africa of an International Center for Research on Animal Production and Health be justified at the present time?

Secondly, if so, what should it do, how should it be staffed and organized, where should it be situated, and how much is it likely to cost to establish it to run?

From the outset, it has been stressed to us that we should try and keep three things very much in mind as we search for the answers to these two questions.

First of all, any international investment in animal research can only be justified if it leads as quickly as possible to an improved speed and efficiency in the development of the livestock industry. The second point that we have been asked to consider is the importance of the various economic and social factors in livestock development, as well as those of a nutritional genetic and ecological nature. Thirdly, any international research effort must be viewed in relation to the research programs which have been, and are still being carried on in Francophone and Anglophone Africa.

Our objective must clearly be to use the opportunities provided by an international center to support and supplement these existing programs.

Our itinerary has so far included over twenty countries, and the fact that all of our arrangements have so far gone without any serious hitch has been entirely viewed on the one hand to the combined efficiency and hard work of the Bank and UNDP, and on the other to the unstinting co-operation of all those people and agencies that we visited.

We began by visiting several of the major donor agencies which have had particular experience in the livestock problems of Africa. Armed with

their advice, we visited selected countries in West, Central and East Africa. Selected, incidentally, either because of their present importance as livestock producers, or consumers, or because of their high potential for the future. In each case, the appropriate authorities have been given good warning of our visits, and have been invited to prepare their views in advance. Certainly the trouble that was taken to prepare the ground certainly paid off.

We were immensely encouraged by the high standards of comments, often constructively critical comments, that we received in every port of call.

There is, I think, no doubt that donor agencies and African countries feel that international research has an important part to play in the development of Africa's livestock production. I can add at once that the Task Force agrees with this view.

The answer to our first question is undoubtedly that an international livestock center would be well justified.

This faith in the concept of international research reflects, I think, the confidence that has been established worldwide by the achievements of the older international centers, particularly CIMMYT and IRRI.

However, there is a general, and we think a well founded belief that the formula that has proved to be so successful with crops will have to be modified if we are to achieve similar results with animals. Compared to the crops, animal research is necessarily slow, and is even more complex. Worse still, results are even more difficult to apply in practice.

You may have heard about the cattle breeder who recently visited IITA, and was shown the F-4 generation of some cowpeas. The F-1 of which had been harvested in January of this year. The cattle breeder shed a

silent tear when he recalled that it had taken him 15 or 16 years of devoted endeavor to get 50 cattle to the point reached by the cowpea breeder using thousands of plants after only six or seven months.

Well, obviously basic differences between crops and stock in their biological characteristics, their generation intervals, growth rate, techniques of reproduction, and so on, make a considerable difference to the nature of the research, to such problems and to the seed at which the resulting knowledge can be exploited in development programs. Moreover, factors such as the system of land tenure, the availability of credit, the support of adequate governmental technical services, and an efficient and equitable marketing system, which are all important in crop production, in animal production, assume an added dimension. Also, basic to every improvement is the attitude, the ambition, behavior and educational standard of the producer himself. Few livestock producers in Africa enjoy the same social, cultural and educational opportunities as do the agriculturalists, and as a group, they are more intimately and permanently attached to their traditional ways of life.

I think it is only realistic to regard a research investment in African livestock as something that will certainly be long term. Yet, we don't doubt that such an investment is justified. Without it, we see no hope of satisfying the rapidly increasing demand for meat or milk in Africa or of halting the present deterioration of much of the arid range lands, nor do we see much chance of improving the conditions either of the postulates or the other traditional livestock owners or of the many Africans in the higher rainfall zones whose potential as livestock producers is so high.

But, how can an International Center help to make the necessary contribution to knowledge, training policy, in such a way as to affect all of the widely differing ecological, economic and social conditions which are to be found across Sub-Sahara Africa?

Clearly we think one Center has no hope of doing this, except insofar as it can work in cooperation with the existing network of national and regional stations which already provide much of the essential range of ecological and social diversity.

How can an International Center hope to provide the quantity and range of facilities and the large numbers and various breeds of cattle, sheep and goats that are needed in an animal research program which encompasses all of the essential and interlocking problems with biology, economics and sociology? Again, one Center has no chance of doing this except insofar as it can work with and through the organizations and the facilities that already exist.

The first aim of the Center then must be to secure the active co-operation and participation of the African countries who need first to be convinced that the Center will in fact give support to their national aims, activities and developments and not compete with them for their own staff and the supply of technical assistants. Cooperative programs with existing national research stations represent a major activity in all international centers. But, in an African livestock center, they are likely to assume an even greater importance.

We envisage that the success of the Center would largely depend on the success of these cooperative programs, and of the variety of training

courses which the Center will run, the livestock extension offices, research scientists and planners.

However, in addition to this cooperative and training program, we believe that for various reasons the Center must have its own essential research function. For example, we believe that a successful cooperative program can only be maintained if the International Center enjoys a certain status and identity and this has to be established on the basis of its own research activities at its own Center.

If this is to influence national programs, it must demonstrate clearly its own skills in both the science and the practice of animal production. If its staff are to influence African staff on national stations, they must themselves have a continuing firsthand experience of the problems, the frustrations and the successes of animal research.

An immense amount of knowledge already exists in Africa concerning animal health, breeding, nutrition, rangeland management and so on. Much work in these fields is still going on at the moment. Many pieces of the jigsaw puzzle exist and others are now being made. The first need is to collect together all of the available pieces and the second is to fit them together in the right order to form a finished picture of livestock development.

We believe that an International Livestock Center would face a major and a vital task as a documentation center which will collect, retrieve, correlate, classify and disseminate all of the available information and this would of course include a translation service to bridge the gap that exists between scientists in Africa.

Having assembled the existing information, the Center then has to tackle the job of integrating this knowledge and this difficult task calls for the combined talent of biologists, economists, and sociologists. It involves a system approach to livestock production, including an analysis of the traditional systems. First, it will certainly involve a good deal of survey work and the monitoring and current development schemes in order to identify the critical factors which determine or limit success.

As it progresses it will also involve simulation studies in relation to the range land eco-systems, particularly ranching and cattle fattening schemes and in a more general sense livestock production in relation to community development.

Such studies will give useful results of two types: They will highlight areas of specific ignorance which deserve priority in future research programs and they will also suggest improved systems of range land management and livestock production which of course will then require testing and validation.

Thus the Center with its multidisciplinary team and supplemented by a network of cooperation stations will aim to formulate the package of bills, the livestock production which is so urgently needed as a basis of development in Africa.

It is an extremely difficult task and as I have said inevitably a slow one. There are good reasons why we think it should be approached cautiously and why excessive ambitions, capital expenditures and over-complex administrative structures should be avoided, particularly at the outset.

There is an obvious danger that a widely dispersed program, both geographically and in a disciplinary sense will dilute the aim and function of the center and blow its focus to the point where little that is positive and concrete will in fact come out of it.

At present the task force is struggling to find a way in which the Center might be organized so that it will make the best possible contribution in the areas that I have mentioned, but in such a way that technical and financial inefficiencies and duplications will be avoided.

As I said at the outset, we are not yet sure how in detail this may best be done. But, all of us feel that it can be done and certainly that it should now be attempted.

Statement by Sir John Crawford
Chairman of the Technical Advisory Committee (TAC)

My remarks are divided into two principal parts. I want first to talk about the financial framework within which TAC hopefully sees itself working, and then secondly, to report about the various items TAC discussed in the last two days.

On the financial matter, TAC has a task of great responsibility, and it realizes this. On the one hand it recognizes the very great problem we are all facing in respect to agriculture in the world, and particularly the developing world. And on the other it recognizes the practical constraints represented by availability of finance for research. But it does need to reach in the reasonably near future some understanding with the Consultative Group.

Let me first just remind you of the problem, familiar as it is in a qualitative sense to all of you. The Bank has just issued an excellent sector paper on agriculture; I hope members of the Consultative Group will find it as valuable as I do. We are conscious in TAC of the fact that population of developing countries will rise from 1.7 billion in 1970 to 2.5 billion in 1985. To match this growth and hopefully some income improvement, food production must rise by 4 to 4.5 percent per annum and improve in quality. The great bulk of this must be produced in the developing countries themselves where 50 to 80 percent of the work force is in agriculture.

The food required is not only for urban areas, it is also for the rural population which has more than its share of poverty and inadequate food supply. In South Asia alone, the rural population will grow to more than 600 million, leaving out China, in 1985.

The agricultural share of the gross national product in 1969 was about \$100 billion. It will need to grow at about 5 percent per annum if it is to play a role in the general development of the economies of these countries. And, of course, it can only grow at that rate if agricultural productivity is significantly increased.

The establishment of TAC represents a basic belief that research and the development of new technologies go together. TAC sees its problem as assisting development through research on technologies. These technologies are preferably feasible in relation to farming structures to be found in the developing countries and feasible in relation to the growing and rather horrifying employment needs in the same sectors.

TAC has to assist those whose work is designed to find solutions to major constraints in the development of agriculture, solutions which will be applicable across a wide spectrum of actual conditions in the agricultural sector. The question in the minds of TAC members that naturally comes from this basic position is whether enough will be invested in research from which a return is expected. We are dealing with international research which is designed to economize the use of

very scarce and very costly resources. It is fundamental in the effort to expand agricultural productivity. Nevertheless, the research of the kind we are dealing with is expensive research.

One could think of fifty million dollars annual recurrent cost in say 1975. This would represent .03 percent or three-hundredths of one percent of the probable value of agricultural GNP in that year.

That is an easy way of looking at it. The more difficult way and the way we all have to look at it is what it represents in relation to a program generally.

TAC is afraid that highly selected priority research will not be properly backed. Even operating, as we are at the moment, within a food priority, it can see a need for at least fifty to seventy million dollars for core and capital and outreach activities at the 1975 price levels.

Since this is an informal meeting, my report has to be considered informal, and I am not going to be bound by any apparent precision of the figures I will be giving. I will indicate later what steps we are taking to make a more significant or more careful assessment.

Research is a continuous process and scientists cannot be bugged by uncertainty. Stop-go during the course of a single year is an impossible set of conditions for scientific work, and we urge the Consultative Group to establish some kind of a contingency fund to deal with the short-term lags that inevitably occur from time to time in translating commitments into cash flow. If there is an indication of support at a given level, that given level must turn up in cash flows not after the year is finished, but in time during the years. That is the short-term problem.

As for longer term commitment. The present commitment in the Consultative Group Secretariat table for 1975 represented about \$22 million in recurrent cost plus \$5.5 or \$6 million capital cost, outreach not included, for the approved research institutes -- which adds up to a total of about \$28 million.

It is not difficult for me to foresee that as a result of this year's and future work of TAC funds will be needed for ICRISAT in Africa, for something in the Near East, for something further in Latin America, for the overall African livestock program, for the conservation of genetic pool, for further work that may well prove necessary in legumes, maybe for something in water, for the Asian Vegetable Center about which I will say more later, and for one or two other activities which are all still within the food framework. I am not talking about industrial crops, although we are receiving pressures from people to undertake work in that category as well.

The very rough stabs that I make suggest that about another \$14 million recurrent costs are needed. It is very difficult during the short time I have had available in the last two days to make sensible judgments about capital. I am not stating the maximum cost in terms of initial establishment, and perhaps I am overstating the continuing level of capital required for up-to-date equipment, replacement of obsolescent buildings, and so on. However, I put capital down at another \$8 million annually, and I without difficulty suggest that the recurrent costs of research at constant prices, at the 1975 level, would be about \$36 million with anything from \$8 to \$12 million for capital.

Let me say a few words about outreach. The more work we do, the more we realize the essential character of outreach programs. Indeed, in one or two cases we feel perhaps the separation of outreach and core is a false distinction because the effective work of the Centers may well require the amalgamation of the two types of funding. However, I am less interested in the type of funding than I am in emphasizing that the work of the principal institutes may well be vitiated unless there are effective outreach programs associated with them.

The foundations and USAID have been very kind in response to questions I addressed over the last few months, and I can indicate that their investment in core and capital programs in 1972 was \$9.3 million. Their concurrent investment in outreach programs was \$6.3 million. I suspect that ratio is high because they are the three principal sources of outreach, higher than one need apply completely generally. But if I made a total as I have of approximately \$50 million, for core and capital, then it is not difficult to add another \$20 million for outreach and to suggest that while operating on a basis of very rigid selection of priority work a level of about \$70 million a year is necessary in the late 1970s.

That does, I remind you, represent a very minute fraction of the value of the farm production for which we are investing, but in terms of the World Bank's estimate of assistance by way of loans and other activities for agriculture, estimated to reach \$1.600 million in 1975, what I am proposing would represent a further 4 percent increase in that aid figure. Perhaps for people who have to find the money that is a more realistic way of putting it.

I am not asking for reactions to my suggestions now. I do ask that what I have said today be noted as a serious contribution which will be followed by a more careful assessment. In response to an earlier question I might indicate to you that TAC in the second half of January 1973 will have a meeting without an agenda for the first few days, but where we will discuss the priorities, what we mean by priorities, and form some judgment along the lines that I have just been giving you, but rather more carefully thought out.

And as a matter of interest in my estimate, very crude projections of requirements, I did not include anything by way of a central institute for economics work. This is a very difficult question, and I will make a further reference to it in the next part of my remarks. There is a certain kind of economic work that must go along with the agricultural work at the centers and the institutes themselves.

As for the other kind of work, I find myself torn. I have been an advocate at one stage of centralized work on the agricultural policy in economic terms that goes with new technologies. One doesn't find it very difficult to set out a general policy framework, but once you have set out a framework, it has still to be expressed in terms of each country. So the problem is how best to develop the expertise of framing and formulating the economic policies that go with agricultural development. A central institute just can't produce magic that is immediately transferrable to every government. But I do propose, and I believe I said this to the Consultative Group last December, that thoughts on this be a part of our general paper on priorities.

In this context I would welcome very much the opportunity to bring together and meet and discuss with the economists from all the research centers so we can reach some understanding of how they see their role and how we see it, because it is obvious from some of the papers and proposals we have had that there is no very settled view on their part and perhaps not yet on ours as to precisely the role of the economists at the centers.

Let me turn then to the agenda that we have had in the last two days. First I would like to say how valuable we found Centers Week. I speak not only for myself, but my colleagues. I think it gave us in the course of two days a much better appreciation of what the Centers were about than we have been able to gain as yet, and we hope Centers Week will be continued.

For our part I should like to make two observations. One, we would like an opportunity to meet the Directors during that week for a face-to-face exchange on some of the technical questions. I think it would be wise and, indeed, I am quite emphatic about this, TAC will not again undertake a regular meeting with a full agenda during Centers Week. But we would like to give the time to a discussion with the Directors and formulating any advice we want to give you on the Centers only, rather than tackle also in the same week various new proposals.

We then in our agenda went through the discussions that had been held in open sessions and had further discussion on our own part. I simply bring to your notice now some of the principal points which will appear in our record when it is written about each of the items. You will find support for the financial programs submitted.

With regard to CIMMYT, only two observations that I bring forward this morning. The general view of TAC members was in agreement with the external review committee. We do not believe that \$40,000 on barley is an effective contribution to the barley problem. To become effective, it would have to grow very considerably, and we suggest that no decision about developing a major attack on barley at CIMMYT should be made until alternative possibilities have been examined. Part of the further work of TAC in relation, for example, to the Middle East will be relevant to this.

We want to emphasize the great importance we attach to the outreach programs of CIMMYT, and as I have already said, our concern that outreach support be maintained at a level which would enable CIMMYT's work to be made effective. We do support the CIMMYT financial proposal.

With regard to IRRI, I first want to stress that in TAC's view the main thrust of IRRI must continue to be the rice product itself. There is a great deal of work yet to be done before the many problems and constraints on the translation of research into more significant increases in yield in the field are to be overcome. We do not want anything to be done to hamper the continued effort of IRRI to deal and assist other people to deal with the main rice problem which I do not limit to irrigation of rice. We do hope that IRRI will increase its emphasis on, and its interest in, rainfed rice problems as well.

When I say that IRRI must maintain its central thrust as a rice institute, we certainly support in principle the multiple cropping proposal, but regard it as an additional program.

We think the new Director should be given an opportunity to develop it further and we would like to talk further with him about it. We certainly agree with the idea of work in the Philippines. But we think that a good deal more thought needs to be given to whether the Philippine Government itself might contribute rather more significantly. We find the idea of buying land at a million dollars rather difficult to swallow. We are not yet convinced on the need for eight senior scientists, and we would be concerned here with a problem which is quite general, not confined to IRRI, as to how to translate systems work conducted at the headquarters into systems policies elsewhere. We are quite clear that highly sophisticated work on systems done by IRRI in the Philippines will produce methodological ideas and suggestive ideas for adaptive work in other areas. But we would be a little happier if we could have further discussions about the nature of the work in the Philippines before we said too much further about the outreach programs in relation to this activity.

We are interested not only in irrigated rice, but particularly in the problems of rice and the monsoonal rain conditions and how you handle a rotation into the dry period following.

Please do not interpret my remarks as any lack of enthusiasm for this work, but a feeling that we would like with IRRI's help to develop some general principles of our own which will make sure that we speak consistently on the subject in respect of other proposals. I would hope that Dr. Cummings, IRRI's new Director would, when he has had time to settle in, be willing to attend a meeting of TAC and talk with us about it. We do support the idea of this work, but we support it as additional to the main thrust of IRRI. We would not contemplate in this instance a heavy inroad into existing work. We do not think the time has arrived for that.

Let me now turn to IITA. Here we have had quite a valuable discussion, and we enjoyed the presentation at Centers Week. We recognize potentially valuable the three-part program. I have said potentially valuable because we recognize that it is very early in the day in this institute. We accept the statement made that the shaking down that is beginning will focus more sharply on the work that it can best do. So we recognize the wisdom and feasibility of work in the yam, sweet potato, cowpeas. There are some questions about the best way to handle cowpeas, but I won't worry the Consultative Group at the moment.

We recognize the work in rice and maize and cassava which are significantly backstopped by IRRI, CIMMYT and CIAT. I think it is vital to develop conventions and practices which assure that there is not merely the supply of materials from the backstopping institute, but a feedback of results and further material.

What we are quite determined to do insofar as our advice and influence can achieve the results is to try to prevent the fragmentation of international research into people so eager for autonomy and independence that they fail to cooperate with one another. Now, the atmosphere is good in this respect, but we want to encourage it, so we are not regarding the rice program in IITA as something sui generis. It is to be seen in relation to the work done elsewhere, and in this way you have some hope of generalizing the work of the international institute.

Thirdly, we recognize the systems work proposed, especially in relation to shifting cultivation, as of major importance in Africa. Here too, principles and methodologies of great significance to people struggling with different systems elsewhere may well be evolved.

We note and suspect that IITA must suffer at times from the fact that it is thought to be very well equipped with capital facilities. We just make the comment that the training facilities will be fully utilized in this important part of the problem of training research workers for work in their own countries.

As for CIAT, there are no critical suggestions to press. We take the view that there is some need for clearer definition in the scope of the economic work. Sometimes one has the impression in listening that

perhaps there was too much emphasis on what might be called farm management. But in reading the papers, the balance is redressed. Here again we think that this worry gave rise to the suggestion it would be valuable if we could meet the economists of the centers and reach some understanding and appreciation of what they are doing. But we support CIAT's program which to us is now a good deal sharper than it was even a year ago.

In the case of CIP I want to report to the Consultative Group that the final document has met most of our problems that we raised during last year. You will remember we were quite unqualified in principle in their support. We were anxious on a number of points, and these have been thrashed out in a way that TAC now fully commends the center.

There are some particular points. One I will be specific about. Great importance was attached all around the membership of TAC to the work of the Tuluca Valley substation in Mexico. It's a good environment for disease work. It has already contributed greatly, and no matter what the formal relationship between it and whatever else, there is anxiety that this work not be lost. And I hope that would be noted.

We have made a number of further observations about CIP, especially outreach activities, taxonomy, adaptation to highlands and to the humid tropics, matters which will be in our record and made available to the Director for consideration.

TAC then discussed the Asian Vegetable Center. I don't have to tell you that all along we have had considerable confidence in the Director's capacity, but we made some serious criticisms of the first proposal. And I would like to report quite carefully where we have come out on this matter.

We believe the Center should receive the capital support required to complete its establishment. We believe the work is important particularly if, first, the vegetable needs of low-income people in Asia is a principal purpose. There has been some worry as to whether the Institute was really a very good way of helping export industries from more advanced countries such as Taiwan. The program now does bear more directly, as we see it, on the problems of low-income people in Asia.

We think it important for the Center -- and I am speaking not for political reasons here, we have ruled that out of our discussion -- that it will develop fairly early in the life some outreach program in countries like Thailand since the Center is just a little far north in latitude. We know of the interest of the Thailand Government in this matter.

We believe also that the Center can play a role in the development of rotational systems, multiple cropping systems generally if it is able to cooperate with the other centers.

The next point I would make -- and here I am speaking only for myself and very tentatively because I have not had time to study the charter in detail -- is that changes in the charter of this Center are necessary to ensure that the trustees and the Director can operate the program independently of Government direction or interference. There is an obvious principle here. In all our efforts we do really insist that the scientists, once they have general approval of their program from financial backers, must be free to carry out the program without political constraints.

Dr. Chandler attached importance, and one could understand why, to the privilege of being linked with the international community of research centers, and we would hope that not merely would they be linked in the way I have already suggested of combined work such as in multiple cropping, but I hope the Center could be invited to participate in Centers Week, and by the same token, be required to report on their activities as any other center.

TAC does not envisage in a tight total money situation giving this Center the same high priority as it would be giving some of the other grain work, for example. It should therefore not be assumed by the Consultative Group nor by Dr. Chandler that our agreement and encouragement at the levels at present put forward mean a willingness to go along with indefinite expansion of the work. Any judgment about that, I think, would certainly have to await the result of our own more serious study of priorities and a study of performance over two or three years period. But we do believe that the Center which has shown a very considerable capacity for self-help should be given the help required to complete its capital establishment and allowed to produce the evidence of its work. When I referred to the capital, it was because I understand that the Center is not seeking further operating funds from the Consultative Group. I hope I am right in that.

Let me now talk about a very interesting case, WARDA. WARDA frightened us at our last meeting by sending a telegram suggesting \$19 million. The proposal this time was very much less, about \$2 to \$3 million. The proposal raises a number of problems of great importance, and I want to speak on this one also at a little length if I may.

I begin by expressing on behalf of TAC a very great appreciation of the way the proposals were presented by Mr. Diouf. It was not merely an excellent personal presentation, but it was a presentation of a man who knew his subject and was ready to deal with all reasonable questions. We do want to record our appreciation.

We also want to say quite unequivocally that we regard WARDA as a very worthwhile endeavor in international cooperation, the kind of which the world could do with a great deal more. We see it as an endeavor which deserves encouragement. We see it primarily as a cooperative rationalization of the need to meet the growing deficiency in rice production in the 14 countries which have founded WARDA. Mr. Diouf made it very clear that the prospects ahead of a grave deficiency of rice supplies and the consequent need to import would lay a very heavy economic burden on the countries concerned. So they do have an urgent problem ahead of them.

We think the present proposals are probably too ambitious and in need of sharper definition of priorities. And we are not at the moment making a recommendation for financial support.

But I now do make a recommendation which I believe is significant and essential. We recognize the problem that these countries face. I repeat, we think their effort to work together, concentrate their work in four centers instead of 14 or more, must be encouraged. But we would like to make as a suggestion for a first step that the Directors of IRRI, IITA, and IRAT confer again with WARDA and make recommendations, hopefully in agreement, about the rice program, which could be backstopped by these three institutions. This must not be misinterpreted. This is not a suggestion that these institutions take over WARDA at all. It is a suggestion that we draw yet one more dividend from the established institutions by arranging for them to backstop the programs to be undertaken by WARDA itself.

We are frankly a little disturbed if there is going to be any difficulty about this sort of collaboration, and any help that we can give in promoting collaboration of this kind, we are willing to give.

We would then like an opportunity to reconsider the program of WARDA, and because I have repeated it twice already, I will repeat it again, we believe this is an effort quite different from any other form we have had yet, but an effort that deserves encouragement. Whether through the Consultative Group or bilateral aid is a different question. It doesn't immediately arise because we are not making any financial recommendation. But I want the Consultative Group to know that we regard it simply as unfinished business. TAC's decision not to recommend financial support for WARDA at the present time does in no way preclude the continuance and development of bilateral aid as at present.

I now turn to the African part of the ICRISAT proposal. You will recall when I spoke to the Group in December last, I stressed very heavily that while the proposal for the Institute in India was a major step, it was not the completion of the ICRISAT work. I indicated that there would be proposals related to Africa.

We have adopted the report of the team led by Dr. Doggett, and we commend that report to the Consultative Group. Many of the details in the report are more appropriate for consideration by the ICRISAT Board and the African centers concerned as well as by the Consultative Group. But the general concept in our mind is of a relationship between the Center in Hyderabad and the centers in Africa and any other centers in the climatic zone is one of an ICRISAT program, a collective noun describing the activities of research in the areas as a whole.

This program must be flexible in design and in operation. We want to avoid and we hope the Consultative Group will avoid, and we hope the Board of ICRISAT will avoid, doctrinaire approaches to relationships. The value of Dr. Doggett's report is the frank discussion of some of these matters. But we see some African programs which call for no direct Hyderabad staff involvement at all, such as the varietal work. We do see others which would be stronger if center staff from Hyderabad were involved. An example is nematode work where specialists are a scarce commodity. But the actual handling of the programs are a matter in our judgment for evolution and cooperation, evolution on the part of the Directors of the African Centers and the Director of ICRISAT. We think it is more important to develop a habit of looking at the problems as a whole and agreeing that certain African work will just go along without any interference other than the exchange and discussion of results -- the two-way relationship that I keep stressing. Others may well require, even though the work is done in Africa, a fairly clear interest and involvement on the part of Hyderabad. But we have confidence that the new Director when appointed to ICRISAT can readily evolve a relationship that would be flexible and rational.

As to the financial implications, it is difficult to be precise because obviously if I am right in suggesting that the broad concept of an ICRISAT program is the general tie, then we can't go too far in the development of the African work until the Director of ICRISAT is available. Hopefully, there would be a possible start in 1973. Dr. Doggett was kind enough to try to answer a question from me as to the financial requirements for next year. And if the momentum of ICRISAT is maintained, that is to say, the Director is appointed soon, then Dr. Doggett could see the need or the scope for building and housing in 1973 in Africa calling for capital of \$450,000 and some recurrent expenditure of about \$85,000, rounded off to a total of half a million next year. He sees in the following year a smaller capital sum, a bigger recurrent, recurrent only in 1975 and 1976, rising finally to the level in 1976 of about \$985,000.

I repeat, I do not pretend to have examined these figures, and Dr. Doggett has given me a figure which is consistent with the report and it suggests an order of magnitude for ICRISAT work in Africa.

Genetic resources are an important matter. I think it is to the credit of the Consultative Group and TAC that, whereas other bodies have been struggling for many years to get the problem recognized, and the Stockholm conference recently passed many resolutions in support of this, we were in fact ahead of the game and we are quite strong in our recommendation for a beginning to be made in this work. We adopted the report finally drafted by some of our members which will be made available with the minutes of our meeting. We would like to establish in 1973 a coordinating committee operating under a trust fund, and I would like to stress the significance of the reference to a trust fund. We see advantages in locating this committee in Rome. We do not wish -- and this is not an insult to FAO -- but we do not wish it to become an integrated part of FAO, because this may impair its recruiting prospects and we want the fund to be used only for the purposes voted. So we would hope that care would be exercised in the form of the establishment of this coordinating center whose task would be to develop cooperation among the existing centers in developed countries, such as Beltsville, centers in Russia, Germany, Australia, United Kingdom, and so on, and the international centers already heavily involved in this, such as IRRI and CIMMYT.

The proposals which evolved out of the symposium called by us and which was held at Beltsville, recommended the establishment of a great number of regional centers. Our recommendation is that the central committee be authorized to develop two or three of these regional centers, but not beyond that without further review of progress and the efficacy of the approach. It's a little slower than some people like, but we believe it is a wise way to approach the matter.

As to the financial requirements, the report sets it out. In the first year we would need \$333,000 -- \$200,000 for the coordinating committee, \$130,000-odd for exploration work, beginning to define the problem in concrete terms. In the second year we would need \$900,000.

I have played the role of skeptic, with some experience of research planned in universities where they always think they can go from here to there in 12 months. I know they can't do this. And I suggest that three years would be a more appropriate target. But these figures will be set out for you. But in terms of 1973, I believe that something like \$300,000 would be a proper figure to put down.

Perhaps one of the most difficult subject in our repertoire of difficult subjects is legumes. The argument continues as to whether we need a central institute dealing solely with the physiological, immunological problems of the legumes. This alongside what is developing, in existing institutes working in the legumes. ICRISAT itself is a major contribution here.

The legumes are a major factor in the quality of foodstuffs, so we are not unmindful of the need to watch this. We are aware of the Protein Advisory Group, the United Nations body. Time ran out at 10 to 7 last night. I declared that I wasn't prepared to tolerate any more discussion, if only because I felt that none of us could absorb any more punishment. So we hadn't finished this item. What we are trying to do is to evolve some machinery that enables us to meet our obligation which is to look for the research gaps. We are not at all satisfied that the legume problem is in total terms adequately serviced yet. But we want to evolve arrangements which enable us to report to you from time to time should we think it necessary on further research in this area. But we do want to reassure you that a very significant increase in effective work is in prospect as a result of decisions taken over the last two or three years.

August 4, 1972

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

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INFORMAL MEETING

August 2 and 4, 1972

Washington, D. C.

WEDNESDAY, AUGUST 2

Agenda

1. Adoption of Agenda;
2. Such further discussion of programs and budgets of Centers, with Center personnel, as Consultative Group members may wish to have;
3. Problems of Allocation and Disbursement;
4. Review Procedures;
5. A Financial Framework;
6. Nomination to Board of Trustees of the International Potato Center;
7. Discussion of any points which Center Directors may wish to put to Consultative Group members;
8. Other business.

FRIDAY, AUGUST 4

1. Preliminary report by Chairman of TAC on programs for 1973 to be recommended for Consultative Group financing;
2. Statement of intention by donors as to their possible financial contribution for 1973 and subsequent years.
3. Other business members of the Consultative Group wish to raise.

ONGOING INTERNATIONAL AGRICULTURAL RESEARCH PROGRAMS:

ESTIMATED CASH REQUIREMENTS, 1973*

(\$'000,000)

	<u>Core</u>	<u>Capital</u>	<u>Less Earned Income</u>	<u>Net Core & Capital</u>
CIAT	3.567	.718 ^{a/}	.064	4.221
CIMMYT	5.172	1.183	.344	6.011
CIP	1.085	.289	-	1.374
IITA	4.549	.352	.110	4.791
IRRI	3.018	.236	.150	3.104
ICRISAT	1.200	2.190 ^{b/}	-	3.390
	<hr/>	<hr/>	<hr/>	<hr/>
	18.591	4.968	.668	22.891

a/ Including \$518,000 for which funds are being sought in 1972.

b/ Including capital expenditures of \$490,000 for which funds are being sought in 1972.

* Revised as of September 13, 1972

SOME PRELIMINARY INDICATIONS OF FINANCIAL SUPPORT FOR 1973

(In \$ Thousands)

<u>DONOR</u>	<u>CIAT</u>	<u>CIMMYT</u>	<u>CIP</u>	<u>IITA</u>	<u>IRRI</u>	<u>ICRISAT</u>	<u>TOTAL</u>
UNDP		750 ^{a/}				700	1.450
Ford							3.000 ^{b/}
Rockefeller							3.000 ^{b/}
Kellogg	350						350
U.K.			70 ^{c/}	500 ^{d/}	343 ^{e/}	200	1.113
Canada	400 ^{f/}	450 ^{g/}		750		800	2.400 ^{h/}
U.S.							*1 ^{i/}
IDRC					100 ^{k/}		100
Netherlands	125			125			250
Norway						75	75
Switzerland						125	250 ^{l/}
IBRD							3.000 ^{m/}

a/ restricted core contribution for high lysine maize program.

b/ precise allocation to be determined by needs and fund availability; preference expressed to continue as ongoing supporters of original four institutes.

c/ restricted core for taxonomic component of program.

d/ restricted core for soil expansion program.

e/ restricted core for varietal programs.

f/ restricted core for cassava-swine program.

g/ restricted core for triticales program.

h/ additional funds to be allocated up to total between \$2.5 and \$3.0 million.

i/ 25% of core and capital requirements of each institute, excluding any sums needed to complete the capital installations of CIAT and IITA.

k/ restricted core for multiple cropping system.

l/ allocation of \$125,000 to be determined.

m/ allocation to be determined.

ANIMAL PRODUCTION AND RESEARCH

IN TROPICAL AFRICA

**Report of the Task Force commissioned by the African
Livestock Sub-Committee of the Consultative Group on
International Agricultural Research**

Barry Nestel

D. J. Pratt

M. Thome

Derek Tribe

September, 1972

L.J.C. Evans, Esq.
Chairman, African Livestock Sub-Committee
Consultative Group on International Agricultural Research

Dear Mr. Evans,

We have pleasure in submitting our Report on Animal Production and Research in Tropical Africa, prepared on your instructions for consideration by the Consultative Group and its Technical Advisory Committee.

You will see that we recommend that:

- an International Centre for the Development of Animal Production in Tropical Africa should be established immediately;
- the main focus of its activities should be a multidisciplinary research study of existing and new systems of animal production, supported by the documentation and dissemination of all available information, and the training of scientific and planning personnel;
- the major part of its research should be carried out in co-operation with existing national and regional research stations;
- it should preferably be located in Addis Ababa, with such associated field stations as may be necessary.

Our visits and discussions in Africa left us in no doubt that an international research input would usefully encourage and support the increased efficiency and output of animal production which Africa so sorely needs. Throughout the Report you will find an emphasis on the need for integrated research involving the complex of environmental, biological, social and economic problems which currently combine to restrict both the rate of livestock development and the application of improved technologies. The rate of progress resulting from research is

necesssarily likely to be slow. Certainly it would be unjustifiably optimistic to think in terms of specific research "break-throughs" or any development in the African livestock industries comparable to the "green revolution" which has occurred in the wheat and rice production of certain countries.

Although we wish to avoid misleading optimism and to emphasize the inevitable differences between animal and crop research, we do not mean to be in any way hesitant or pessimistic. Rather we wish to stress that "winds of change" are blowing through Africa's livestock industries. Developments which only a short time ago would have been considered impossible are now gathering momentum.

The difficulties which remain must nevertheless be recognised. Not only are there climatic limitations to increased animal production but also the rate of human population increase continually imposes new limits to the realization of development goals. Furthermore, the acute shortage of trained African staff often makes it difficult to maintain even the present efficiency of technical services; while restricted communications and generally low levels of education impose their own inevitable limits on the rate of progress.

Yet, on the other hand, the veterinary services of many countries have achieved outstanding progress in controlling major animal diseases. In many localities the water resources are being developed and marketing facilities are being improved. Of most significance has been the readiness of many governments to give appropriate priority to the livestock industries in their national development plans and the preparedness of the livestock owners themselves to respond to technical and economic pressures and appropriate incentives.

Much remains to be done but there are grounds for believing that change has started and that the rate of progress will be maintained. This progress will not be easy but it could be made less difficult if there was an international centre to offer the type of support which we advocate.

The suggestion that there should be an international centre was welcomed in principle by most of the African governments and officials we met. Nevertheless, many of them were concerned that such a centre might either try to impose its views on national policies or would attract to itself the staff and financial support which might otherwise have strengthened national research programmes. We have done our best to allay these genuine and understandable fears which we feel bound to draw to your attention.

The success of the proposed Centre will depend upon the extent to which it gains the confidence and cooperative participation of the African authorities. To encourage this cooperation these authorities must be convinced that the establishment of the Centre will not only lead to the continuation of support for their national endeavours but that it will also lead to increased support, as has resulted, for example, from the work of CIMMYT and IRRI.

African governments must also be encouraged to feel that they have an effective part to play in deciding the policy and priorities of the Centre. Although we have suggested that there should be adequate African representation on the Governing Board of the Centre, the exact nature of the Board's responsibilities in relation to those of the Consultative Group and its Technical Advisory Committee has yet to be resolved. We appreciate that this matter is relevant to all international centres and we now refer to it because it is a question of concern in some of the countries we visited.

We would like to suggest that it would be helpful if the African authorities, who were all most generous in giving us advice and assistance, were kept informed concerning the outcome of our mission. Perhaps it would be possible to circulate this Report or a summary of it, together with an account of the decisions of the Consultative Group, to the African authorities most concerned.

It is a pleasure for us to acknowledge the advice we have received in various specialised areas from the following consultants:

- | | |
|----------------------------------|----------------------------------------------------|
| Dr. K.V.L. Kesteven (Australia) | - Animal health and production |
| Dr. H.F. Lamprey (U.K./Tanzania) | - Wildlife research and multiple land use |
| Dr. P. Nderito (Kenya) | - Education and training in East Africa |
| Dr. L. N'Diaye (Senegal) | - Education and training in Francophone Africa |
| Prof. V.A. Oyenuga (Nigeria) | - Education and training in Anglophone West Africa |
| Mr. J. Tyc (France) | - Economics and marketing |

The views and information they have provided have contributed much to the thinking of the Task Force and to the recommendations of this Report.

Finally, we would like you to know how excellently we have been supported by the staffs of the IBRD and the UNDP. The arrangements made on our behalf were admirable and it was clear that the authorities we visited also appreciated the cooperation and efficiency of the Resident Representatives of the UNDP. Without their help and the unreserved backing of the IBRD our task would have been much more difficult and far less enjoyable.

Yours sincerely,

Barry Nestel
D. J. Pratt

M. Thome
Derek Tribe

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CHAPTER ONE

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

1. The present level of animal production* in Africa is well below its potential. On grounds of economic growth, human nutrition and welfare, trade balances and the conservation of deteriorating rangeland resources there is an urgent case for trying to secure its improvement.
2. The main impediment to development is not merely the lack of technical knowledge. A considerable fund of knowledge has resulted from several decades of work at numerous research centres. Moreover, these existing national and regional centres provide most of the facilities necessary for the future research activities which are needed.
3. Although the results of much of the past work are not widely known and present research activities are limited by shortages of experienced staff and supporting funds, the primary cause of the disappointing growth in animal productivity in tropical Africa has been the failure to integrate the biological, economic and sociological components of research and development programmes.
4. In particular there is a need for more detailed study of animal production systems of tropical Africa before existing knowledge can be fully utilized or future research priorities defined. This work must give full consideration to those aspects of biology, economics and social anthropology that relate to animal production.
5. Several African authorities are now seeking to adopt a multi-disciplinary approach to livestock development and some hopeful programmes are now being implemented. However, the rate of progress is limited by the availability of appropriate information and of multidisciplinary teams of scientists.

Note: Throughout this Report the term "animal production" is used in the wide sense defined in the second paragraph of the Terms of Reference on page 6.

6. This situation has led the Task Force to conclude that an International Centre for the Development of Animal Production in Tropical Africa would be justified provided it is given a limited and carefully defined objective.

7. In essence this objective should be to identify means of increasing the efficiency of the major animal production systems of tropical Africa and to assist the governments and authorities responsible for achieving new levels of productivity.

8. In working towards this objective the Centre will need to analyse all existing information, collect new survey data and participate directly and indirectly in an expanded programme of multidisciplinary and integrative research. Special attention will need to be given to analysing ongoing livestock development programmes.

9. In particular, it is recommended that the Centre should:

- retrieve, assemble and make available in both English and French all relevant information on animal production in tropical Africa;
- engage a multidisciplinary research team to study existing animal production systems; develop new or amended systems of production, and define other research priorities;
- support, supplement and cooperate with existing national and regional research stations in developing a fully coordinated programme of research which is related appropriately to the urgent needs of livestock development;
- develop the capacity to undertake specific research programmes which are appropriate to an international centre. Such programmes will require careful justification with particular emphasis given to their timing and to their international application;

- provide, or assist in providing, seminars, technical conferences and training courses for staff engaged in livestock research, extension, planning and production, in order particularly to increase regional competence in the multi-disciplinary 'systems' approach to livestock research and development; and
- make available statistical support, information or advice to national, regional or international authorities in the various fields relating to animal production in which the Centre is actively engaged.

10. This approach - which both strengthens ongoing activities and provides an adequate coordinating mechanism - would be preferable to such possible alternatives as concentrating all activities at one central station or of using all additional resources for the support of existing national stations.

11. Seven locations were considered for the headquarters of the proposed Centre and Addis Ababa is recommended as the most suitable.

12. The development of the Centre has been proposed in two phases. During the first phase (years one to three) efforts will be concentrated on the analysis of animal production systems and related programmes of documentation and training. Towards the end of this phase a programme of cooperative research with existing national or regional stations will be started. Subject to scientific review towards the end of Phase One, the second phase (years four to eight) will develop further the programmes initiated in Phase One, particularly the cooperative research programme.

13. The closest possible liaison should be established between the Centre and the planned International Laboratory for Research in Animal Disease (ILRAD). Until a decision has been made concerning the siting and host country relationships of the two institutions it is not possible to recommend precisely how this liaison should best be organized. The present proposals are intentionally flexible on this matter but provide for the amalgamation of the two institutions into a single Centre should this be considered appropriate.

14. It is recommended that the Centre should be established under the authority of a Director-General who would be responsible to a Governing Board of not more than fifteen members. The Director-General would have under his immediate supervision a Director of Research and a Director of Documentation and Training. If ILRAD becomes a component of the Centre its Director would likewise be responsible to the Director-General.

15. By the end of the first phase of development the number of senior professional staff (excluding ILRAD) is expected to total 28.

16. The proposed capital costs are \$4.75 m.* for Phase One and \$1.30 m. for Phase Two. Recurrent costs (with an annual 8% growth factor) are budgeted as rising from \$1.36 m. per annum to \$2.62 m. per annum and totalling \$5.89 m. in Phase One, and from \$3.23 m. per annum to \$6.81 m. and totalling \$25.19 m. in Phase Two. For the initial 8-year period capital costs total \$6.05 m. and recurrent costs \$31.07 m. These estimates do not include the costs which have been separately proposed for ILRAD, nor do they include enabling costs of \$0.50 m.

17. It is recommended that an Executing Agency be nominated to undertake further planning and to supervise the initial stages of establishing the Centre.

* Note: All cost estimates in this report are expressed in US\$.

CHAPTER TWO

BACKGROUND

Origin of Mission

The concept of an international centre for animal production and rangeland improvement in Africa has been under discussion for several years. Following a series of conferences and commissioned working papers in 1968 - 1970, the Rockefeller Foundation undertook to sponsor a detailed study and to present its findings to the Technical Advisory Committee (TAC) of the Consultative Group on International Agricultural Research.

Two proposals were submitted at the end of 1971, one for an International Laboratory for Research on Animal Diseases (ILRAD) and one for a more comprehensive centre, concerned with broader issues of animal production. The former proposal was endorsed by the TAC and approved by the Consultative Group but the case for a broader animal production centre was regarded as incomplete.

Accordingly, an African Livestock Sub-Committee was established by the Consultative Group. This Sub-Committee invited the Rockefeller Foundation to carry forward the ILRAD proposals and arranged for the IBRD, supported by UNDP, to service the present Task Force in a review of the broader issues of animal production research. The IBRD commissioned the services of Professor D.E. Tribe (University of Melbourne) as team leader. Team members - Dr. Barry Nestel (IDRC), Mr. D.J. Pratt (ODA) and Dr. M. Thome (EMVT) - were provided by their respective agencies.

The four members of the Task Force first assembled at the IBRD in Washington on 30 March 1972 and were given the following terms of reference, which had been agreed by the African Livestock Sub-Committee:

Terms of Reference

1. The purpose of the mission is to provide the Consultative Group on International Agricultural Research and its Technical Advisory Committee with a report and recommendations containing all the necessary information

on which to base decisions for accelerating research on animal production and health in tropical Africa, with special reference to ruminant livestock.

2. In undertaking its survey and writing its report it is understood that the mission will interpret research in animal production and health in its widest sense, including breeding, feeding, management, and related health aspects of husbandry; the improvement of range and pastures; the social and economic factors affecting the livestock industry with particular emphasis on marketing. The survey would pay due regard to the recommendations of TAC and decisions by the Consultative Group in relation to the control of trypanosomiasis and East Coast fever.

Objectives

3. The mission will have the following objectives:

- (a) To identify and define the different ecological zones in which it is likely and desirable that livestock development should be intensified.
- (b) To identify the basic animal production problems in these ecological zones - political, social, economic, and technical.
- (c) To analyze the research work that has already been conducted in these ecological regions, with particular reference to its influence on present livestock husbandry practices. Special note should be taken of reasons for the failure of development projects to make use of research results, with the aim of identifying the main obstacles to progress and the best means of overcoming them.
- (d) To assess the adequacy of the existing research institutions staffs and facilities, both to meet their stated objectives and to undertake any new activities which might be essential for more rapid progress in livestock development, including training of research workers or managers for the industry.

- (e) As a result to determine the main gaps and weaknesses in current activities in animal production and health research (as well as any avoidable duplication of such activities) including any related training and 'outreach' activities.
- (f) To prepare a report and recommendations embodying the conclusions of the mission.

Report and Recommendations

4.

The mission will prepare a report which will:

- (a) Define the main objectives of and priorities for the future research on animal production and health in Africa, giving due regard to the bearing of ongoing work on those priorities.
- (b) Having regard to (d) above, indicate the approach recommended to achieve these objectives, and other alternatives which were considered in reaching their recommendations. In so doing the mission should take into account the need to avoid duplication as well as to strengthen, where necessary, existing regional co-operative or national research programs.
- (c) Specify the type, function and location of any new facilities should these be considered essential.
- (d) Make any additional proposals which they consider necessary to create an effective over-all network for research, training and outreach on animal production and health in Africa, linking international, multi-lateral, regional and national efforts and providing a suitable mechanism for coordination of research, training and information.
- (e) Indicate a provisional cost structure and five-year operating budget for the proposals under (c) and (d) above - differentiating capital from recurrent costs,

and the core program (of any major new centre which may be recommended) from outreach activities, 'relay' station support program costs, etc.

- (f) Suggest a mechanism for over-all control, direction, and management of any new efforts proposed, covering both production and health aspects of the work.
- (g) Make recommendations for initial logistic support to any new activities proposed, and means of obtaining any necessary expert guidance and advice in respect to program formulation as well as administration, and construction if necessary.

Mode of Operation

Logistic support for the Task Force was provided by the IBRD and support at the country level for field trips in Africa was coordinated by UNDP Resident Representatives working in close harmony with FAO and IBRD Field Mission Chiefs in countries where these organizations had representatives.

The Chairman of the African Livestock Sub-Committee of the Consultative Group wrote a letter accompanied by an explanatory paper to appropriate Ministers in the countries to be visited. This letter explained that the Task Force was seeking views "concerning the desirability of an international animal research activity in tropical Africa" and invited suggestions "as to how such an activity might be planned in order to give the greatest possible support to livestock development programs." It also invited Ministers to submit written comments in addition to discussing these matters with the Task Force. The Task Force leader also wrote to the Directors of Animal Health and Production Services and Directors of Livestock Research Institutes in the countries to be visited.

UNDP Head Office notified all of its Resident Representatives in Africa about the Task Force and requested their cooperation in supporting its activities in the field.

After its initial briefing in Washington, the Task Force visited those donor agencies in North America and Europe which have a particular interest in the livestock industries of Africa. Visits to West, Central and East Africa followed, interspersed with further consultations in Europe. After preparing a draft report, a final round of visits was made in North America, Europe and Ethiopia, before returning to Washington to finalise this Report. The details of the itinerary are recorded in Annex I.

The Mission's liaison with the Consultative Group was maintained through its contact with the Chairman of the African Livestock Sub-Committee. In addition the leader of the Task Force submitted a short interim report at International Centres Week in August 1972 and he also attended the third meeting of the African Livestock Sub-Committee which took place at the same time and which reviewed the progress being made by the Task Force.

CHAPTER THREE

LIVESTOCK IN TROPICAL AFRICA

By world standards current levels of animal production in tropical Africa are extremely low. There is an enormous wastage in potential meat and milk production due particularly to excessive preweaning mortality, inadequate nutrition, and poor standards of management and health. The times taken to reach market, the percentage offtakes and the average marketed weights of the livestock all compare unfavourably with those in most other parts of the world.

To some extent this situation is due to climatic limitations, but there is also ample evidence to show that the application of known technology would considerably increase present African livestock production. Indeed new development schemes across the continent are now demonstrating that marked progress can be achieved once the essential conditions for change have been effectively met.

Ecology

Tropical Africa covers about 23 million square kilometres. This area contains about 130 million cattle, 100 million sheep, 80 million goats, 12 million equines and 9 million camels, and encompasses an enormous range of ecological conditions, ranging from desert to temperate highlands and tropical rain forest.

In West and Central Africa the main ecological zones correspond to belts of increasing rainfall, from the Sahara to the rain forests of the coastal belt and the Congo Basin. These have been designated by the French workers as the Saharien, Sahelien, Soudanien and Guineen zones. In East Africa, where there is more upland country, rainfall and ecology are determined more by elevation, and a series of six eco-climatic zones are recognized, from Afro-alpine mountain peaks, to land of forest potential, moist and dry woodland or 'savanna', dry thorn bushland and semi-desert. South of the Congo Basin there is a broad belt of Isoberlinia - Brachystegia woodland and savanna (miombo) that extends from Zambia through to southern

Tanzania. These several zones - their characteristics and problems - are described in more detail in the Rockefeller Foundation Report of 1971.

The present distribution of livestock varies markedly between ecological zones and is determined particularly by the distribution of forage and water and the risk of disease. For example, tsetse fly, the vector of trypanosomiasis, effectively precludes most breeds of cattle from some 12 million square kilometres of territory, predominantly land of high forage potential. Apart from the relatively trypano-tolerant breeds of West Africa, most livestock are forced to remain in the drier zones or at the higher altitudes.

In general there is little integration between livestock and crop production. The respective ways of life of the stock-owners and cultivators are largely unrelated, with the result that the livestock are almost solely dependent for their nutrition upon natural herbage. Thus the marked seasonality of growth of the vegetation is generally reflected in the erratic growth of the livestock.

In many areas the concentration of livestock has led to overgrazing. Indeed, the continued deterioration of the drier rangelands constitutes one of the most urgent problems facing the region. One solution would be to open for livestock production those areas which have been unoccupied because of tsetse fly or other constraints. On the other hand the maintenance of these constraints may represent one of the most effective ways of preserving natural resources until such a time as they may be used rationally.

It has often happened that expensive tsetse eradication schemes or water development programmes, or even standard types of animal disease control measures, have resulted in serious ecological deterioration, often involving the uncontrolled intrusion of people and their livestock into new areas in such a fashion as to perpetuate and extend the undesirable conditions which the development of the new land was intended to relieve. Lands which are still unoccupied need to be protected from unplanned exploitation until viable settlement schemes can be implemented.

Many rangelands support substantial wildlife populations and offer prospects for the economic production of additional animal protein by game-cropping. Having examined this potential, the Task Force has concluded that, while it undoubtedly exists in limited and specific areas, the management of game animals and the harvesting and marketing of game meat present sufficient difficulties that it is unlikely that this form of production can play more than a token part in satisfying the meat demands of Africa in the foreseeable future. The Task Force also came to a guarded conclusion regarding the large scale export prospects for game meat.

Economics

The economies of almost all African countries are heavily dependent on agriculture. Agriculture is both a means of livelihood and a source of income for the greater part of the population, about 80% of whom are engaged in agriculture as their primary occupation. For the region as a whole the agricultural sector contributes about 40% of the Gross Domestic Product (GDP).

Within the agricultural sector the livestock sub-sector plays an important role and utilizes a substantial labour supply. However, since much of its output is used for subsistence consumption and for draft power, and therefore does not enter the market economy, the importance of livestock in the economy is usually underestimated. Bearing this in mind, it appears that the total value of livestock production in tropical Africa, including the value of products which are not marketed, exceeds US\$ 1 billion per annum. This figure represents about one-seventh of the value of total agricultural production or 5 to 6% of the GDP of the area. The total livestock inventory exceeds US\$ 8 billion, and appears to have grown over the last decade at a little over 2% per annum.

Apart from questions of income, employment and resource utilization, there is a major need to develop the livestock industries of Africa on the grounds of the projected future demand for animal products. This has important implications from the standpoints of both nutrition and trade. The current consumption of animal protein in the region averages only about 10 grams per head per day. Per capita consumption levels of meat, milk and

eggs are of the order of 12, 16 and 1 kg per annum respectively. The income-elasticities of these commodities are high in most countries and FAO has projected (using a constant price assumption) a growth rate in demand of the order of 5 to 6% per annum.

Since the limited evidence available indicates that price elasticities are also high, this demand projection foretells a severe shortage of meat or a substantial rise in prices, or both, unless the traditional growth rate in production increases two-fold or more. Assuming a growth rate in animal production of 3 to 4% per annum, FAO's Indicative World Plan (IWP) projected for 26 tropical African countries that by 1985 there would be a deficit of over 1 million tons of meat and 700,000 tons of milk.

During the first decade of the IWP period the growth rate in livestock production has fallen behind the stated targets. In African countries where economic growth has been most impressive (e.g. Ivory Coast and Nigeria) the shortfall in supply of meat has led to an increase in imports and, except where prices are controlled, to a sharp rise in meat prices. In the future, unless the current trend in production improves dramatically, the result must be still lower animal protein intakes for the low-income groups and a severe drain on foreign exchange for purchasing livestock imports to meet the demands of the higher income groups.

This situation will, in the long run, also effect the regional pattern of trade, since currently the trade in livestock products is an important source of income for a number of African countries. If domestic demand outstrips local production, export earnings will decline. Since the opportunities for expanding exports of other tropical commodities are generally bleak, a decline in livestock exports could have serious balance-of-payment implications for traditional meat exporters. The seriousness of this situation is underlined by the fact that a global shortage of meat is already developing, so that a change in the regional trading balance for meat will not only represent a loss of potential earnings but will also mean that each ton of meat imported will require more foreign exchange.

Alternatively, the expected global shortage of meat represents an exciting opportunity for any African country that can meet the hygiene standards of the European market, since market prices for meat in Africa are currently well below European levels.

Social Factors

In view of the demand that exists for animal products, it is perhaps paradoxical that few of the past efforts to increase livestock production have achieved sustained success. Despite some notable exceptions - including individual and group ranches, and the introduction of high-grade dairy cattle in areas of higher potential - little has yet been achieved in increasing productivity on a sustained basis for the tens of millions of animals managed in the traditional manner on open rangeland. In the main, what has been offered to pastoralists has failed to persuade them to change their systems.

The major reason for this failure is that efforts to bring about change have usually stressed technical factors and have largely ignored socio-economic considerations. Too little recognition has been given to the fact that in most situations the stockman is still a herdsman or a shepherd rather than a rancher or a farmer. To a considerable extent he lives outside or on the fringes of a monetary economy and usually he attaches greater importance to the number of his stock than to their productive efficiency. For the most part, livestock provide the link between life and death, and it is not surprising that a cultural tradition related to livestock keeping has developed in a pattern closely associated with the constraints imposed by the environment.

The key features of the pastoral tradition are as follows:

1. Livestock are individually owned but grazing and water resources are rarely individually owned, so that their use is opportunistic, favouring short rather than long term objectives.

2. Livestock have a multiple value and can represent variable combinations of wealth, prestige, prerequisites of adulthood, marriage or parenthood, and subsistence, as well as being convertible into a money value.
3. Different classes of stock represent different value systems. Camels and cattle are major items of property whereas sheep and goats are used more as everyday currency.
4. The multiple value of livestock and the mobile conditions of pastoral life tend to isolate the pastoralist from consumer goods and reduce the marketing incentive. However, improvement in communications and in supplies of consumer goods are leading to changes in market orientation.
5. The structure of subsistence herds may vary radically from that desired for commercial production. Old animals are often retained beyond their productive life while a need for draft oxen may lead to a preponderance of males. Likewise, if milk is the preferred diet there will be a preponderance of females in the herd.

The life-style of the pastoralists is difficult to change because it already represents a highly integrated and by and large successful adaptation by the society to long-standing social and environmental requirements. Two requirements of change are often security of tenure and the organization of the people into a form of social institution adapted to their circumstance.

However, increasingly evidence is accumulating to show that improvements in animal husbandry leading to increased yields can be achieved even in subsistence societies. The reasons why this is now possible are many, but stem from the basic fact that developments such as disease control, improved communications, better market prices, and the greater concern of governments for the welfare of rural peoples, have together provided greater security in the life of the livestock owner, so that he now has less fear that the thin thread upon which his survival depends will be broken.

Technology

There are three main ways in which the supply of meat from domestic livestock can be increased in Africa:

- (a) by increasing the offtake percentage;
- (b) by increasing the weight of animals slaughtered; and
- (c) by increasing the number of animals in the national herds and flocks.

Offtake can be improved most directly by reducing death rates (e.g. through disease control and better water supplies) and by developing new marketing facilities. It can also be sought by increasing the percentages of sheep and goats relative to cattle, since the former can yield an offtake of 30 percent annually, whereas from cattle it is difficult to exceed an average of 15 percent. However, the quickest way of increasing overall beef production undoubtedly lies in the provision of facilities which will enable a greater number of cattle to be removed from the arid zones and reared or fattened under more suitable conditions.

To divert large numbers of cattle from premature slaughter, or death caused by seasonal or periodic drought, requires improved marketing facilities and areas where fattening and finishing can take place. Suitable unoccupied land is available in many African countries, but it requires development, especially in terms of tsetse control, pasture improvement and the provision of water supplies. National development corporations and ranching cooperatives can play their part in this if they have available efficient managerial staff and the necessary capital. The smallholder in the high potential areas could also contribute, especially where he has excess maize, groundnut or other crop residues which could be used to fatten a few steers.

In addition to opportunities for increasing offtake and carcase weight, almost all countries in tropical Africa have scope for increasing the numbers of livestock in their national herds, particularly in the zones of high potential. The more immediate need is often for a redistribution of livestock (especially to relieve serious overgrazing in the drier localities)

but, where appropriate, increases in herd size can be achieved through better management, improved reproductive efficiency and reduced calf mortality (which runs from 10 to above 50%).

Each of these potential means of increasing meat production requires basic improvements in existing methods of livestock husbandry. In particular, it will be necessary to revise the methods of cattle feeding in order to relate management practices to the differing nutritional requirements of pregnant, lactating, growing and fattening stock, and to use different species of grazing animal to exploit to the full specific differences in grazing behaviour and feed requirements. Where disease is no longer the limiting factor in production, top priority will have to be given to improving management. With improved management go opportunities for range improvement or grass/legume pastures and for the genetic improvement of the livestock.

Under existing management conditions, arguments about the respective merits of specific cattle breeds are largely irrelevant. The shortage of animals for future development programmes is so serious that use must be made of virtually all that are available. In the present changing situation - where water development, disease control, pasture improvement and better management are all being utilized to improve the nutritional environment - there is little point in seeking specific gene: environment interactions. Even in a stable situation, the quest for the "best" breed or cross is likely to prove long, difficult and, ultimately, unrewarding. Ample evidence already exists to show the advantages of cross-breeding between Bos indicus and B. taurus, and the benefits of genetic selection within the indigenous zebu stock. What is needed is to ensure that breeding programmes are so designed to maximise the exploitation of environmental and managerial potentials.

Rather than concentrating solely on cattle breeding (as occurs in many African countries), it could prove more rewarding to explore also goat and sheep production. Small stock often have specific advantages over cattle, as well as some disadvantages, and too little is yet known of their relative merits and of the problems involved in their more efficient production.

Undoubtedly a substantial potential also exists in poultry. Since our terms of reference refer specifically to ruminant livestock we have not examined the poultry situation, but clearly a fully integrated approach to animal production cannot ignore the poultry sector, particularly in view of the interactions between poultry and ruminant stock in areas such as feedstuff requirements and meat consumption practices.

Research and Training

There are already many national and regional research centres operating in tropical Africa. It is essential that any new research investment should be considered in relation to (a) the state of present knowledge and the scope of present research programmes and (b) the range of existing research facilities.

State of Present Knowledge

The accumulated results of many years of study in a wide range of disciplines already provides a substantial foundation of technical knowledge on which to base development programmes and further scientific progress.

In particular, outstanding advances have been made in animal disease control, which has received top priority in most investigational programmes. Several major livestock diseases (e.g. rinderpest, contagious bovine pleuropneumonia, anthrax, pasteurellosis, and the clostridial infections) are already substantially under control or, at least, are capable of control given the appropriate infrastructure and organization.

The achievements of veterinary scientists have been supported by the work of geneticists, nutritionists, agronomists and rangeland ecologists. In country after country such work has clearly shown that substantial improvements in livestock production are technically possible provided that healthy, well-fed animals of superior genetic quality are grazed according to the established tenets of good pasture or rangeland management. More recently, because of the improved availability of feed grains and agricultural by-products, attention has been paid to the technical problems of supplementary feeding and feed-lot fattening.

However, this is not meant to imply that further biological research is not urgently necessary. Even in those areas in which most progress has been made, important problems remain to be investigated. For example, in veterinary research, trypanosomiasis and streptothricosis are still major problems; while even with diseases for which control measures exist, a considerable advance would follow the development of improved thermo-stable and polyvalent vaccines. Furthermore, as the menace of the major epizootic diseases is successfully overcome, new animal health problems become increasingly important, related for example to helminths, metabolic disturbances and reproductive efficiency. Cysticercosis (beef measles), which may lead to condemnation of carcasses, is assuming increasing economic significance in new ranching enterprises.

It is only now becoming generally recognized that in order to develop African livestock industries further it is necessary to provide inputs of knowledge in economic and social sciences as well as in biological sciences. In most situations, it is problems concerned with land tenure, credit, taxation and marketing, or with human attitudes, education and behaviour that limit the application of technical knowledge, and thus the developmental process.

Even basic statistical information is frequently missing or, at least, is notoriously unreliable. Thus the need for investigational work in the social sciences does not refer primarily to the more sophisticated techniques of econometrics and the behavioural sciences. Rather, the immediate need is for:

- surveys to determine existing resources;
- investigations to identify the most important and sensitive social and economic constraints to livestock development; and
- analyses of ongoing development programmes in order to identify the reasons for success or failure.

The bibliographical note presented as Annex II draws attention to the large amount of published material concerning livestock production in

tropical Africa. There is also a substantial bulk of unpublished results in the files of research stations in many countries. Unfortunately the existence of available results is often not fully appreciated by research and planning staffs. The situation is accentuated by a communications problem between countries of Anglophone and Francophone Africa, and the frequency of staff changes which makes it difficult to maintain either continuity in research policy or the verbal transmission of accumulated research wisdom. The latter is an important characteristic of the older, larger and more stable research laboratories.

There is also a shortage of good library and documentation facilities in Africa. The scientist working in a national research station is likely to find it extremely difficult to determine the present state of knowledge in his particular field. In such circumstances the duplication and repetition of work is inevitable.

The work of the Inter-African Bureau for Animal Resources (IBAR) is making a useful contribution to the communications problem, although this task has to compete with its many other responsibilities for which limited funds and staff are available.

Existing Research Facilities

The present limits to African research efforts are set by the availability of trained staff and recurrent research budgets rather than by a shortage of research facilities. In particular, the several laboratories for veterinary research in West, Central and East Africa are well-designed and equipped and are capable of handling an expanded research programme with only minor extensions. Several of these laboratories include an adequate variety of modern facilities for any normal range of studies in pathology, virology, bacteriology and parasitology.

We have not prepared a precise inventory of research stations, but the general picture is clear. The East African Livestock Survey of 1965 noted 25 stations in three countries, representing a total research area of more than 18,000 ha. Although a few of these stations have since been closed others have started, including the 24,000 ha Range Research Station at Kiboko

in Kenya. The situation in West Africa is broadly similar. For example, in six Francophone countries visited, by the Task Force, twelve research stations were seen and the existence of at least ten more was noted.

However, there is a relative lack of stations in the arid zones where there is a need for more research activity because of their extent, sensitivity to misuse and importance as breeding areas for livestock.

Training

It is noticeable that the livestock research services of Africa are largely dependent upon expatriate staff. Although the number of African research scientists is steadily increasing, the demand for professionally trained men in other sectors (for which expatriates are often unsuitable) is so high that many years will elapse before the research services will be manned predominantly by local staff.

In the meantime, every encouragement and opportunity needs to be given to African research staffs in order that they should improve further their scientific and technological expertise, and that they should maintain the sympathetic attitude towards development which is so necessary in persons engaged in problem-oriented research.

It is particularly necessary to broaden the disciplinary basis of the training of African scientists engaged in livestock development and research. At present not only is there a shortage of trained manpower but there is a preponderance of people who are trained primarily in animal health. The number of animal production scientists and rangeland specialists is low and in the fields of livestock economics, marketing and production sociology there are hardly any African personnel. There is an urgent need to train more specialists of every type and to attract many more people into fields other than animal health.

The primary objective in the University training of veterinary and livestock specialists lies in the production of the maximum number of first degree graduates. Although most governments and universities recognise the need for more postgraduate courses they appreciate that for many years it will be necessary to use overseas institutions for this type of training.

All of the universities that we visited have plans for developing postgraduate courses but only three of them yet provide such training, to any significant degree, in the livestock field. Moreover the structure of African universities does not lend itself readily to postgraduate training being established on a multidisciplinary basis, although there is a severe shortage of broadly based personnel who are needed as decision makers in both the policy and research fields.

Development Objectives

The first aim of development in the African livestock industries must be to satisfy the rapidly increasing demands of the home market for meat and milk and thus to improve the economic prosperity, the nutritional status and employment opportunities of the African people, not least the livestock-owners themselves. At the same time livestock production must be expanded in a manner that is ecologically sound and that can be sustained indefinitely without deterioration in the natural environment. An associated aim should be the continued expansion of markets for animal products.

Since the livestock industries of the region are characterised by an extreme diversity of ecology, human populations and stages of economic development, their development on a regional basis represents a task of great difficulty and complexity. Clearly no single pattern of development can be applied simultaneously throughout the region as a whole.

The product of this diversity of conditions is a variety of distinct (though sometimes overlapping) livestock production systems, each with its own potentials and limitations for development. For example, the Fulani system, in which there is a symbiotic relationship between pastoralists and cultivators, is distinct from the subsistence pastoral systems of eastern Africa. Within eastern Africa (for example, Somalia) there are separate systems based on sheep and goats, on camels and on a combination of species including cattle. As well as traditional production systems, there now exist a number of development programmes that seek to amend or replace traditional systems, some of them incorporating unique forms of tenure or social organization. Other systems new to Africa include feed-lots.

It is clear that little past and present research has been or is related directly to specific production systems. Admittedly some research transcends individual systems - including a great deal of disease research - but even in these cases the actual implementation of research results, as aids to development, can only be affected by dealing through individual systems. The detailed study of the major production systems of Africa and of the relation between available technology and individual systems, deserves much greater attention than hitherto. Indeed, we judge that the absence of such a study has limited the impact of past research more than any other factor.

In the early stages of development there is limited opportunity for technical progress. The first essential is to create the social and institutional framework within which technical improvement is possible. An environment for change must be created both within the structure of government and at the local level. For example it may be possible at the local level to organize social institutions that are acceptable to traditional societies yet conducive to development. In the longer term, however, change through education is essential. In areas of high potential, the basic education services are usually well-established and in such areas livestock owners are already set on the path of progress, but in the more sparsely populated arid or semi-arid regions social services in general, and educational services in particular, have exerted little influence on the nomadic or semi-nomadic pastoralists.

Despite all difficulties, it is impossible to leave the livestock industry of the drier and more backward areas completely to its own resources. Apart from the social welfare implications of this action, the subsistence pastoral herds account for a substantial proportion of the cattle in Africa, and thus exert a powerful influence on national economies. In particular this livestock population forms an essential reservoir from which can be drawn foundation breeding females for the expansion of beef production in new areas, and for supplying immature and store stock for fattening.

For these reasons the public sector may need to take the initiative in the pastoral areas, in order to promote balanced and rational development.

For example, in areas where major epizootics occur there needs to be strict veterinary supervision of stock movements and marketing, and large-scale disease eradication programmes may be required. Similar public action may be needed to conserve water, soil and vegetation.

Experience throughout Africa has repeatedly demonstrated that attempts to control management and improve livestock productivity have only been rewarded when communal land tenure has been replaced by legal rights of use, held either by individuals, discrete family groups, co-operatives or companies. Not only do established rights of occupancy provide security for the investment of personal effort, private savings and loans from banks and other credit organizations but it also enables governments to identify and act against those who perpetuate mismanagement.

This is not to say that the nomadic way of life is necessarily to be regarded as undesirable. Indeed, in areas of low and unreliable rainfall, a system of husbandry involving a degree of nomadism may be the only acceptable form of production. In such a case, however, the system of land tenure is still of vital importance because without some form of group organization, the rational use of water and vegetation is impossible.

As the development process gathers momentum, disease control, better management and improved breeding and feeding all become increasingly important. A greater flow of credit is required, marketing organizations must be further refined and extension services need to be multiplied. Although the detailed order of these developments varies from district to district according to differences in ecology and social conditions, their general order is surprisingly rigid. For example, there is no point in attempting controlled grazing in an area in which livestock owners insist on communal grazing. Similarly, the introduction of improved exotic cattle to areas in which tick-borne diseases have not been controlled is bound to fail. Individual improvements should not be considered on their isolated merits, but in relation to overall development in a particular area. In other words, to be "an improvement" any particular measure needs to be introduced to the right place at the right time; otherwise it is likely to be a wasteful

expenditure of money and labour. This basic fact again points the need for research and development to be organized in the context of complete production systems.

In certain situations, such as where land is sparsely populated and where capital and management are available, advanced technologies and improved systems of cattle ranching can be introduced relatively quickly, circumventing many of the social and economic problems which have been emphasised in this chapter. However, although such investment opportunities deserve to be identified and exploited whenever possible, the conditions which they require are only found in relatively few places. Moreover, development schemes of this type do not generally impinge directly on the lives of the millions of traditional livestock owners in tropical Africa or the productivity of their millions of cattle, sheep, goats and camels. Since these traditional owners and their herds make up the major part of tropical Africa's livestock resources any international effort in the field of livestock productivity and research is likely to be of little avail unless it is geared directly to improving the systems in which the bulk of Africa's meat and milk is produced.

CHAPTER FOUR

THE ROLE OF INTERNATIONAL RESEARCH

Summary of the Need

The facts and arguments presented in the previous chapter have led the Task Force to the following conclusions.

1. It is technically possible to bring about a substantial improvement in the level and efficiency of livestock production in tropical Africa, and for economic, social and ecological reasons such a improvement is urgently needed.
2. Social and economic factors are the major constraints limiting the rate of livestock improvement in most localities. Nevertheless significant changes are occurring and there are grounds for believing that many governments and peoples are prepared to accelerate the speed of change even in the sensitive areas of social, fiscal and land reform.
3. Although there exists a great deal of information concerning animal health and production in tropical Africa, much of this knowledge is not readily available to research workers and planners nor is it in a form appropriate for development purposes.
4. Many animal research stations already exist in tropical Africa but shortages of scientific staff and finance impose severe limitations on the scope and effectiveness of current research programmes.
5. There is a serious lack of research and survey work in economics and social anthropology as they relate to animal production and further biological research on various aspects of animal health and production is urgently required. Of even greater importance, few efforts are being made to integrate the biological, economic and social aspects of research programmes. In consequence differences in attitudes and objectives occur between various authorities and departments responsible for formulating livestock research and development plans and the agencies which implement them.

6. Hopeful progress is taking place in livestock production, including the development of several major schemes of ranching, cattle fattening and small-holder development. The progress of such schemes needs to be systematically monitored so that the planning of future programmes can be further improved.

Recommended Aims of International Research

These conclusions have led the Task Force to believe that a contribution by the Consultative Group to the livestock research needs of Africa would be thoroughly justified provided that its specific focus is integrative research centred upon the multidisciplinary study of existing animal production systems and the formulation of new or amended systems. This would necessarily involve social anthropologists and economists as well as biologists and would seek to:

- quantify vital herd statistics, husbandry methods and animal performance in relation to the environment and to the material and cultural needs of particular societies;
- establish relationships between the biological, environmental, social and economic components of production systems and identify points in the systems which are sensitive or resistant to change;
- identify those specific topics in which a lack of knowledge limits development and in which research is therefore a priority need.

Such a contribution would not only fill a major gap in the present organization of research and development but would serve to maximise past research and support ongoing programmes. It will complement, but in no way duplicate, the work of the various research stations and universities which already exist in Africa. Moreover this orientation and approach will provide the appropriate context for the other associated activities which we believe to be most desirable.

Thus the Task Force recommends that a new International Centre for the Development of Animal Production in Tropical Africa should engage in

the following set of limited and carefully defined activities, which are listed in the chronological order in which they would be developed:

- to retrieve, assemble and make available in both English and French all information relevant to animal production in tropical Africa;
- to engage a multidisciplinary team for a research study of existing animal production systems with a view to designing and testing new or amended systems and defining future research priorities;
- to support and cooperate with existing national and regional research stations in developing a fully coordinated programme of multidisciplinary research encompassing a full range of ecological, economic and social conditions and relating appropriately to the urgent needs of livestock development;
- to develop the capacity to undertake specific research programmes which for one reason or another are appropriate to an international centre and which are not being undertaken elsewhere;
- to provide, or assist in providing, suitable training programmes for personnel engaged in livestock research, extension, planning and production;
- to make available statistical support, information or advice to national, regional or international authorities who may seek it, in the various fields relating to animal production in which the Centre is actively engaged.

In all of these activities, the Centre should seek every opportunity of cooperation with existing institutions in Africa. The ultimate success and effectiveness of the Centre will depend upon its influence through the activities of national and regional institutions rather than directly through its own activities. In order to be influential the Centre must achieve an appropriate status and identity of its own, but it should not put itself into competition with existing institutions. Its essential role should be complementary, cooperative and catalytic.

The recommended programme of work is set out in the following section. This programme is intended to provide only sufficient detail to support an informed discussion on this proposal and on its attendant financial and organizational implications. Necessarily considerable discretion and freedom of action has been left to the future Governing Board, Director-General and staff of the Centre.

Recommended Programme of Work

Documentation and Information

The Task Force regards the development of an efficient documentation and information service as being vitally important, particularly in the early life of the Centre since, to a considerable extent, it will establish the framework on which the other activities of the Centre will be based. The Task Force has itself assembled a considerable bibliography and collection of documents (see Annex II) but we recognise that, with the limited time and facilities available to us, it has not been possible to do more than identify the need.

A specialist staff is needed to collect, collate, analyse and disseminate all the relevant information that is available, including an inventory of ongoing research programmes. It is envisaged that this staff will provide an information service for the livestock research and planning authorities in Africa, and will publish bibliographies and reviews on particularly important topics. It is essential that its activities should be bilingual, thus bridging the gap between the Anglophone and Francophone literature.

It has already been noted that much of the information collected at African research stations has never been published. Largely because of staff changes and a lack of continuity in research policy, a substantial collection of important and reliable information remains in the files of these stations. An essential part of the proposed documentation service would therefore be the retrieval, storage and classification of these results so that they are readily available in a form designed to meet specific development or research purposes.

A further important activity will be the collection of statistics relating to animal production in Africa. At present the methodologies of collecting statistics as well as the reliability and availability of the data are open to serious criticism. It is envisaged that the activities of the International Centre would aim to improve the methods and extent of recording livestock statistics, and that the Centre would cooperate with national authorities to increase the reliability and usefulness of statistical information.

The proposed staffing pattern for the Centre provides for a range of specialists to assist the documentation, information and retrieval activities and also includes specialists in communications so that the information disseminated by the Centre will be designed both to have the maximum impact and to help and encourage national extension authorities in their own communication activities.

For all of these activities it will be necessary for the Centre to house a complete library, documentation and reference bureau.

In the course of these activities it is important that the Centre should cooperate fully with the existing national and international organizations which are operating in similar fields. For example, a close liaison should be maintained with the Inter-African Bureau of Animal Resources (which is a branch of the Scientific, Technical and Research Commission of the Organization of African Unity) and with the various abstracting and review bureaux in Europe (e.g. IEMVT and the Commonwealth Agricultural Bureaux). We are aware that FAO has already taken the initiative in proposing the establishment of both an International Information System for the Agricultural Sciences and Technology (known as AGRIS) and a Computerized Agricultural Research Information System (CARIS). These projects are designed to achieve their aims through an international pooling of efforts

and resources under the aegis of FAO. We believe that the Centre will benefit from these developments and that it will also be able to make a valuable contribution to them.

Animal Production Systems

It has already been emphasised that technical answers are available to many of the specific problems facing livestock development of Africa. The major constraint lies rather in the difficulty of introducing change into existing socio-economic systems, combined with inexperience in adapting technologies to suit local situations.

The first task of the interdisciplinary team would be to gain a basic appreciation of the major livestock production systems of Africa, by the study of all available literature, a review of ongoing research programmes, and widespread travel and survey. From this base the team will then be expected to devise its own programme of studies.

Having established broad frameworks for systems studies, it is anticipated that a more analytical phase will soon follow, which will both identify areas of specific ignorance which deserve priority attention in future surveys and research, and suggest new or amended systems of animal production. This research effort will concentrate on techniques of rangeland management, livestock production, disease control and marketing which could be incorporated in future development schemes. Such techniques and systems will almost certainly require validation and further investigation, either at the Centre itself or within a cooperative programme at national stations, so that a constant interplay can be expected between research and development planning.

Emphasis initially should be given to studies of those societies which at present own most of the livestock, but with the objective of expanding, as soon as possible, to embrace a wider range of agricultural and commercial systems. When the

appropriate methods and teamwork have been established regional units might possibly follow.

It will also be important to examine the response of traditional systems to development processes. Indeed, the monitoring of ongoing development programmes needs to receive a high priority, since these programmes represent unique experiments which can never be reproduced in the confines of a research station. If not given early attention, a great volume of information crucial to future livestock development will be lost. At first these studies are likely to be mainly in eastern Africa, where existing development programmes already affect a wide range of pastoral societies, though they would be selected also for their wider relevance to Africa as a whole.

The envisaged programme will combine the latest techniques of mathematical simulation and modelling with constant field investigations, and will therefore require close liaison with national workers in related fields. There will need to be regular meetings to discuss ongoing programmes, principles and objectives, and to allow for joint planning.

No single institution could develop the complete range of specific livestock systems which is needed to cover all the diverse conditions of tropical Africa, but the basic studies of the proposed Centre will concentrate on the development of production systems in selected but real situations. These will then serve as comparative methodological models to stimulate and promote consideration and attack on this problem by national authorities.

It needs to be emphasised that the activities which are separately described as information services, training and production systems research are, in fact, closely related and best considered as a single, well-integrated continuum. Thus the research team will be dependent on the work of the information staff and will participate in survey and data retrieval activities. Similarly the range of training activities will be influenced by, and largely dependent on,

the participation and progress of the information section and the research team.

Cooperative Research Programmes

Most African authorities supported the principle of an international centre, though it was made clear to us that such a centre would only be welcomed if it:

- supported and complemented national programmes of research and avoided undesirable overlap or duplication;
- attracted additional financial support from donor agencies and did not syphon off support which at present goes to national stations or which national stations might reasonably seek in future;
- did not disrupt local staffing patterns and recruitment by offering superior salaries and conditions to the limited number of scientists on which national research programmes now depend;
- recognised that the diversity of ecological, economic and social conditions across tropical Africa is such that most applied research concerned with livestock production needs to be done in particular localities and cannot be concentrated at a single research station.

The Task Force agrees with these views and recommends that the Governors and staff of the Centre keep them prominently in view as the Centre and its programmes develop. This will then ensure that the Centre will function in such a manner as to strengthen and support national programmes of research.

Such an approach is already a prominent characteristic of the older international centres. However, whereas centres such as IRRI and CIMMYT have been able to use the distribution of improved genetic materials as a convenient basis on which to build their cooperative programmes, no comparable distribution is practicable in the case of a livestock centre. Instead the

cooperative programme will have to be built on training and support to national research projects. It is to be hoped that the Centre will also contribute through influencing attitudes to research and development planning but it is likely that, in the first instance, support to national research projects will be the contribution that is most easily appreciated and, therefore, most warmly welcomed.

It is therefore recommended that where the Centre has identified a project in a particular location as being of priority importance, it should have the capability of supporting it with suitable finance and staff. Normally this will be done by seconding small teams of Centre staff to national or regional institutions to undertake specific projects for specified periods of time. These projects will be those that are regarded as "essential" for the Centre's own overall programme but are best carried out on existing stations elsewhere. In such cases the cooperating stations would be required to afford an appropriate degree of autonomy to the out-posted Centre staff.

The full nature of the cooperative research programmes cannot be predicted at this stage. A large part will arise directly from the analysis of production systems while other parts will emerge as a sequel to research meetings between national and international representatives. However, certain fields of activity can be anticipated.

Research in the Sahelian and Soudanian zones is likely to range from the control of desert encroachment in the drier extremities to maximising the advantages of cultivable land in the more humid areas. Since this is an important livestock breeding zone a critical area of research will be the improvement of reproductive performance and the reduction of calthood mortality in the indigenous zebu cattle. Dry season nutrition and parasite control are other obvious topics that will need attention, as well as comparative studies on calf rearing, to determine the feasibility of removing cattle from the region at a young age for fattening in higher potential areas.

Work designed to favour stratification in the livestock industry will need to be pursued also in the more humid agricultural and forest lands. Important subjects for examination here will be the use of agricultural surpluses or by-products for intensive livestock feeding and the introduction and use of improved grasses and legumes. There is also a need for studies into the basis of trypanosomiasis tolerance in the N'Dama and related breeds of cattle, as well as for work on cross-breeding to produce animals capable of optimising the use of improved pastures in the humid tropics.

The eastern rangelands share some problems with the rangelands of West Africa but require less emphasis on calfhood mortality and more on maximising offtake through institutional incentives, improved marketing and better husbandry. More emphasis is also needed on grazing systems for the better utilization of the natural vegetation, and on comparative studies on wildlife and wildlife-livestock relationships.

Throughout all of the drier rangelands of tropical Africa there is a need to establish criteria and appropriate methods for assessing range condition and trend. Although these are essential management tools, appropriate methodologies for African conditions have yet to be developed. Attention also needs to be given to the effects of development in the cattle industries on the status, productivity and marketing of other herbivores, both domestic and wild.

Training

Closely allied to the documentation and research functions will be the training and conference activities.

The Centre would be expected to organize seminars and technical short courses on selected specialist topics, and frequently to act as host to such meetings (although some meetings may be held at other venues, e.g. universities, in Africa). In this class of meeting the international staff will not necessarily assume an instructor role. By providing opportunities for small groups of specialists from various parts of Africa (and, in appropriate cases, other parts of the world) to exchange views, experiences and results, the Centre would serve to facilitate and catalyse the free

exchange of information and the development of scientific thought among animal research workers in the tropics. These activities will also help to establish the Centre's position and partnership role in relation to national scientific staff and institutions.

There is also a need for specialist training in particular research techniques. For example, postgraduate courses are needed in statistical methods concerned with experimental design and analysis, in computer programming, and in the analysis of animal breeding records. We anticipate that courses would be offered for social scientists as well as biologists and that instructors would be engaged temporarily to help permanent staff members in running these courses. Provision may also be needed for certain types of specialised training to be undertaken elsewhere than at the Centre.

It is envisaged that the Centre would also provide opportunities for young research workers to experience periods of "in-service" training, during which the trainee would work as part of an established, multi-disciplinary team actively engaged in livestock research. Such experience would widen the trainee's technical skills, and would help to inculcate appropriate attitudes of enthusiasm, healthy scepticism, and an applied orientation. Thus we have recommended a staffing pattern which includes graduate trainees at the Centre who would participate in the work of the proposed research team.

Apart from technical training, we are persuaded that there is an urgent need for programmes organized specially for those responsible for the planning of the livestock industry. When the work of the Centre has been sufficiently advanced, senior officials from government departments of planning, agriculture and natural resources, together with heads of statutory marketing boards and similar institutions should be invited to participate in small, high-level seminars on policy and planning. Such seminars would consist primarily of an exchange of information and experience among participants, though they would rely also on the results of the Centre's research. Apart from establishing frameworks for future livestock research and development in Africa, such seminars would also serve to identify the position and role of the International Centre, thus strengthening its overall effectiveness.

Other Research Activities

In addition to the programmes summarised above, it is anticipated that the Centre will need to conduct special research projects on its own land at its own expense and under its own supervision. In general, this will apply when a project:

- is long-term and demands continuity of staff and policy;
- involves sophisticated equipment that is especially expensive and delicate;
- requires scientific supervision and control of an unusually high order; or
- concerns an important investigation of a basic type, the results of which are likely to have widespread application.

Because it is not possible to foresee exactly the research needs that may be identified, or the extent to which existing facilities will meet the situation, it is not possible to anticipate what field facilities may eventually be needed by the Centre. Therefore, there is a case for delaying a decision on the siting and development of the field station facilities until such a time as the precise nature of the need for them has been established.

On the other hand, it is also possible to argue that at least a basic minimum of field facilities should be provided from the start in order to support the programme of training activities and ensure that the Centre staff are not cut off from the day-to-day disappointments, successes and frustrations of animal research. Further, the Centre may be unable to establish for itself a position of influence and leadership in African live-stock production until it has demonstrated its practical skills in animal production as well as its scientific expertise.

In this situation, the Task Force found itself unable to make a unanimous recommendation on the timing of the development of field station facilities. Although budgetary provision has been made for a station to

be established in Phase One some of us believe that this should have been delayed until specific needs have been identified.

Consultant Activities

As the various activities of the International Centre develop and its general status and standing become established in the broad field of animal production, we anticipate that its assistance will be sought by various national and international agencies responsible for planning and operating schemes of livestock development.

The experience of the international staff will enable them to make valuable contributions when invited to do so, and we believe that such an association with the development process will serve to keep pressing problems of an applied nature before the staff. The consultant role can therefore be expected to grow in importance, to the benefit of both the development process and the programme of studies at the Centre itself. However, care will be needed not to involve the Centre staff too deeply in tasks such as the identification, preparation or appraisal of projects for donor agencies. Nor should the Centre at any time encroach on the decision-making processes of governments.

Suggested Phasing of Activities

It is proposed that the International Centre should be established as quickly as possible, but that its development should be planned in two phases.

After the appointment of the senior administrative staff, Phase One should concentrate on the establishment of the documentation and information service, and the phased recruitment of the systems research team. All staff will begin by gathering background information and defining priorities but, as the work proceeds, their separate programmes will steadily emerge. Areas will be identified in which original research or survey work is needed, and in which seminars or workshops are most appropriate. As the work of the research group becomes more analytical it will be possible to identify research priorities for cooperative programmes or for special projects which may need to be investigated at the Centre itself.

Thus the first year of work will be devoted almost exclusively to documentation and information activities, including an inventory of ongoing research. By the end of the second year the programme of seminars and technical conferences should be established and the research on production systems will have begun. Although it will not be before the end of the third year that it will be possible to identify, establish and operate a comprehensive programme of project research in cooperation with national stations, it is anticipated that a start will be made with the cooperative programme in Phase One and budgetary provision has been made for this.

We propose that Phase Two should start at the beginning of the fourth year of work, and its planning should be based upon a detailed review of the progress made during Phase One. Such a review, after two and a half years, would aim particularly to define the need and extent of the cooperative research programme and would include the possibility of creating regional sub-centres.

At that time the case for broadening the programme of studies (in either a geographical or disciplinary sense) will have to be considered. However, the aims of the Centre need to be kept in sharp focus as too great an expansion of research involvement could seriously dilute the overall effectiveness of the Centre as well as greatly increase its costs. Inevitably the programmes will be multidisciplinary and complex but it is to be hoped that the Governing body and Director-General will curb excessive ambitions and over-complex administrative structures.

Therefore, although this Report outlines ways in which Phase Two might develop and the order of costs which might be involved, we recommend that these and any other proposals, be reviewed carefully by a Special Review Committee after the Centre has been operating for about two and a half years, i.e. towards the end of Phase One.

At the same time, it is appreciated that no hard and fast line can be drawn between these two phases, and therefore we recommend a limited budgetary provision in Phase One for such developments as may be necessary, at the discretion of the Governing Body and the Director-General, to lay a firm but flexible foundation for Phase Two.

Intercontinental Cooperation

In accordance with the Terms of Reference, this Report concentrates upon the research needs of tropical Africa and the impact which an international research effort might have upon those needs. However, it is emphasised that the envisaged Centre should also maintain close cooperative relations with various research organizations and universities in other parts of the world. The stress we have placed upon the multidisciplinary study of production systems as the core of the research programme makes such cooperation particularly important.

It is more usual for an animal production research centre to concentrate upon the investigation of biological problems by teams of biochemists, physiologists, nutritionists, microbiologists, geneticists, etc. Our departure from this model is not because we doubt its validity but rather because we believe that the greater need in Africa is for research studies on production systems which would seek to integrate and adapt existing and new knowledge to particular socio-economic and ecological situations.

However, the two approaches must be regarded as essentially complementary. Thus the proposed International Centre will rely a great deal on the basic biological studies being conducted by other organizations concerned with animal production in the tropics, such as the French Institut d'Elevage et de Medecine Veterinaire des Pays Tropicaux (IEMVT), the Australian Commonwealth Scientific and Industrial Research Organization (CSIRO) and the Instituto Interamericano de Ciencias Agrícolas (IICA). Also a great deal of basic work being carried out in universities and research institutes in Australasia, Europe, India and North America may have an important bearing upon animal production in Africa.

Therefore, we envisage that the staff of the Centre will maintain a continuing liaison with individuals and organizations in various parts of the world. Although the Centre will not wish to duplicate such work as that being done by CSIRO on tropical pasture and forage production, or by IEMVT on particular aspects of tropical animal diseases, it will seek to use the

results of these research programmes and to adapt them appropriately to the needs of particular production systems in tropical Africa.

Close contact should also be maintained with the animal research programme of CIAT and the studies of farming systems at IITA and ICRISAT. Similarly the work of the proposed animal research laboratory in Indonesia, which is to be operated jointly by the Indonesian Department of Agriculture and CSIRO, is likely to yield results of interest to workers in Africa.

At the same time, although the work of the Centre is designed specifically in relation to the needs of tropical Africa, we anticipate that it will have a value in a wider context. In particular we would expect that the approaches and methodologies developed by the Centre would be of interest and help to individuals and organizations in many parts of the world. Also certain of the Centre's training courses are likely to attract, and benefit from, participants from continents other than Africa.

CHAPTER FIVE

ORGANIZATION AND ESTIMATED COSTS OF AN INTERNATIONAL CENTRE

General Considerations

The Task Force considered several possible approaches to international livestock research in Africa. The option of recommending that no action at all should be taken at this time by the Consultative Group was discarded because the urgent need for developing Africa's animal production was recognized and the opportunity for an appropriate research programme to accelerate this development was identified. Similarly the possibility that a centre should be established with its headquarters in Europe was considered and discarded, mainly because of the overwhelming need to give the centre an African orientation and identity.

Three possible approaches were considered in greater detail, namely:

- increased support to existing national and regional efforts;
- the development of two or more centres of international research, either as new stations or by strengthening existing stations;
- the development of one headquarters centre, linked by an "outreach" system to the existing research effort.

The provision of increased support for existing work without any central coordinating mechanism seems unlikely to yield rapid advance. Each developing country is deeply concerned with solving its own problems and few can give much attention to the needs of their neighbours. Not only would there be differences in priorities between nations, but there could well be conflict within countries on what constitutes appropriate research for international funding. Furthermore, the dispersal of effort over a wide area would seriously

limit the depth in which any specific problem could be studied. Therefore although there is a clear need for additional funding for national stations, the Task Force does not regard this in itself as the most profitable method of utilizing new international support.

The establishment of a number of separate research centres might be more effective but would be very expensive. At least three major ecological regions would need to be covered, and the dispersion of staff over several centres could well result in slower progress at all of them. The estimates given later for the minimum staffing and budgeting of one international centre serve to indicate the costs which might be involved in establishing two or more centres. Moreover, a basic aim of the international effort should be to establish a closer integration between zones in the stratified development of the livestock industries. The development of separate centres in different ecological, political or lingual zones might detract from this cooperation and integration.

The Task Force concluded that the most effective form of international support would be to locate a research headquarters in an area where the animal industry is of major importance and to develop from that centre a comprehensive "outreach" research programme incorporating a network of national and regional stations. Other international centres (e.g. IRRI and CIMMYT) have demonstrated that an effective pattern can be built in this way.

Location of the Centre

The ideal requirements for the location of the headquarters of the Centre are as follows:

- (i) Ready accessibility to an international airport which has good connections to East, Central and West Africa.
- (ii) Proximity to a population centre which enjoys a tolerable climate and provides reasonable amenities to staff members and their families (shopping, education, health services and entertainment).

- (iii) Desire on the part of the host country to have the Centre and willingness to provide tax and import concessions and other privileges appropriate to an international centre.
- (iv) Availability locally of trained personnel sufficient to provide the required supporting scientific, technical, administrative, clerical and domestic staff.
- (v) A social and educational environment that would readily accommodate French and English speaking people and which could provide bilingual support staff.
- (vi) Proximity to a range of ecological conditions, diverse animal production systems and ongoing schemes of live-stock development.
- (vii) Availability of field research facilities within a reasonable distance of the Centre headquarters.
- (viii) Proximity to a university which has active programmes of study in agricultural economics, sociology, agriculture and veterinary science.

The following specific locations were identified as possibilities: Abidjan (Ivory Coast), Addis Ababa (Ethiopia), Dakar (Senegal), Kampala (Uganda), Nairobi (Kenya), Yaounde (Cameroon), and Zaria (Nigeria).

Abidjan is an active city with a large expatriate population. It houses the headquarters of the African Development Bank and the regional office of the World Bank in West Africa. The climate is humid and can be oppressive during the hot season. The city probably has the best air connections of any city in West Africa, although the service to East Africa is still somewhat limited. Medical, shopping and schooling facilities are excellent although good schooling to university entrance level is only available in the French language. There is a local University, of which l'Ecole Nationale Superieure Agronomique (ENSA) is a part.

There is considerable interest in livestock development on the part of the Government, particularly in view of the increasing drain of foreign exchange due to imports of livestock products. However, the cattle population is one of the smallest in the region (0.3m) and is located mainly in the north of the country. The main livestock stations are in the north (Korogo) and in the centre (Bouake). The range of ecological conditions is limited.

Addis Ababa has a large expatriate population and is the headquarters of the ECA and the OAU. It has a cool and healthy climate although the high altitude (2500 m) does not suit everyone. Air connections are already good and appear to be improving further. It possesses the best schooling facilities of any African city for expatriate children in that schooling is available in English, French, German, and Italian. Medical and shopping facilities are reasonable and improving but are still not as good as some other cities. A University exists in Addis but the Agricultural Faculty is at Alemaya, 500 km or one hour's flight away. A Veterinary Faculty is soon to be established but whether it is to be at Alemaya or Debre Zeit has not yet been decided.

The country has by far the largest cattle population in Africa (26 million). It also has a wide range of ecological conditions, although close to Addis Ababa it is highland country, and field stations under typical Sahelian and humid tropical conditions are not available in Ethiopia. Several government stations and ranches exist, most with limited staff and facilities at present. There are several development schemes just starting.

The Government strongly supported the concept of the Centre and expressed its desire to have the headquarters located in Addis Ababa. They indicated their readiness to provide the necessary requisites and conditions for such a centre. An Addis Ababa location appeared to be acceptable to most donors and African countries, particularly those who prefer a location that is not strongly identified either with Anglophone or Francophone attitudes.

Dakar has a dry and pleasant climate and good living conditions for expatriates, though schooling facilities only exist in the French language. The city is served by good air connections to Europe and West Africa but has limited flights to East Africa and is isolated geographically because of its location on the extreme west of the Continent. The supply of bilingual staff is very limited.

Although only the Soudanian zone is immediately accessible from Dakar, conditions tend towards Sahelian in the north of Senegal and towards Guinean in the South. The main animal production research station is at Dahra, 260 km from Dakar in the Sahelo-Soudanian zone, and there is a large and well-equipped veterinary research laboratory managed by IEMVT in Dakar. The University of Dakar has just started a Veterinary Faculty but lacks a Faculty of Agriculture. There is a large commercial feed-lot outside Dakar and a pastoral development programme in the north but the range of livestock development schemes is still limited.

The Task Force gained the impression that the Government had a limited interest in hosting the Centre although the matter was not discussed in precise terms.

Kampala provides reasonable living conditions for expatriates though schooling is limited at the high school level, especially for non-English speakers. There are University faculties of Agriculture and Veterinary Science at Makerere University. Air connections are moderately good, especially via Nairobi.

Within a few hours driving of Kampala there are a number of research stations and a range of different ecological zones. There is an active development programme.

The Government had some reservations about the likelihood of success for the proposed Centre and did not indicate that they would be enthusiastic to act as host.

Nairobi is probably the most attractive city in Africa in terms of living conditions for expatriates. Air connections are good both to Europe and the rest of Africa, although there is still room for improvement in services to the West. Medical and shopping facilities are excellent but schooling in French and German is limited. There is a local University with a flourishing Veterinary Faculty and a more recent Faculty of Agriculture.

The country has an important cattle industry and a good network of livestock research stations. Although Nairobi itself is situated at 1,650 m. elevation, drier and lower conditions lie within a reasonable distance (as also does land of higher potential) and there are good prospects of finding a suitable location for a field station. There are also in Kenya opportunities for collaboration with a wide range of ongoing development programmes. The headquarters of IBAR are in Nairobi and it seems likely that ILRAD will also be located near at hand.

Indeed, it is just this strength of the Nairobi location that has led some people to express the opinion that the new Centre would be better located in an area where its impact might be more readily identifiable. This sentiment appears to be sympathetically understood in Kenya which expressed considerable interest in the Centre without pressing for Nairobi to be the headquarters location.

Yaounde is an attractive city with a limited but nevertheless adequate range of social, educational and medical facilities. Air connections are moderately good, particularly when connections via Douala are included.

The main advantages of Yaounde are that it is the capital of the only bilingual country in Africa and that the Government would warmly welcome the Centre. The University has an Agricultural School and, if the Centre was located in Yaounde, field station facilities would probably be available adjacent to the University Farm, about 10 km from the city.

A wide variety of ecological conditions exist in the country - from Sahelian zone in the north to Guinean rain forest in the south, with

substantial areas of highland plateaux - but the livestock population is more restricted, numbering barely 2 million cattle and 4 million sheep and goats.

Zaria is the site of the Institute for Agricultural Research and Ahmadu Bello University with strong Faculties of Agriculture and Veterinary Medicine. It is an attractive area climatically but from the point of view of the Centre its distance from an international airport is a serious disadvantage. Also several people have suggested that since the only international centre already in Africa (IITA) is in Nigeria her neighbours and some donor agencies might not readily accept that a second centre should also have its headquarters in that country.

Zaria offers access to a good range of ecological conditions but it is a relatively small city and the supply of local supporting staff, particularly those that are bilingual, would be limited. Schooling facilities also are limited. Although the Task Force does not regard Zaria as the best place for the Centre it could play an important part in the projected cooperative research programme.

It is clear that none of these possible locations can be judged to be ideal from all points of view. However, the Task Force is agreed that the choice can be limited to Addis Ababa, Dakar, Nairobi and Yaounde, and that first consideration should be given to Addis Ababa. This recommendation is based on Ethiopia's large cattle population, potential for development and general international acceptability (though one of us is uncertain that the 'acceptability' of Addis Ababa outweighs the advantages of Nairobi).

From discussions held in Addis Ababa it seems likely that a satisfactory location for the headquarters could be made available in the city with ready access to the airport. We envisage that such a site, of about 10 ha, would accommodate the administrative, systems research, documentation, information and training activities of the Centre. The choice of field station facilities may be more difficult. Although suitable highland sites could be made available close to Addis Ababa or at Debre Zeit (the location of the Imperial Veterinary Institute,

the School for Animal Health Assistants and the University Research Farm), work carried out at these locations would be limited in its application. However, several alternative (or additional) sites were mentioned by Ethiopian authorities and some of these, in the Awash and Rift Valleys were visited by members of the Task Force. A more detailed study of these sites, including soil and water surveys, would be necessary before a final decision is made. However, for the reasons presented in Chapter 4, the Task Force does not think that it is essential to identify specifically the location of an Ethiopian field station before establishing the Centre headquarters.

Should the Consultative Group wish to establish the Centre headquarters in West or Central Africa, the Task Force recommends that consideration should be given to Yaounde.

Administration and Governance

It is envisaged that the Centre would be administered by a Director-General who would be nominated by the Consultative Group and approved by a Governing Board.

The Director-General would be responsible for the internal operation and management of the Centre and for ensuring that the programme and objectives for the Centre are properly developed and carried out. He would be a member of, and would serve as Executive Secretary to, the Board. The Board would be responsible for the development and/or approval of the policies under which the Centre operates and would approve the appointment of all senior scientific staff on the recommendation of the Director-General. The Board would also review and approve the budget estimates for the Centre.

Governing Board

It is envisaged that an Interim Board of five to seven members would be designated by the Consultative Group to serve a period of one year or until a permanent Governing Board is fully constituted. If the permanent Governing Board is patterned on existing international

centres, it might consist of up to fifteen members selected on the following lines:

- (i) Three representatives from the host country, to be chosen from such persons as the Minister or Secretary of Agriculture, Animal Industry or Rural Development (as appropriate), the Minister or Secretary of Planning, the Director(s) of the relevant technical department(s), or the Vice Chancellor or Dean of Agriculture of the National University.
- (ii) Three representatives of the Consultative Group on International Agricultural Research.
- (iii) Six or more representatives from the scientific, agricultural and educational leadership of the countries to be served by the Centre including at least three from West Africa, with at least two of these members being from the Francophone countries.
- (iv) Not more than two non-African scientists of international repute who are familiar with the problems of livestock research and development in Africa.
- (v) The Director-General of the Centre (Executive Secretary).

The Consultative Group would be responsible, in consultation with the Interim Board, for constituting the above Board, and for designating its chairman and the members appointed under headings (ii)-(iv). Two of the eight members appointed under headings (iii) and (iv) would be appointed for one year and three each for two and three years; thereafter the Board itself would designate successors to non-ex-officio members whose term shall expire, or who leave the Board for other reasons. Members appointed under headings (i) and (ii) would be ex-officio and would hold office at the pleasure of the responsible Minister of the host country and the Consultative Group respectively.

Programme Committee

The Task Force further recommends that a committee of scientists should be constituted, four to six in number, consisting of outstanding scientists competent to assess the quality of the work in the biological, economic, sociological and communications programmes of the Centre. The committee would conduct an annual review of the programmes of the Centre, assessing their quality, accuracy, strengths and weaknesses, and would advise the Board as to how these programmes should be modified to meet changing needs.

The Committee should contain two or three scientific members of the Board and one of these Board members should be Chairman of the Committee and should report its activities to the full Board. The Programme Committee should meet at least once annually, in advance of the annual meeting of the Board.

Relations with ILRAD

Since the aims and activities of ILRAD and the present Centre are closely complementary, it is desirable that their programmes and financing should be coordinated. This could be arranged in various ways, from placing ILRAD completely within the organizational structure of the new Centre, under the same Director-General and Governing Board, to having two autonomous institutions between which there are frequent, though largely informal, contacts at all levels.

From the scientific point of view there is likely to be little, if any, advantage to either institution in uniting a laboratory staff "composed of specialists who will focus on fundamental aspects of host resistance or tolerance and the processes and mechanisms of immunity to protozoan infections" (ILRAD Proposals) to a second team of field oriented biologists, economists and social anthropologists who will be analysing systems of animal production. On the other hand, common

direction would ensure that, in the longer term, any major changes in programme emphasis would be fully coordinated.

Since there is no irrefutable argument in either direction, we believe the final decision is best deferred until questions of siting and host country relationships have been resolved.

Host Country Relations

Prior to establishment, the Centre must be provided with appropriate legal status by the host country, adequate to enable it to function effectively as an international centre. The Task Force believes that specific legislation should be worked out with great care prior to any firm commitment, so that the authority and status of the Centre and its programmes are assured.

In particular, arrangements and assurances are needed for expeditious movement of:

- staff members;
- visiting scientists, administrators and trainees;
- semen, ova, animals and plant material; and
- research data and results.

Agreement must be assured that there will be no restrictions on the appointment and posting of staff or on the entry and participation of scientists, trainees, and other visitors. This must be established irrespective of whether or not the host country has active diplomatic relations with the country of origin of the individual concerned, subject only to normal checks and clearances required for security purposes.

Additional assurances will be necessary for the establishment of a quarantine unit, in association with the Centre, to assure prompt examination of incoming and outgoing livestock shipments and thus avoid any unnecessary delay of animal movement. In principle, no restrictions are anticipated

other than the examination necessary to avoid the import or export of diseases and pests which might pose a threat to the livestock industries of the host country or to others to which animals, semen or ova may be sent.

Provisions will also be needed covering tax exemptions for non-national staff members and personal and scientific equipment and effects. These should follow the provisions established for existing international centres, with any additional provisions which the experience of other centres has shown would be required for smooth and effective operation of the programme.

In the case of Ethiopia, the Minister of Agriculture has already indicated that no difficulty need be anticipated in reaching the required agreements with the Imperial Ethiopian Government.

Staffing

Employment policies and conditions for senior scientific staff should be on an international basis without discrimination as to nationality or origin or any considerations other than scientific and professional merit and performance.

It would be hard to over-emphasise the importance and the difficulty of recruiting first class scientists who can work together as an effective multidisciplinary team and who combine their specialist expertise with a broad and practical "development orientation". We therefore urge that recruitment procedures should be cast as widely as possible and that there should be no hurry to complete the staff establishment according to any particular time-table. Rather we would prefer to see the central research team grow steadily from a carefully hand-picked nucleus of five widely experienced scientists (animal scientist, biometrician, ecologist, economist and social anthropologist). This nucleus team should include experience of the systems approach and of African livestock production.

Since the Centre will operate in both English and French-speaking African countries it is desirable that all senior staff be able to work fluently in these two languages. To this end staff who are not bilingual

in English and French should undertake a course in the appropriate language, at the Centre's expense, prior to assuming duty with the Centre.

Technical, clerical, administrative and operational support personnel should be drawn largely from the host country and should be employed under terms and conditions approved by the Governing Board. Conditions of employment for such personnel should approximate accepted norms of the host country, but with such modifications as may be necessary to assure availability of qualified and competent staff.

Phase One

Although the Director-General will require latitude to develop organizational patterns and methods of programme administration, a projected staff complement for the first phase of the Centre's operations is set out below, as a guide for estimating personnel and related requirements. This list excludes the requirements of ILRAD.

Administration

Director-General

Director of Research

Director of Documentation and Training

Treasurer/Controller

Administrative Officer

Central Research Team (Animal Production Systems)

Animal Scientists 3 (Animal Breeder
Animal Nutritionist
Epidemiologist)

Ecologists - 2 (Range Ecologist
Wildlife Ecologist)

Economists - 2 (Marketing Economist
Production Economist)

Social Anthropologists - 2

Biometrician - 1

Forage Crops Agronomist - 1

Hydrologist/Climatologist - 1

Documentation and Training Section

Chief Librarian

Communications Specialist (Audio-visual aids and publications)

Data Retrieval Specialist

Head of Translation Unit

Information Officer/Editor

Liaison and Training Specialists (2)

The proposed senior staff will need the regular support of assistant scientists, research assistants and lay staff. These will include data analysts, abstractors, translators and field staff. In addition, provision should be made for visiting scientists.

Further, the scope and variety of research activities and the productive output of the Centre's staff could be increased significantly through the planned use of trainees. Thus it would be expected that the Centre would accept as many trainees as the staff and facilities can accommodate. Under appropriate supervision, these trainees would play an important role in the research activities of the Centre, and in the process gain valuable experience of the interdisciplinary systems approach.

Table 1 presents by years the numbers and categories of staff and trainees that might be engaged in the Centre's programmes during Phase One. This Table shows the manner in which the central research team is expected to grow progressively over the years. While the main cooperative programme will not be developed until Phase Two, provision is included for one outposted research unit to be established in the last year of Phase One.

Phase Two

In the third year of operations the Director-General would be expected to prepare his proposals for the next five years for examination by a Special Review Committee appointed by the Consultative Group. These proposals would cover such possibilities as:

- expanding the central research team;
- recruiting permanent or fixed-term research staff for the cooperative programme with national stations;
- increasing the number of field stations run by the Centre.

Clearly the definition of the staff requirements after the third year will depend on the findings of the central research team and the opportunities offered for developing the cooperative programme. Broadly speaking the Task Force envisages that the central research team might expand by about four posts in this quinquennium and that cooperative research programmes with national stations might be expanded at the rate of one per year, each involving 3-4 outposted scientists. These figures are offered at this stage to indicate the type of budget that might be involved, as presented below.

It is also possible that in Phase Two a case will be established for a new international sub-station to serve the drier rangelands. At present there is only one station in the whole of the Sahelian zone (Toukounous, Niger) and none in the equivalent zone of eastern Africa. There is relatively little information on which to base the rational utilization of this land and, in particular, there is a need for long-term management studies. If the site were in West Africa it would have the added advantage of providing a base for a regional survey and systems team studying the Fulani and related systems. There should be little difficulty in locating a suitable site in Mali or Niger at the appropriate time.

It is not anticipated that the Centre will establish any other regional units, except perhaps in Central Africa, in the event of national

development plans for the intensive development of miombo belt for livestock. It would seem unlikely at this stage that any new station will be established in the rain forest belt, which is already served by IITA. The inclusion at IITA of studies on the role of livestock in the agricultural systems of the forest belt could well develop as a natural progression of IITA's existing work on farming systems.

Capital Development

It is envisaged that the headquarters of the proposed Centre will include the following buildings or capital works:

Administrative headquarters

Dining and recreation facilities

Housing for senior staff

Library and documentation bureau

Research building

Residence for trainees and visitors

Site works

Training and conference building

Workshop and store

The following cost estimates are based on the assumption that the Centre will be in Addis Ababa on a 10 ha site which we have been encouraged to believe would be provided by the Imperial Ethiopian Government.

Discussions with appropriate authorities in Addis Ababa led us to conclude that:

- it would be more economic to build staff houses than to rent them;
- there is no need in Addis Ababa to install air-conditioning or central heating;

- a number of large national and international architectural and building companies operating in Addis Ababa have had recent experience of designing and erecting buildings of the type, size and quality required for the Centre.

On the basis of estimates derived from recent building costs in Addis Ababa the following calculations have been made. It will be appreciated that these are approximations only and that a detailed review of all capital cost estimates will be needed immediately a decision in principle has been taken concerning the present recommendations. However in making these calculations we have purposely taken the highest of the range of figures given to us. Therefore we regard them as "realistic guesses" and would be surprised if they would need to be increased at the next planning stage.

<u>Building</u>	<u>Cost in US\$</u>
Administrative headquarters	210,000
Dining and recreation facilities	190,000
Housing for senior staff (24)	775,000
Library and documentation bureau	750,000
Research building	250,000
Residence for trainees and visitors	430,000
Site works (including water purification and storage, sewerage disposal, roads and landscaping)	165,000
Training and conference building	200,000
Workshop and store	80,000
	<u>\$3,050,000</u>
To which must be added: Equipment	1,000,000
Contingency	<u>500,000</u>
TOTAL	<u><u>\$4,550,000</u></u>

In addition to the capital needs of the headquarters, provision also needs to be made for the capital development of a possible headquarters field station (\$500,000) and for such facilities as may be needed in each of the cooperative research projects (\$200,000 per project).

Operating Costs

We have provisionally estimated annual operating costs by deriving these as a function of professional staff numbers and assuming that the total operating costs of each member of the professional staff will average \$80,000 per annum in 1973, rising by 8% per annum to \$148,000 by 1981. These figures,

which include training, documentation, research and all other costs, are derived from data collected from other international agricultural centres. They will need to be reviewed carefully when the Governing Board has approved the Director-General's detailed Programme of Work.

A Notional 8-Year Budget

Tables 1 and 2 show the projections of senior staff and total staff during Phase One of the Centre's development. Table 3 lists the estimates of capital and operating costs and shows how annual expenditures are spread over each year of Phase One and Phase Two. It will be seen that the total annual expenditure is expected to increase from \$3.11 million in 1974 to \$6.81 million in 1981, and that the total expenditure during the first 8 years will total \$37.12 million.

TABLE 1

Phasing of Senior Staff in Phase One

<u>Time Elapsed in Years After Consultative Group has Agreed to Finance Centre</u>	<u>Numbers of Senior Staff</u>				
	<u>0.5</u>	<u>1.5</u>	<u>2.5</u>	<u>3.5</u>	<u>4.5</u>
<u>Administration</u>					
Director General	1	1	1	1	1
Director of Research	-	1	1	1	1
Director of Documenta- tion and Training	-	1	1	1	1
Treasurer/Controller	-	1	1	1	1
Administrative Officer	1	1	1	1	1
<u>Central Research Team (Animal Production Systems)</u>					
Animal Scientists (3)	-	-	1	2	3
Ecologists (2)	-	-	1	2	2
Economists (2)	-	-	1	2	2
Biometrician	-	-	1	1	1
Social Anthropologists (2)	-	-	1	2	2
Forage Crops Agronomist	-	-	-	1	1
Hydrologist/Climatologist	-	-	-	-	1
<u>Communications & Training Section</u>					
Chief Librarian	-	1	1	1	1
Liaison & Training Specialists (2)	-	-	2	2	2
Information Officer/Editor	-	-	1	1	1
Data Retrieval Specialist	-	1	1	1	1
Head of Translation Unit	-	1	1	1	1
Communications Specialist	-	-	1	1	1
<u>Cooperative Research Team</u>					
Disciplines to be determined		-	-	-	4
	2	8	17	22	28

TABLE 2

Total Staff at End of Phase One (4.5 years after
Consultative Group has agreed to finance Centre)

<u>Programme Area</u>	<u>Inter- national staff</u>	<u>Research Assistants (a)</u>	<u>Visiting Scientists (b)</u>	<u>Training (c)</u>	<u>Clerical</u>
Administration	5				10
Central Re- search Team	12	40	6	36	20
Documentation and Training	7	25		21	10
Cooperative Research Team (d)	4	12	2	12	4
	28	77	8	69	44

(a) Young B.S. and M.S. personnel: 3 to 4 per senior scientist

(b) Dependent on need and availability (numbers purely illustrative)

(c) Junior research staff: 3 to 4 per senior scientist

(d) Assuming that one cooperative project is established in Phase One

TABLE 3

Estimated Capital and Operating Costs for Years 1 to 8

It is anticipated that enabling funds will be provided separately to cover the first 12 to 18 months subsequently the approximate annual costs will be:

			<u>Years</u>								
			<u>Phase One</u>			<u>Phase Two</u>					
			<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>Total</u>
<u>Capital Budget (\$m)</u>											
Headquarters			1.75	1.75	0.55	0.5					4.55
Headquarters Field Station					0.5						0.50
Co-operative Research Programme					0.2	0.2	0.2	0.2	0.2		1.00
Total Capital Costs \$m			1.75	1.75	1.25	0.7	0.2	0.2	0.2		6.05 m
<u>Operating Budget (\$m)</u>											
No. of Scientists at HQ			17	22	24	25	26	27	28	28	
No. of Scientists in the Cooperative Research Programme			-	-	4	7	11	14	18	18	
Total Operating Costs \$m			1.36	1.90	2.62	3.23	4.03	4.82	6.30	6.81	31.07
Total Annual Requirements \$m (Capital and Operating)			3.11	3.65	3.87	3.93	4.23	5.02	6.50	6.81	37.12

Name of the Centre

The Task Force has considered a variety of names for the Centre. Obviously the name should be self-explanatory and descriptive of the programme of the Centre. It should preferably be reasonably short and provide an acronym which is easily pronounceable and which carries a favourable connotation. The "Centre for Research on Animal Production" was rejected early in the deliberation.

Tentatively, the Task Force suggests the name "International Centre for the Development of Animal Production in Tropical Africa" (ICDAPTA) although an alternative with distinctive appeal is "Centre for Animal Production and Rangeland Improvement" (CAPRI). Two other possible alternatives are: "African Livestock Centre" (ALC) and "Animal Production, Health and Rangeland Improvement Centre for Africa" (APHRICA).

Future Action

Should the main recommendations of this Report be accepted it will be necessary to establish a mechanism for their implementation.

The Consultative Group will need to designate an Executing Agency to be responsible for the detailed planning and the initial stages of the establishment of the new Centre. The relationships between this Executing Agency, the Consultative Group (or its African Livestock Sub-Committee), the TAC, and their respective Secretariats and the Interim Board of Governors of the new Centre should be specified so that the lines of responsibilities are clearly understood.

In order that the Executing Agency should have adequate financial support for carrying out its task, a special fund should be established on lines similar to those which were established for ICRISAT. If this fund was set at a level of \$500,000 it would provide sufficient flexibility to ensure that finance was available for architectural and legal fees and for the renting of temporary facilities so that the Centre might be operational 12 to 18 months after receiving the approval of the Consultative Group.

The Executing Agency will need to appoint a Project Development Officer who will:

- 1) Reach an agreement with the Imperial Ethiopian Government (IEG) to establish the Centre as an autonomous, legally constituted, international, non-profit making, tax exempt, research, educational and training institution which would function along the lines indicated in this Report.

- 2) Carry out negotiations with the IEG to prepare the charter and the legal framework for the establishment of the Independent International Centre. The form of charter and the legal status of the Centre should conform to the pattern set by the existing international centres. The completion of this step should be a prerequisite to any capital commitment.

- 3) Identify candidates for the posts of Director-General and Administrative Officer and present to the Consultative Group (or its nominees) a short-list of candidates from which these appointments could be made. This step should be taken as soon as possible after agreement has been reached with the IEG and the charter and legal framework for the establishment of the Centre are assured.

- 4) Propose to the Consultative Group (or its nominees) suggested personnel to comprise the Interim Board of Governors.

- 5) Provide such administrative support for the Director-General as may be needed.

The first objective of the Director-General should be to develop a Programme of Work and Budget for the Centre. This should detail the nature of the research, training, information, outreach and collaborative programmes. Because of the complexity of this task the Director-General should seek the advice of a multidisciplinary panel of specialists with experience in the fields in which the Centre will be involved. He will also need to travel extensively within Africa and elsewhere in order to identify and liaise with potential cooperating institutions and individuals. This burden would be

lightened if at an early stage of operations he is supported by a high calibre Administrative Officer who is familiar with both the international agricultural network and the African scene.

Only when a detailed programme of work has been developed will it be possible to confirm the staffing needs and the capital and budgetary requirements of the Centre.

Thus a provisional timetable for the establishment of the Centre might follow the following lines, taking as its starting point the time when the Consultative Group gives its approval for the initiation of action.

Stage 1 (3 months)

- a) Establish the enabling fund and appoint the Project Development Officer.
- b) Negotiate an agreement with the IEG to proceed with the establishment of the Centre.
- c) Identify potential candidates for the posts of Director-General and Administrative Officer and possible members of the Interim Board.

Stage 2 (3 months)

- a) Draft the charter and legal framework of the Centre.
- b) Appoint Interim Board of Governors.
- c) Nominate the Director-General (or Interim Director-General) and the Administrative Officer.

Stage 3 (4 months)

- a) Establish the Director-General and Administrative Officer in Addis Ababa.
- b) Develop a programme of work and budget.
- c) Initiate architectural work and obtain preliminary costings.

Stage 4 (6 months)*

- a) Organize temporary office and library accommodation.
- b) Develop detailed plans for physical facilities and obtain tenders for construction.
- c) Commence recruitment of nucleus staff.

Stage 5 (12 to 18 months)

- a) Construct facilities.
- b) Continue recruitment of staff.
- c) Appoint full Board of Governors.

Stage 6

Declare open the International Centre for the Development of Animal Production in Tropical Africa!

*Note: It is envisaged that the \$0.5 m. enabling fund will cover operations other than Stage 4, item (c).

ANNEX I

ITINERARY

The itinerary, which lasted from March 30 to September 30, was arranged in the following stages:

1. North America and Europe
2. West and Central Africa
3. Europe
4. Eastern Africa
5. Europe and North America
6. Report Drafting
7. Europe, Ethiopia and North America
8. Final Report Drafting

The following pages list the countries, organizations and individuals that were visited in Africa, North America and Europe. Some of these were visited on several separate occasions.

AFRICA

CAMEROON

UNDP/FAO

M. Challons

Deputy Resident Representative

Ministere de l'Elevage

C. Fouapon

Secrtaire-General

F. N'zie

Directeur, Service de l'Elevage

N. Eyidi

Directeur-Adjoint, Service de l'Elevage

Ministere du Developpement de l'Industrie et du Commerce

L. Yinda

P. Atemezem

Ministere du Plan et de l'Amenagement du Territoire

N. Ngatchou

Secrtaire de la Recherche Scientifique

F. Ngone

Direction de la Recherche Scientifique

F.T. Nguyen

" " " " (UNESCO)

Amadou Bello

Directeur de la Programmation

M. Ecobo

Directeur-Adjoint de la Programmation

J.A. Minland

Chef de la Division des Syntheses

S. Jamet

Division Planification

M. Pem

" "

Universite Federale Cameroun

R. Branckaert

Ecole Federale Superieure d'Agriculture

Organisation Commune Africaine, Malgache et Mauricienne (OCAM)

A. Foalem

Directeur, Departement des Affaires
Economiques, Financieres et des
Transports

Visits included l'Ecole Federale Superieure d'Agriculture et Nkolbisson,
near Yaounde.

CHAD

UNDP/FAO

B. Ly

FAO Country Representative

Ministere de l'Agriculture

B. Lepissier

Service de l'Elevage (FAO)

Laboratoire de l'Elevage de Farcha (IEMVT)

G. Tacher

Directeur-Adjoint

Lake Chad Basin Commission

I. Licht

Economist (USAID)

P. Renard

Conseiller (FAC)

ETHIOPIA

UNDP/FAO

A. Hamersley

FAO Country Representative

M. Bellver-Gallant

JP 15

Ministry of Agriculture

H.E. Abebe Reta

Minister of Agriculture

H.E. Maaza Workinem

Minister of State

Haile S. Belay

Coordinator, Research & Services Department

A. Keshewalul

Head, Animal Production & Health

Asefa Woldegiorgis

Director of Veterinary Services

E. Beyene

Director, Animal Production Division

Hailu Kassa

Director of Livestock Farms

Ephrem Bekele

Range Management Officer

J. Fikre

Director, Imperial Veterinary Institute
(IVI)

G. Chamoiseau	Bateriologist, IVI (IEMVT)
H. Harding	Project Manager, Animal Health School (FAO)
S. Atnafu	Director, Animal Health School

Planning Commission

H.E. Telaique Gedami	Minister of State
----------------------	-------------------

Awash Valley Authority

A.G. Goudie	Farm Management Consultant (Australian Aid)
G. Lines	" " " " "

Dairy Development Agency

W. Mekasha	General Manager
R. Sandford	Production Manager (FAO)

Livestock and Meat Board

Behano Wakwaya	General Manager
----------------	-----------------

Haile Sellasie University

Mulugetta Wodajo	Academic Vice President
Abraham Besrat	Associate Vice President
Melak Mengesha	Dean of Agriculture (Alemaya)
Amare Getahum	Research Director "
W. Lockhart	Head of Animal Sciences "
R. Carr	Animal Sciences Department

Economic Commission for Africa (ECA)

R. Gardiner	Executive Secretary
F. Pinder	Special Assistant
E.A. Okwuosa	ECA/FAO Joint Division
E.E. Broadbent	" " " "

M.G. Leroy

ECA/FAO Joint Division

T.W. Sears

" " " "

Organization of African Unity (OAU)

J.D. Buliro

Assistant General Secretary

K.A. Quagraine

Head, Science & Technology Section

I. Macfarlane

Coordinator, JP15

Mission Veterinaire Francaise

J. Desrotour

Chef de Mission

USAID

D. De Tray

Senior Veterinary Adviser

L. Holdcroft

Food and Agriculture Officer

J.E. Walker

Manager, Southern Rangelands Project

IBRD

T. Finsaas

Country Representative

Visits included the Institute of Agricultural Research at Holetta, University College of Agriculture at Alemaya, Melka Werer Experimental Station (in the Awash Valley), the School for Animal Health Assistants and the Imperial Veterinary Institute at Debre Zeit, Adami Tulu Breeding Station, Abernosa Ranch and the Chilalo Agricultural Development Unit (CADU) Breeding Station at Goba.

IVORY COAST

UNDP/FAO

K. Englund

Resident Representative

J. Conde

FAO Country Representative

Ministere de l'Agriculture

A. Sawadogo

Ministre

Ministere du Plan

Y. Lemaitre	Conseiller Elevage
M. Montenez	Conseiller Agricole

Ministere de la Production Animale

Dicoh Garba	Ministre
G. Jourdain	Conseiller Technique
M. Rombeau	" " (FAO)
B. Gotta	Directeur, Service de l'Elevage

Ministre de la Recherche Scientifique

. Lohoury	Directeur du Cabinet
. Duplessis	Directeur des Affaires Scientifiques
L. Letenneur	Directeur, Centre de Recherches Zootechniques (CRZ) de Minankro (IEMVT)
J.C. Mathon	CRZ de Minankro (IEMVT)
P. Catala	" "
B. Gombaudo	" "
G. Roberge	" "
M. Richard	" "
D. Secq	" "

Ecole Nationale Supérieure Agronomique

R. Didier de St Amand	Directeur
-----------------------	-----------

ORSTOM Centre d'Adiopodoume

M. Goujon	Directeur-Adjoint
-----------	-------------------

Société de Développement des Productions Animales (SODEPRA)

P. Lamizana	Directeur
-------------	-----------

African Development Bank

. Sakka	Director of Operations
M. Negrin	Livestock Specialist

IBRD

X. de la Renaudiere	Regional Representative
K.H. Ochs	Livestock Specialist
C. Megas	" "

Conseil de l'Entente, Communauté Economique du Betail et de la Viande

. Gurgand	Conseiller Technique (FAC)
-----------	----------------------------

Visits included CRZ de Minankro at Bouake

KENYA

UNDP/FAO

Miss S. Drouilh	Deputy Resident Representative
L. Stenstrom	FAO Country Representative

Ministry of Agriculture

J. Kibe	Permanent Secretary
J.K. Ndoto	Deputy Secretary (Development)
J.S. Mburu	Director General, Technical Services
R.B. Ryanga	Under Secretary (Livestock)
J.J. Njoroge	Chief Research Officer
I.E. Muriithi	Director of Veterinary Services
W.M. Njoroge	Deputy Director of Veterinary Services
R.D.W. Betts	Head of Training Division
D.W. Ware	Head of Economic Planning Division
R.E. Gray	Economic Planning Division
Z. Owiro	Head of Animal Production Division

Ministry of Agriculture (Cont.)

H.W. Were	Senior Research Officer
I. Mann	Project Manager, AHITI (FAO)
L.R.N. Strange	Lecturer (Range Management), AHITI (FAO)
G.G. Kamau	Co-Manager, AHITI
A.M. Manyaya	Education Officer/Registrar, AHITI
M. Creek	Project Manager, Beef Industry Development (FAO)
D.G. Miles	Beef Industry Development Project, Lanet (FAO)
D.M. Redfern	" " " "
E.W. Schleicher	" " " "
H.A. Squire	" " " "
B. Rumich	Project Manager, Sheep & Goat Development (FAO)
G. Smith	Sheep & Goat Development Project, Naivasha (FAO)
C. van Velson	Project Manager, Dairy Research (Danish aid)
. Bonsma	Dairy Research Project, Naivasha
B. Mungi	" " ")
R. Njenga	" " ") (counterparts)
. Mbogoh	" " ")
A.K.A. Siele	Officer i/c National Sahiwal Stud
R. Tonn	Assist. to K. Meyn (German aid)
P. Bartilol	Officer i/c Naivasha Station
. Thorsen	Ag. Chief Veterinary Research Officer
J. le Roux	Chief Zoologist
V.L. Bunderson	Project Manager, Range Management (FAO)

Ministry of Agriculture (Cont.)

M.D. Gwynne	Range Management Project (FAO)
G. Boothby	" " "
E.C. Trump	" " "
C. Allen	" " "
J. Cassady	" " "
A.M. Chege	Ag. Senior Range Officer, Range Management Division
. Wanyama	Range Research Officer (Livestock Improvement)
. Nganga	Farm Manager, Kiboko Range Research Station
. Gitau	District Range Officer, Kajiado
P.J.E. Dorey	Ag. Head of Livestock Marketing Division
M. Mukolve	Provincial Director of Agriculture, RVP

Ministry of Finance

J.W. Yaa	Deputy Secretary
R. Clough	

Agricultural Finance Corporation

S.L. Ward	Ranch Division
G. Murphy	Field Officer, Ranch Division

Kenya Cooperative Creameries

E. Hastings

Kenya Meat Commission

L.A. Culver	Ag. Managing Commissioner
-------------	---------------------------

University of Nairobi

. Mugeru	Dean of Veterinary Science
. Contant	Dean of Agriculture
A.H. Jacobs	Institute of African Studies

East African Community

W.W. Rwetsiba	Minister for Communications & Research
C. Karue	Head, Animal Production Division, EAAFRO
H.P. Ledger	Animal Production Division, EAAFRO
G.L. Corry	Ag. Director, EAVRO
M.P. Cunningham	Project Manager, Tick-borne Diseases (FAO)
G.G. Wagner	Immunochemist, " " "

Organization of African Unity, Inter-African Bureau for Animal Resources (IBAR)

M. Sall	Joint Deputy Director
P.C. Nderito	" " "
K.O. Adeniji	Livestock Officer
. Dahab	Deputy Coordinator, JP 15

IBRD

W. Schaefer-Kehnert
. Adams

Visits included the Range Research Station at Kiboko, the IDA/SIDA Range Livestock Project at Ilkaputiei, the Animal Husbandry Research Station at Naivasha, the UNDP/FAO Beef Development Project at Lanet, the Veterinary Laboratories and the Animal Health & Industry Training Institute (AHITI) at Kabete, the Veterinary Faculty of the University of Nairobi, the East African Agriculture & Forestry Research Organization (EAAFRO) and the East African Veterinary Research Organization (EAVRO) at Muguga.

NIGER

UNDP/FAO

. Atchou	Deputy Resident Representative
A.S. Adande	FAO Country Representative

Ministere de l'Economie Rurale

Noma Kaka	Ministre
H. Baza	Directeur, Service de l'Elevage
P. Bres	Conseiller Zootechnique
R. Ferry	Directeur, Laboratoire de l'Elevage (IEMVT)
J.B. Haumesser	Laboratoire de l'Elevage (IEMVT)
R. Delavenay	" " "
B. Peyre de Fabregues	" " "
J.N. Chambellant	" " "
Van Sivers	" " " (German Aid)
Lawaly Adamou	Directeur, Station Sahelienne Experimentale, Toukounous
Djariri Badamassi	Zootechnicien, Toukounous
M. Trouette	Directeur, Abattoir

Visits included Kirkissoye Pilot Farm near Niamey, the Laboratoire National de l'Elevage and the Station Sahelienne Experimentale at Toukounous.

NIGERIA

UNDP/FAO

V. Rose	FAO Country Representative
R. Blainey	UNDP Deputy Resident Representative, Kaduna

Federal Ministry of Agriculture and Natural Resources

Bukar Shaib	Permanent Secretary
I. Mohamed	Director, Department of Livestock, Kaduna
D. Walker	Adviser, " " " "
M. Goni	Director, Department of Veterinary Research, Vom
M.A. Bhatti	Ag. Principal Research Officer, Vom
D.R. Nawathe	" " " " "
A.S. Sohael	" " " " "

North-East State, Ministry of Natural Resources

. Azenyake	Commissioner for Animal & Forest Resources
K. Imem	Permanent Secretary
I.M. Khalil	Chief Veterinary Officer
A.O. Hassanein	Provincial Veterinary Officer
M. Bulama	Senior Animal Husbandry Officer
. Zambuk	Range Management Officer
J.B. Cornforth	Principal Livestock Superintendent, Bornu

Livestock and Meat Authority

. Sigle	Veterinarian, Mokwa Ranch (German Aid)
. Chukwujchwu	Veterinary Officer, Mokwa

Ahmadu Bello University/Institute of Agricultural Research

I.S. Audu	Vice Chancellor, ABU
. Dafaalla	Provost, ABU
M. Dagg	Director, IAR
J. Davies	Deputy Director, IAR
E.H. Coles	Dean of Veterinary Medicine

Ahmadu Bello University/Institute of Agricultural Research (Cont.)

S. Dennie	Faculty of Veterinary Medicine
B. Koch	Head, Animal Sciences Department
P. de Leeuw	Officer i/c Shika Research Station
D.W. Norman	Head, Agricultural Economics Department
L.A. Tatum	Officer i/c West African Cereals Project

University of Ibadan

J.K. Loosli	Ag. Head, Animal Sciences Department
-------------	--------------------------------------

International Institute of Tropical Agriculture (IITA)

H.R. Albrecht	Director General
J.L. Nickel	Deputy Director
F. Moomaw	Head of Farming Systems Team
D. Headley	Agricultural Economist

Visits included IITA at Ibadan, Mokwa and Bornu Ranches, Ahmadu Bello University and the Institute of Agricultural Research at Zaria and the Federal Veterinary Laboratories at Vom.

SENEGAL

UNDP/FAO

J. Leger	Resident Representative
R. van den Ammele	Deputy Resident Representative

Ministere du Developpement Rural

T. D'Erneville	Directeur-Adjoint
J. Cissoko	Chef de Division
R. Kerkhove	" "
J. Croquet	" "
J. Orue	Directeur, Laboratoire de l'Elevage (IEMVT)

Ministère du Développement Rural (Cont.)

F. Sagna	Laboratoire de l'Elevage (IEMVT)
M. Rioche	" "
S. Toure	" "
A.K. Diallo	" "
R. Cadot	" "
J. Valenza	" "
R. Boudergues	" "
H. Calvet	" "
Ph. Martin	" "

Ministère du Plan

M. Thiaw	Directeur
El Shazly	Manager, UNDP Project SEN/71/525

Société d'Exploitation des Ressources Animales du Sénégal (SERAS)

M. Ba	Directeur-General
-------	-------------------

Université de Dakar

J. Ferney	Directeur de l'Ecole Veterinaire
-----------	----------------------------------

Organisation pour la Mise en Valeur du Fleuve Sénégal (OMVS)

Ould Amar	Secrétaire-Executif
Castiaux	Manager, FAO Regional Agricultural Project

USAID/FAC

H. Lepissier	Livestock Adviser
--------------	-------------------

Visits included Laboratoire National de l'Elevage at Dakar-Hann, and Nutri-Senegal at Bambilor (feedlot owned by General Chevance-Bertin).

TANZANIA

UNDP/FAO

L. Mattsson	UNDP Resident Representative
-------------	------------------------------

UNDP/FAO (Cont.)

B.B. Jensen

Ag. FAO County Representative

Ministry of Agriculture

N.K. Maeda

Chief Veterinary Officer

Il Molelian

Chief Research Officer (Livestock)

M. Milliken

Chief Planning Adviser (FAO)

Tanzania National Parks/Serengeti Research Institute

A. Mongi

Ag. Director, Tanzania National Parks

H.F. Lamprey

Director, SRI

T. Nchato

Deputy Director, SRI

USAID

O. Hess

Food & Agriculture Officer

UGANDA

UNDP/FAO

W.R. Prattley

Resident Representative

W. Holzhausen

Deputy Resident Representative

R. Stout

FAO Country Representative

Ministry of Animal Resources

B.W. Banage

Minister

H.S.K. Nsubuga

Permanent Secretary/Commissioner

G.K. Binaisa

Deputy Commissioner (Veterinary)

J.H. Kagoda

" " "

G. Sacker

Director, IDA Beef Ranching Project

D. McFarlane

Project Manager, Beef Development (FAO)

W. Querishi

Beef Development Project (FAO)

H. Ekhardt

" " "

Ministry of Animal Resources (Cont.)

G. Harrison	Pasture Research Officer, Mbarara
A. Sorensen	Principal, Dairy Training School
J. Mukibi	Principal, Veterinary Training School
S. Rogers	Ag. Director, Animal Health Research Centre
I. Robson	Tick Research Officer, " " "

Makerere University

R.H. Dunlop	Dean of Veterinary Medicine
K. Oland	Dean of Agriculture
H.H. Nicholson	Department of Animal Science & Production
J. Mugerwa	" " " " "

East African Community, East African Trypanosomiasis Research Organization (EATRO)

A.R. Njoga	Ag. Director
B. Allsop	Biochemist
G.J. Losos	Pathologist
F.K. Dar	Protozoologist
T. Ogado	Physician

USAID

V.C. Johnson	Director
--------------	----------

Visits included the Beef Ranching Project at Mbarara, Makerere University, the Animal Health Research Centre, the Veterinary Training School and the Dairy Training School at Entebbe, and EATRO at Tororo.

ZAMBIA

UNDP/FAO

A.C. Gilpin	Resident Representative
T. Rose	FAO Country Representative

Ministry of Rural Development

M.M. Babbar	Under Secretary (Planning)
R.J. Hughes	Economist
J. Vogt	Deputy Director of Agriculture (Research)
H.H. Scott	Director of Veterinary & Tsetse Control Services
I. Gordon	Chief Animal Husbandry Officer
A.H. Beaumont	Head of Land Use Services
N. Mumba	Chief Agricultural Research Officer
R. Craufurd	Legume Breeder, Mt Makulu
D. Cruickshank	Animal Husbandry Officer, Mazabuka
M.A.Q. Awan	Chief Veterinary Research Officer, Mazabuka

National Council for Scientific Research (NCSR), Animal Productivity Research Unit

A. M. Rakha	Principal Professional Officer
-------------	--------------------------------

University of Zambia

A. Quartermain	Senior Lecturer in Animal Sciences
----------------	------------------------------------

Visits included Mount Makulu Research Station and Mazabuka Central Research Station.

NORTH AMERICA

CANADA

Canadian International Development Agency

H. G. Dion	Technical Adviser (Agriculture)
------------	---------------------------------

International Development Research Centre (IDRC)

W. D. Hopper	President
J. H. Hulse	Programme Director, Agriculture Food and Nutrition Sciences

MEXICO

International Maize and Wheat Improvement Center (CIMMYT)

H. Hanson	Director-General
E. W. Sprague	Director (Maize Programme)
R. Ostler	Deputy Director

USA

USAID

S. C. Adams	Assistant Administrator for Africa
J. Bernstein	Assistant Administrator, Bureau for Technical Assistance (BTA)
R. L. Peterson	Deputy Assistant Director, BTA
O. J. Kelley	Director, Office of Agriculture, BTA
N. Konnerup	Animal Health Adviser
F. J. Spencer	Director, Regional Affairs (Francophone Africa)
.Ellis	Director, Regional Affairs (Southern Africa)
J. L. Cooper	Principal Agricultural Adviser, Bureau for Africa

UNDP

M. Gucovsky	Senior Technical Adviser
F. Vandemaele	Senior Technical Adviser

Ford Foundation

F. Hill	Program Adviser for Agriculture
L. Hardin	Program Officer for Agriculture

Rockefeller Foundation

S. Wortman	Vice President
J. A. Pino	Director (Agricultural Sciences)
J. J. McKelvey	Associate Director (Agricultural Sciences)

IBRD

R. J. Demuth	Chairman, Consultative Group/Director Development Services Department
L.J.C. Evans	Chairman, African Livestock Subcommittee/ Director, Agriculture Projects Department
J. M. Fransen	Agriculture Projects Department
H. Graves	Executive Secretary, Consultative Group
F. Kaps	Assistant to the Executive Secretary Consultative Group
D. Sutherland	Agriculture Projects Department
R. Khouri	" " "
R. Milford	" " "
M. Walsh	" " "
J. R. Peberdy	" " "
C. Chisholm	Consultant

EUROPE

BELGIUM

Administration Generale de la Cooperation au Developpement

Mme S. Vervalcke	Directeur a la Cooperation Multilaterale
J. Doumont	Principal, Developpement Rural
M. G. Stevens	

Universite de Louvain

R. Germain	Directeur, Laboratoire de Phytotechnique Tropicale
------------	-------------------------------------------------------

Rijksuniversitair Centrum Antwerpen

F. Evens	Directeur, Laboratorium voor Oekologie
M. Kollaart	Consultant

European Economic Community (EEC)

J. Ferrandi	Fonds Europeen de Developpement (FED)
P. Wirsing	" " "
A. Cerini	" " "
M. Gruner	" " "

DENMARK

International Development Agency (DANIDA)

Mrs. I. Nielsen
K. Winkle
H. Wanscher

Royal Veterinary and Agricultural University of Copenhagen

G. Thomsen	Professor
K. Nielsen	"

FRANCE

Secretariat d'Etat aux Affaires Etrangeres

H. Vernede	Commissaire du Gouvernement
M. Lacrouts	Conseiller Technique
A. Robinet	Conseiller Technique

Caisse Centrale de Cooperation Economique (CCCE)

R. Bailhache Conseiller Technique

Institut de l'Elevage et Medecine Veterinaire des Pays Tropicaux (IEMVT)

J. R. Pagot Directeur-General

Office de la Recherche Scientifique et Technique Outre Mer (ORSTOM)

G. Camus Directeur-General

E. Bernus Chercheur

J. Fournier "

Societe d'Etudes pour le Developpement Economique et Social (SEDES)

G. Ancian Directeur-Adjoint

J. Tyc Economiste

Universite de Rouen

J. Gallais Professeur

GERMANY

Bundesministerium fur Wirtschaftliche Zusammenarbeit (BMZ)

D. Treitz

H. Janssen

Neumann-Damerau

T. Harms

Gross-Herrenthey

M. Berg

H. Simon

. Clemens

Bundestelle fur Entwicklungshilfe

F. Bruckle

" " "

.Unger

" " "

'Ministry of Agriculture'

.Peters

.Hermkes

D. Grumbein

'Ministry of Economy and Finance'

.Osterhaus

Arbeitsgemeinschaft Deutscher Tierzuchter (ADT)

H. H. Messerschmidt

Direktor

ITALY

FAO

P. A. Oram

Secretary, TAC

Agricultural Services Division

T. S. B. Aribisala

Director

L. B. Kristjanson

Chief, Production Economics & Farm
Management Service

N. R. Carpenter

Chief, Operations Service

C. H. Bonte-Friedheim

Operations Service

R. Capitaine

" "

C. A. Morfaw

" "

C. G. Groom

" "

M. Pellissier

Project Manager (formerly WARDA)

Animal Production and Health Division

H. A. Jasiorowski	Director
R. S. Temple	Office of Director
D. G. White	Chief, Operations Service
E. Otte	Operations Service
R. B. Griffiths	Chief, Animal Health Service
G. M. Boldrini	Animal Health Service
E. Knudsen	" " "
J. Rendel	Chief, Animal Production Service
P. J. Auriol	Animal Production Group
A. S. Demiruren	" " "
P. Mahadevan	" " "
I. Mason	" " "
A. Charpentier	" " "
J. M. Westergaard	Meat and Milk Group
J. Renaud	" " "
F. Winkelmann	" " "
Z. Duda	" " "
L. R. R. Reinius	" " "

Plant Production and Protection Division

R. A. Peterson	Chief, Crop & Grassland Production Service
J. J. Norris	Grassland & Pasture Crops Group
H. J. van Rensburg	" " " "
F. Riveros	" " " "

Economics and Social Department
Rural Institutions Division

H. J. Mittendorf	Marketing, Credit & Cooperatives Service
M. Fenn	Marketing Group
R. F. E. Devred	Development Institutions & Services Unit

Commodities and Trade Division

L. Borsody	Basic Foodstuffs Service
------------	--------------------------

Development Department

S. C. Sar	Chief, Africa Service
A. L. Molle	Deputy Chief, Africa Service

Documentation Centre

G. Dubois	Chief
F. Thevenin	Project Officers, CARIS

FAO/IBRD Cooperative Programme

J. P. Huyser	Director
H. H. Groenewold	Animal Production Officer
P. Brumby	" " "

UK

Overseas Development Administration (ODA)

A. R. Melville	Chief Natural Resources Adviser
R. Cunningham	Agricultural Adviser (Research)
A. L. C. Thorne	Animal Health Adviser
J. Davie	Deputy Animal Health Adviser
J. H. Howard	Principal, Science Technology & Medical Dept.
M. A. Brunt	Principal Scientific Officer, Land Resources
P. Tuley	" " " " "
R. Rose Innes	" " " " "
B. C. Wills	" " " " "

Commonwealth Development Corporation

B. Woodhead

Agriculturist

University of Edinburgh

I. McIntyre

Professor of Veterinary Medicine

University of Glasgow

Sir Alex. Robertson

Professor of Veterinary Medicine

University of Reading

A. H. Bunting

Professor

J. Bowman

"

P. Ellis

Lecturer in Animal Health

B. G. F. Weitz

Director, National Institute for Research
in Dairying (NIRD)

A. S. Foot

Deputy Director, NIRD

C. C. Balch

Head, Nutrition Department, NIRD

East Malling Research Station

H. C. Pereira

Director/Member, TAC

ANNEX II

BIBLIOGRAPHICAL NOTE

The Task Force has been impressed with the extent of the literature on livestock research in Africa. We have deposited with the Consultative Group Secretariat both a list of the documents that were brought to our attention and copies of the papers and reports that we have collected during the course of our work, so that these may be passed on to the Centre if and when it is established.

Several review papers and reports prepared the groundwork for the establishment of the Task Force. We have found the following documents to be particularly useful.

1. Report of a Symposium on East African Range Problems, Villa Serbelloni, Lake Como, Italy, June 1968. Edited by William H. Longhurst and Harold F. Heady, Rockefeller Foundation, New York.
2. Guidelines for Planning AID Assistance Programs in Animal Resources Development for Sub-Sahara Africa by G.B. McLeroy and Nels Konnerup, USAID, Washington, November 13, 1969.
3. An International Center for Rangelands Research and Development in Africa South of the Sahara - A Proposal for Cooperative International Action put forward by the Nairobi Office of the Ford Foundation. Pt.I. Purpose and Method by John P. Robin; Pt.II. A Survey of Need by Leslie H. Brown, 1970.
4. Dynamics of Livestock Production in Sub-Sahara Africa by J.M. Fransen, R.H. Khouri and R. Milford, IBRD, Washington, September 21, 1970.
5. Discussion Paper on Livestock Production in Tropical Africa prepared for Bellagio VI Conference by John A. Pino, Rockefeller Foundation, New York, November 1970.

6. East Cost Fever and Related Diseases, a Technical Conference, Rome, March 1971, Rockefeller Foundation, New York.
7. Livestock Production and Disease Control in Africa by John Pino, Rockefeller Foundation, New York, October 19, 1971.
8. Proposals for an International Livestock Center for Tropical Africa by Glenn H. Beck, Rockefeller Foundation, New York, October 1971.
9. Proposal for an International Laboratory for Research on Animal Diseases by W.R. Pritchard, Sir Alexander Robertson and R. Sachs, Rockefeller Foundation, New York, 1972.

We found the following documents particularly helpful when evaluating the magnitude, and classifying the nature, of the existing research literature.

1. Bartha Reinhold, 1971. Studien uber Fragen der Zebu-Rinderzucht in den Tropen, (IFO-Institut fur Wirtschaftsforschung Munchen Afrika - Studienstelle) (350 references).
2. Deramee, O., 1971. L'elevage des ruminants en Afrique au Sud du Sahara - bibliographie. Belgium: Centre de Documentation Economique et Sociale Africaine (nearly 9,000 references).
3. FAO, Marketing Service, Bibliography of Marketing and Market Studies of Livestock and Meat in Africa, April 1972 (38 references).
4. FAO Animal Production and Health Division, List of Documents relating to Livestock Production in Africa, April 1972 (119 references).
5. FAO Crop Ecological Survey in West Africa, Vol. I 1966 (194 references).
6. Le Houerou, H-N., 1969. Principes, Methodes et Techniques d'Amelioration Pastorale et Fourragere, Tunisia, FAO (236 references).

7. Meyn, K. 1970. Beef Production in East Africa. IFO - Institut fur Wirtschaftsforschung Munchen. (Over 500 references).
8. Pagot, J.R., 1971. Natural Pastures, Forage Crops and Farming in the Tropical Regions of French Africa. Maisons-Alfort: Institut d'Elevage et de Medecine Veterinaire des Pays Tropicaux (176 references).
9. Pagot, J.R., 1971, Cattle Diseases in French Tropical Africa. Maisons-Alfort: Institut d'Elevage et de Medecine Veterinaire des Pays Tropicaux (337 references).
10. Pratt, D.J., 1972. Selected Bibliography on African Livestock and Rangelands, Overseas Development Administration, London (About 300 references).
11. Risopoulos, S.A., 1966. Management and Uses of Grasslands - Democratic Republic of the Congo. FAO (132 references).
12. SEDES, Quelques Etudes Realisees dans le Domaine de l'Elevage, SEDES, Paris (37 references).
13. Van Rensburg, H.J., 1969. Management and Utilization of Pastures - East Africa, FAO (193 references).
14. Wills, J.B., 1969. Contribution to a Bibliography of Animal Husbandry in West Africa from 1960. Ghana J. Agric. Sci. 2 (about 150 references).

This admittedly incomplete list indicates the quantity of literature dealing with livestock in Africa. Much of the older material is located in libraries in the Federal Republic of Germany, France, and the United Kingdom. For the more recent literature, FAO publications contribute a particularly valuable source of material, especially for the new African states.

